

Handbook of Research on

Green, Circular, and Digital Economies as Tools for Recovery and Sustainability



Patricia Ordóñez de Pablos, Xi Zhang, and
Mohammad Nabil Almunawar

IGI Global
PUBLISHER OF TIMELY KNOWLEDGE

Copyright 2022. Business Science Reference. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

Handbook of Research on Green, Circular, and Digital Economies as Tools for Recovery and Sustainability

Patricia Ordóñez de Pablos
The University of Oviedo, Spain

Xi Zhang
Tianjin University, China

Mohammad Nabil Almunawar
Universiti Brunei Darussalam, Brunei



A volume in the Advances in Finance, Accounting,
and Economics (AFAE) Book Series

Published in the United States of America by

IGI Global
Business Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA, USA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: <http://www.igi-global.com>

Copyright © 2022 by IGI Global. All rights reserved. No part of this publication may be reproduced, stored or distributed in any form or by any means, electronic or mechanical, including photocopying, without written permission from the publisher. Product or company names used in this set are for identification purposes only. Inclusion of the names of the products or companies does not indicate a claim of ownership by IGI Global of the trademark or registered trademark.

Library of Congress Cataloging-in-Publication Data

Names: Ordóñez de Pablos, Patricia, 1975- editor. | Zhang, Xi (Researcher in business management), 1982- editor. | Almunawar, Mohammad Nabil, 1960- editor.

Title: Handbook of research on green, circular, and digital economies as tools for recovery and sustainability / Patricia Ordóñez de Pablos, Xi Zhang, Mohammad Nabil Almunawar, editors.

Description: Hershey, PA : Business Science Reference, an imprint of IGI Global, [2022] | Includes bibliographical references and index. |

Summary: "The book explores new and emerging frameworks, tools, strategies to support companies and economies towards the green and digital transformation in Asia, with special focus on ASEAN by analyzing the role of disruptive technologies, cutting-edge green technologies and in these emerging practices in Asia and how they can boost the creation of new business opportunities, more jobs and economic growth for the recovery of Asian economies in post-covid-19 scenarios"-- Provided by publisher.

Identifiers: LCCN 2021036868 (print) | LCCN 2021036869 (ebook) | ISBN 9781799896647 (hardcover) | ISBN 9781799896661 (ebook)

Subjects: LCSH: Economic development--Technological innovations--Southeast Asia. | Sustainable development--Economic aspects--Southeast Asia. | Information technology--Economic aspects--Southeast Asia. | Green technology--Economic aspects--Southeast Asia. | Technological innovations--Economic aspects--Southeast Asia. | Business enterprises--Technological innovations--Southeast Asia.

Classification: LCC HC441 .G745 2022 (print) | LCC HC441 (ebook) | DDC 338.959/07--dc23

LC record available at <https://lccn.loc.gov/2021036868>

LC ebook record available at <https://lccn.loc.gov/2021036869>

This book is published in the IGI Global book series Advances in Finance, Accounting, and Economics (AFAE) (ISSN: 2327-5677; eISSN: 2327-5685)

British Cataloguing in Publication Data

A Cataloguing in Publication record for this book is available from the British Library.

All work contributed to this book is new, previously-unpublished material. The views expressed in this book are those of the authors, but not necessarily of the publisher.

For electronic access to this publication, please contact: eresources@igi-global.com.



Advances in Finance, Accounting, and Economics (AFAE) Book Series

Ahmed Driouchi
Al Akhawayn University, Morocco

ISSN:2327-5677
EISSN:2327-5685

MISSION

In our changing economic and business environment, it is important to consider the financial changes occurring internationally as well as within individual organizations and business environments. Understanding these changes as well as the factors that influence them is crucial in preparing for our financial future and ensuring economic sustainability and growth.

The **Advances in Finance, Accounting, and Economics (AFAE)** book series aims to publish comprehensive and informative titles in all areas of economics and economic theory, finance, and accounting to assist in advancing the available knowledge and providing for further research development in these dynamic fields.

COVERAGE

- Borrowing and Lending
- Labor Economics
- Economics of Intellectual Property Rights
- Development Economics
- Corporate Finance
- Auditing
- Economic Indices and Quantitative Economic Methods
- Statistical Analysis
- Applied Accounting
- Managerial Accounting

IGI Global is currently accepting manuscripts for publication within this series. To submit a proposal for a volume in this series, please contact our Acquisition Editors at Acquisitions@igi-global.com or visit: <http://www.igi-global.com/publish/>.

The Advances in Finance, Accounting, and Economics (AFAE) Book Series (ISSN 2327-5677) is published by IGI Global, 701 E. Chocolate Avenue, Hershey, PA 17033-1240, USA, www.igi-global.com. This series is composed of titles available for purchase individually; each title is edited to be contextually exclusive from any other title within the series. For pricing and ordering information please visit <http://www.igi-global.com/book-series/advances-finance-accounting-economics/73685>. Postmaster: Send all address changes to above address. Copyright © 2022 IGI Global. All rights, including translation in other languages reserved by the publisher. No part of this series may be reproduced or used in any form or by any means – graphics, electronic, or mechanical, including photocopying, recording, taping, or information and retrieval systems – without written permission from the publisher, except for non commercial, educational use, including classroom teaching purposes. The views expressed in this series are those of the authors, but not necessarily of IGI Global.

Titles in this Series

For a list of additional titles in this series, please visit: www.igi-global.com/book-series/advances-finance-accounting-economics/73685

Transitioning From Globalized to Localized and Self-Reliant Economies

Ruchika Gupta (Amity University, India) Priyank Srivastava (Amity University, India) Shiv Ranjan (Amity University, India) and M. Affan Badar (Indiana State University, USA)

Business Science Reference • © 2022 • 256pp • H/C (ISBN: 9781799887058) • US \$195.00

COVID-19 Pandemic Impact on New Economy Development and Societal Change

Cristina Raluca Gh. Popescu (University of Bucharest, Romania & The Bucharest University of Economic Studies, Romania & The National Institute for Research and Development in Environmental Protection (INCDPM), Romania & National Research and Development Institute for Gas Turbines (COMOTI), Romania)

Business Science Reference • © 2022 • 425pp • H/C (ISBN: 9781668433744) • US \$195.00

Microfinance and Sustainable Development in Africa

Yahaya Alhassan (University of Sunderland in London, UK) and Uzoechi Nwagbara (University of the West of Scotland, UK & Cardiff Metropolitan University, UK)

Business Science Reference • © 2022 • 368pp • H/C (ISBN: 9781799874997) • US \$195.00

Redefining Global Economic Thinking for the Welfare of Society

Md Mashiur Rahman (Bank Asia Ltd., Bangladesh) Richa Goel (Amity University, Noida, India) Anthony P. Gomes (TeamPeople, USA) and Md Almas Uzzaman (Independent Researcher, Australia)

Business Science Reference • © 2022 • 268pp • H/C (ISBN: 9781799882589) • US \$225.00

FinTech Development for Financial Inclusiveness

Muhammad Anshari (Universiti Brunei Darussalam, Brunei) Mohamad Nabil Almunawar (Universiti Brunei Darussalam, Brunei) and Masairol Masri (Universiti Brunei Darussalam, Brunei)

Business Science Reference • © 2022 • 269pp • H/C (ISBN: 9781799884477) • US \$225.00

Evaluating Trade and Economic Relations Between India and Southeast Asia

Anita Medhekar (Central Queensland University, Australia) and Harpreet Kaur (Central Queensland University, Australia)

Business Science Reference • © 2022 • 347pp • H/C (ISBN: 9781799857747) • US \$195.00

Handbook of Research on Global Aspects of Sustainable Finance in Times of Crises

Ibrahim Yasar Gok (Süleyman Demirel University, Turkey & Freie Universität Berlin, Germany)

Business Science Reference • © 2022 • 442pp • H/C (ISBN: 9781799885016) • US \$285.00



701 East Chocolate Avenue, Hershey, PA 17033, USA
Tel: 717-533-8845 x100 • Fax: 717-533-8661
E-Mail: cust@igi-global.com • www.igi-global.com

Editorial Advisory Board

Anindita Adhikary, *Sikkim Manipal University, India*
Aakanksha Agarwal, *Malaviya National Institute of Technology, India*
Muhammad Anshari Ali, *University Brunei Darussalam, Brunei*
Subhanil Banerjee, *Amity University, Chhattisgarh, India*
Bedanta Bora, *Sikkim Manipal University, India*
Chua Chen, *Anglia Ruskin University, Malaysia*
Omkar Dastane, *FTMS Global Malaysia, Malaysia*
Sumita Dave, *Amity University, Chhattisgarh, India*
Telisa Aulia Falianty, *Universitas Indonesia, Indonesia*
Leu Fang-Yie, *Tunghai University, Taiwan*
Shilpi Gupta, *Amity University, Chhattisgarh, India*
Umi Hamidah, *Indonesian Institute of Sciences, Indonesia*
Mohammad Hasan, *United International University, Bangladesh*
Fahmi Ibrahim, *Universiti Teknologi Brunei, Brunei*
Pg Siti Rozaidah Pg Idris, *University Brunei Darussalam, Brunei*
Asep Insani, *National Research and Innovation Agencies, Indonesia*
Andong Jiao, *Independent Researcher, China*
Namita Kapoor, *Amity University, India*
Tien Dung Khong, *Can Tho University, Vietnam*
Uus Khusni, *National Research and Innovation Agencies, Indonesia*
Souren Koner, *Amity University, Chhattisgarh, India*
Mahadi Miraz, *Sunway University, Malaysia*
Fadzliwati Mohiddin, *University of Technology Brunei, Brunei*
Firdha Anisa Najiya, *SigmaPhi Research Institute, Indonesia*
Binh Nghiê-m-Phú, *University of Hyogo, Japan*
Dewi Nilawati, *Indonesian Institute of Sciences, Indonesia*
Amirul Noeh, *University Brunei Darussalam, Brunei*
Sara Pereira, *Polytechnic Institute of Cávado, Portugal*
Gusti Raganata, *SigmaPhi Research Institute, Indonesia*
Didi Rosiyadi, *National Research and Innovation Agencies, Indonesia*
Saibal Saha, *Sikkim Manipal University, India*

Sangita Saha, *Sikkim Manipal University, India*
Ferdoush Saleheen, *Universiti Utara Malaysia, Malaysia*
Michael Sampat, *Independent Researcher, Canada*
Muhammad Sanip, *University of Technology Brunei, Brunei*
Ankita Sarangi, *Sikkim Manipal University, India*
Shumi Sarkar, *University of Information Technology and Sciences, Bangladesh*
Arif Budimanta Sebayang, *SigmaPhi Research Institute, Indonesia*
Desi Setiana, *University of Brunei Darussalam, Brunei*
Ahmad Setiawan, *The Agency of Human Resources Research and Development, Ministry of Communication and Information Technology, Indonesia*
Nikita Shaikh, *Amity University, Chhattisgarh, India*
Shweta Sharma, *Malaviya National Institute of Management, India*
Neni Sintawardani, *Indonesian Institute of Sciences (LIPI), Indonesia*
Bruno Sousa, *Polytechnic Institute of Cávado and Ave, Portugal*
Sawarisa Suam, *Assam Royal Global University, India*
Farhana Sumi, *University of Information Technology and Sciences, Bangladesh*
Alifya Kayla Susanto, *University of Technology Brunei, Brunei*
Heru Susanto, *National Research and Innovation Agencies, Tunghai University, Taiwan*
João Veiga, *Polytechnic Institute of Cávado, Portugal*
João Veloso, *Polytechnic Institute of Cávado, Portugal*
Widyarani, *Indonesian Institute of Sciences, Indonesia*
Diana Wulan, *Indonesian Institute of Sciences, Indonesia*
Huynh Xuan, *Can Tho University, Vietnam*
Abubakar Mukhtar Yakasai, *Universiti Brunei Darussalam, Brunei*
Poshan Yu, *Soochow University, China*

List of Reviewers

Sri Bramantoro Abdinagoro, *Binus University, Indonesia*
Mohammad Alif Azizi Abdullah, *Universiti Brunei Darussalam, Brunei*
Mohammad Tariq Hasan, *United International University, Bangladesh*
Fareed Ahmad Malik, *Minhaj University, Lahore, Pakistan*
Ina Agustini Murwani, *Binus University, Indonesia*
Nima Norouzi, *Bournemouth University, UK*
Suprihatin Suprihatin, *IPB University, Indonesia*

List of Contributors

Adhikary, Anindita / <i>Sikkim Manipal Institute of Technology, Sikkim Manipal University, India</i> .	329
Agarwal, Aakanksha / <i>Malaviya National Institute of Technology, India</i>	1
Almunawar, Mohammad Nabil / <i>Universiti Brunei Darussalam, Brunei</i>	66, 84
Anshari, Muhammad / <i>Universiti Brunei Darussalam, Brunei</i>	84, 107
Banerjee, Subhanil / <i>Amity University, Chhattisgarh, India</i>	186
Bora, Bedanta / <i>Sikkim Manipal Institute of Technology, Sikkim Manipal University, India</i>	329
Chen, Chua (Jane) Soh / <i>Anglia Ruskin University, UK</i>	43
Dastane, Omkar / <i>FTMS Global, Malaysia</i>	43
Dave, Sumita / <i>Amity University, Chhattisgarh, India</i>	142
Dunan, Amri / <i>Ministry of Communication and Informationa Technology, Indonesia</i>	22
Falianty, Telisa Aulia / <i>Universitas Indonesia, Indonesia</i>	156
Fang-Yie, Leu / <i>Tunghai University, Taiwan</i>	123
Gupta, Shilpi / <i>Amity University, Chhattisgarh, India</i>	186
Hamidah, Umi / <i>Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia</i>	231
Hasan, Mohammad Tariq / <i>United International University, Bangladesh</i>	66
Ibrahim, Fahmi / <i>University of Technology Brunei, Brunei</i>	123
Insani, Asep / <i>National Research and Innovation Agencies, Indonesia</i>	123
Jiao, Andong / <i>Independent Researcher, China</i>	257
Kapoor, Namita / <i>Amity University, Noida, India</i>	219
Khai, Huynh Viet / <i>Can Tho University, Vietnam</i>	207
Khong, Tien Dung / <i>Can Tho University, Vietnam</i>	207
Khusni, Uus / <i>National Research and Innovation Agencies, Indonesia</i>	123
Koner, Souren / <i>Amity University, Chhattisgarh, India</i>	186
Miraz, Mahadi Hasan / <i>Sunway University, Malaysia</i>	66
Mohiddin, Fadzliwati / <i>University of Technology Brunei, Brunei</i>	123
Mudjianto, Bambang / <i>Ministry of Communication and Informationa Technology, Indonesia</i>	22
Najiya, Firdha Anisa / <i>Sigmaphi Research Institute, Indonesia</i>	156
Nghiêm-Phú, Bình / <i>University of Hyogo, Japan</i>	311
Nilawati, Dewi / <i>Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia</i>	231
Noeh, Amirul Shahnoel / <i>Universiti Brunei Darussalam, Brunei</i>	107
Pereira, Sara Quintão / <i>Polytechnic Institute of Cávado and Ave, Portugal</i>	295
Pg Idris, Pg Siti Rozaidah / <i>Universiti Brunei Darussalam, Brunei</i>	107
Raganata, Gusti / <i>SigmaPhi Research Institute, Indonesia</i>	156

Rosiyadi, Didi / <i>National Research and Innovation Agencies, Indonesia</i>	123
Saha, Saibal Kumar / <i>Sikkim Manipal Institute of Technology, Sikkim Manipal University, India</i> . 280, 329	
Saha, Sangita / <i>Sikkim Manipal Institute of Technology, Sikkim Manipal University, India</i>	329
Saleheen, Ferdoush / <i>Universiti Utara Malaysia, Malaysia</i>	66
Sampat, Michael / <i>Independent Researcher, Canada</i>	257
Sanip, Muhammad Syamim / <i>University of Technology Brunei, Brunei</i>	123
Sarang, Ankita / <i>Sikkim Manipal Institute of Technology, Sikkim Manipal University, India</i>	280
Sarkar, Shumi / <i>University of Information Technology and Sciences, Bangladesh</i>	66
Sebayang, Arif Budimanta / <i>SigmaPhi Research Institute, Indonesia</i>	156
Setiana, Desi / <i>Ministry of Law and Human Right, Indonesia & University of Brunei Darussalam, Brunei</i>	123
Setiawan, Ahmad Budi / <i>Ministry of Communication and Information Technology, Indonesia</i>	22
Shaikh, Nikita / <i>Amity University, Chhattisgarh, India</i>	142
Sharma, Shweta / <i>Malaviya National Institute of Management, India</i>	1
Sintawardani, Neni / <i>Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia</i>	231
Sousa, Bruno Barbosa / <i>Polytechnic Institute of Cávado and Ave (IPCA), Portugal & CiTUR research member, Portugal</i>	295
Suiam, Sawarisa / <i>Assam Royal Global University, India</i>	280
Sumi, Farhana Rahman / <i>University of Information Technology and Sciences, Bangladesh</i>	66
Susanto, Alifya Kayla Shafa / <i>University of Technology Brunei, Brunei</i>	123
Susanto, Heru / <i>Univeristy of Technology Brunei, Brunei & National Research and Innovation Agencies, Indonesia & Tunghai University, Taiwan</i>	123
Veiga, João Miguel / <i>Polytechnic Institute of Cávado and Ave, Portugal</i>	295
Veloso, João Daniel / <i>Polytechnic Institute of Cávado and Ave, Portugal</i>	295
Widyarani / <i>Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia</i>	231
Wulan, Diana Rahayuning / <i>Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia</i>	231
Xuan, Huynh Thi Dan / <i>Can Tho University, Vietnam</i>	207
Yakasai, Abubakar Mukhtar / <i>Universiti Brunei Darussalam, Brunei</i>	84
Yu, Poshan / <i>Soochow University, China</i>	257

Table of Contents

Preface..... xxi

Chapter 1

Influence of Corporate Sustainability on Providing Electronic Payment Services by the Banking Industry in India..... 1

Shweta Sharma, Malaviya National Institute of Management, India

Aakanksha Agarwal, Malaviya National Institute of Technology, India

Chapter 2

Policies and Innovations of Financial Technology Business Models in the Digital Economy Era on the E-Business Ecosystem in Indonesia..... 22

Ahmad Budi Setiawan, Ministry of Communication and Information Technology, Indonesia

Amri Dunan, Ministry of Communication and Informationa Technology, Indonesia

Bambang Mudjianto, Ministry of Communication and Informationa Technology, Indonesia

Chapter 3

Advanced Technological Factors Affecting Digital Banking Usage Intention..... 43

Chua (Jane) Soh Chen, Anglia Ruskin University, UK

Omkar Dastane, FTMS Global, Malaysia

Chapter 4

Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period..... 66

Mahadi Hasan Miraz, Sunway University, Malaysia

Ferdoush Saleheen, Universiti Utara Malaysia, Malaysia

Mohammad Nabil Almunawar, Universiti Brunei Darussalam, Brunei

Farhana Rahman Sumi, University of Information Technology and Sciences, Bangladesh

Shumi Sarkar, University of Information Technology and Sciences, Bangladesh

Mohammad Tariq Hasan, United International University, Bangladesh

Chapter 5

Framework for Assessing Online Shopping Use Under the Digital Transformation of the Economy in a Post-Pandemic Era 84

Abubakar Mukhtar Yakasai, Universiti Brunei Darussalam, Brunei

Mohammad Nabil Almunawar, Universiti Brunei Darussalam, Brunei

Muhammad Anshari, Universiti Brunei Darussalam, Brunei

Chapter 6

Developing a National Innovation System in Small States: A Case for Brunei Darussalam's Economic Development – A Catalyst for Digitalization Catch-Up and Economic Growth..... 107

Amirul Shahnoel Noeh, Universiti Brunei Darussalam, Brunei

Pg Siti Rozaidah Pg Idris, Universiti Brunei Darussalam, Brunei

Muhammad Anshari, Universiti Brunei Darussalam, Brunei

Chapter 7

Business Process Reengineering of Digital Learning Ecosystems: Green Strategy for Recovery and Sustainability..... 123

Heru Susanto, Univeristy of Technology Brunei, Brunei & National Research and Innovation Agencies, Indonesia & Tunghai University, Taiwan

Fadzliwati Mohiddin, University of Technology Brunei, Brunei

Leu Fang-Yie, Tunghai University, Taiwan

Muhammad Syamim Sanip, University of Technology Brunei, Brunei

Alifya Kayla Shafa Susanto, University of Technology Brunei, Brunei

Desi Setiana, Ministry of Law and Human Right, Indonesia & University of Brunei Darussalam, Brunei

Didi Rosiyadi, National Research and Innovation Agencies, Indonesia

Fahmi Ibrahim, University of Technology Brunei, Brunei

Asep Insani, National Research and Innovation Agencies, Indonesia

Uus Khusni, National Research and Innovation Agencies, Indonesia

Chapter 8

Technological Innovations in Supply Chain Management Towards a Circular Economy in the Healthcare Sector of the UAE..... 142

Sumita Dave, Amity University, Chhattisgarh, India

Nikita Shaikh, Amity University, Chhattisgarh, India

Chapter 9

Digital Economy Transformation in Nexus With External and Social Sustainability: The Indonesian Experience..... 156

Arif Budimanta Sebayang, SigmaPhi Research Institute, Indonesia

Telisa Aulia Falianty, Universitas Indonesia, Indonesia

Firdha Anisa Najiya, Sigmaphi Research Institute, Indonesia

Gusti Raganata, SigmaPhi Research Institute, Indonesia

Chapter 10

Sustainability and Consumerism: How Green Are the Green Sectors 186

Subhanil Banerjee, Amity University, Chhattisgarh, India

Shilpi Gupta, Amity University, Chhattisgarh, India

Souren Koner, Amity University, Chhattisgarh, India

Chapter 11	
Recycling Behaviour of Urban Households in the Vietnamese Mekong Delta	207
	<i>Huynh Thi Dan Xuan, Can Tho University, Vietnam</i>
	<i>Tien Dung Khong, Can Tho University, Vietnam</i>
	<i>Huynh Viet Khai, Can Tho University, Vietnam</i>
Chapter 12	
How Responsible Are Consumers? Analysis of Food Waste Behavior of Households.....	219
	<i>Namita Kapoor, Amity University, Noida, India</i>
Chapter 13	
Recovery of Energy and Materials From Small-Scale Tofu Processing Industries in Indonesia	231
	<i>Neni Sintawardani, Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia</i>
	<i>Umi Hamidah, Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia</i>
	<i>Widyarani, Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia</i>
	<i>Diana Rahayuning Wulan, Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia</i>
	<i>Dewi Nilawati, Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia</i>
Chapter 14	
The Effect of Chinese Green Transformation on Competitiveness and the Environment	257
	<i>Poshan Yu, Soochow University, China</i>
	<i>Andong Jiao, Independent Researcher, China</i>
	<i>Michael Sampat, Independent Researcher, Canada</i>
Chapter 15	
Rural Tourism and Its Impact on the Economy: A Study of Lalong Village, Meghalaya	280
	<i>Saibal Kumar Saha, Sikkim Manipal Institute of Technology, Sikkim Manipal University, India</i>
	<i>Sawarisa Suiaam, Assam Royal Global University, India</i>
	<i>Ankita Sarangi, Sikkim Manipal Institute of Technology, Sikkim Manipal University, India</i>
Chapter 16	
Market Segmentation and Dark Tourism and the (Post) Pandemic Scenario.....	295
	<i>João Miguel Veiga, Polytechnic Institute of Cávado and Ave, Portugal</i>
	<i>João Daniel Veloso, Polytechnic Institute of Cávado and Ave, Portugal</i>
	<i>Sara Quintão Pereira, Polytechnic Institute of Cávado and Ave, Portugal</i>
	<i>Bruno Barbosa Sousa, Polytechnic Institute of Cávado and Ave (IPCA), Portugal & CiTUR research member, Portugal</i>

Chapter 17

The Projected Images of a Thrift Store Chain in Japan: A Study of Online Interview Materials 311
Bình Nghiệm-Phú, University of Hyogo, Japan

Chapter 18

COVID-19 Health Pandemic: A Turnaround in Economic Infrastructure 329
Saibal Kumar Saha, Sikkim Manipal Institute of Technology, Sikkim Manipal University, India
Bedanta Bora, Sikkim Manipal Institute of Technology, Sikkim Manipal University, India
Anindita Adhikary, Sikkim Manipal Institute of Technology, Sikkim Manipal University, India
Sangita Saha, Sikkim Manipal Institute of Technology, Sikkim Manipal University, India

Compilation of References 343

About the Contributors 408

Index..... 416

Detailed Table of Contents

Preface	xxi
----------------------	-----

Chapter 1

Influence of Corporate Sustainability on Providing Electronic Payment Services by the Banking Industry in India.....	1
--	---

Shweta Sharma, Malaviya National Institute of Management, India

Aakanksha Agarwal, Malaviya National Institute of Technology, India

This study investigates the role of sustainable finance practices and their impact on digital banking services in India. An increased frequency of internet use for various digital banking services provides an opportunity to build the banking industry with various online services. This study reviews the literature on sustainable corporate finance and the adoption of e-banking services. The study uses an exploratory research-based approach to understand the usage rate and adoption of internet banking. A questionnaire-based survey was conducted on 325 respondents. Findings of the study suggest that there is a gradual increase in the adoption of internet banking, but major barriers in adoption are a threat of security, privacy, and trust.

Chapter 2

Policies and Innovations of Financial Technology Business Models in the Digital Economy Era on the E-Business Ecosystem in Indonesia.....	22
---	----

Ahmad Budi Setiawan, Ministry of Communication and Information Technology, Indonesia

Amri Dunan, Ministry of Communication and Informationa Technology, Indonesia

Bambang Mudjianto, Ministry of Communication and Informationa Technology, Indonesia

The rapid development of technology and information systems continues to give birth to various innovations, especially those related to financial technology to meet the various needs of the community, including access to financial services and processing of financial transactions. Financial technology (FinTech) is the implementation and utilization of technology to improve financial and banking services. The development of financial technology in Indonesia itself is growing rapidly, along with the development of existing technology. FinTech is developed by utilizing the latest software, internet, and computing technologies. Based on this, this study examines the development of innovation and policies for the fintech business model in the e-business ecosystem in Indonesia. This research is a qualitative research with data collection methods through focus group discussions, in-depth interviews, and literature studies. This chapter recommends that the government develop and make policies for fintech business model innovation in the e-business ecosystem in Indonesia.

Chapter 3

Advanced Technological Factors Affecting Digital Banking Usage Intention 43

Chua (Jane) Soh Chen, Anglia Ruskin University, UK

Omkar Dastane, FTMS Global, Malaysia

This research-based chapter investigates impact of various innovation technology factors on digital banking customers' usage intention. The selected factors are online banking, mobile payment, artificial intelligence-based robot advisors, and cloud-based services. The study develops conceptual model against theoretical background of the innovation diffusion theory, technology acceptance model, and unified theory of acceptance and use of technology. Empirical data was collected through online survey using a self-administered questionnaire. Quantitative research method was employed with a total sample size of 302 respondents using snowball sampling technique. Normality and reliability tests were performed followed by confirmatory factor analysis, validity assessment, and structural equation modelling using AMOS 24. The findings confirm positive significant impact of artificial intelligence-based robot advisor and cloud-based services on usage intention. Theoretical contribution and managerial implications are then discussed along with limitations of the current study and future research avenues.

Chapter 4

Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period 66

Mahadi Hasan Miraz, Sunway University, Malaysia

Ferdoush Saleheen, Universiti Utara Malaysia, Malaysia

Mohammad Nabil Almunawar, Universiti Brunei Darussalam, Brunei

Farhana Rahman Sumi, University of Information Technology and Sciences, Bangladesh

Shumi Sarkar, University of Information Technology and Sciences, Bangladesh

Mohammad Tariq Hasan, United International University, Bangladesh

This research examines the relationship between facilitating condition, digital literacy, pandemic adoption, social influence, application use intention, and IoT-based business. Also, the research used systematic random sampling in this study to achieve the most rigorous analysis of the possible research objectives even though 277 legitimate replies were received in response to the survey questions asked at the online-based companies in Bangladesh. The scope of this study is the urban SME industry in Bangladesh. Besides that, the data was being analyzed with the help of partial least squares structural equation modeling (PLS-SEM). These research findings showed that facilitating condition (FC), digital literacy (DL), pandemic adoption (PA), social influence (SI), application use intention (AUI), and IoT-based business (dependent variable) effect in SME business industries in Bangladesh.

Chapter 5

Framework for Assessing Online Shopping Use Under the Digital Transformation of the Economy in a Post-Pandemic Era 84

Abubakar Mukhtar Yakasai, Universiti Brunei Darussalam, Brunei

Mohammad Nabil Almunawar, Universiti Brunei Darussalam, Brunei

Muhammad Anshari, Universiti Brunei Darussalam, Brunei

The sudden appearance of COVID-19 has positively ameliorated digital presence generally as well as B2C e-shopping transactions. This situation attracts researchers' interest to unravel the effect of COVID-19 vis-à-vis various e-commerce activities. Recent studies have already shown a direct impact of the pandemic on many businesses, especially B2C transactions. However, its moderation effect and its effect as a control

variable were scarcely traced in the literature. Hence, the chapter explains and proposes a framework for assessing online shopping use under the digital transformation in a post-pandemic era, including both a moderating and a control effect of the COVID-19 pandemic. Building on the TAM theoretical model, the proposed framework added risk factors and channel credibility as additional independent variables and the COVID-19 pandemic as both a moderating and a control variable, respectively. Using existing literature, the authors establish relationships among variables and conceptualise both the moderating and control effects of the COVID-19 pandemic, respectively.

Chapter 6

Developing a National Innovation System in Small States: A Case for Brunei Darussalam's Economic Development – A Catalyst for Digitalization Catch-Up and Economic Growth..... 107
Amirul Shahnoel Noeh, Universiti Brunei Darussalam, Brunei
Pg Siti Rozaidah Pg Idris, Universiti Brunei Darussalam, Brunei
Muhammad Anshari, Universiti Brunei Darussalam, Brunei

This study shares some empirical insights for adopting a national innovation system (NIS) to catalyze capacity building in small states with relatively low technology-based research and development resources. These countries may have to start further back than other nations; however, this chapter maintains that with the right NIS, latecomers can have the advantage of catching up economically. This study explores Brunei Darussalam's journey to catalyze innovation for sustainable economic growth, particularly digitalization and deep tech. The study found that establishing a national innovation ecosystem could be effective with national consensus and acceptance behind the approach. It emphasizes building critical infrastructures, institutions, and governance to promote efficient knowledge flow, talent development, digital literacy, and overall absorptive capacity. Because Brunei is a small state, coordinating and facilitating cohesive linkages among its key stakeholders can strategically mobilize change. As Brunei Darussalam embarks on such a trajectory, it must determine a relevant model.

Chapter 7

Business Process Reengineering of Digital Learning Ecosystems: Green Strategy for Recovery and Sustainability..... 123
Heru Susanto, Univeristy of Technology Brunei, Brunei & National Research and Innovation Agencies, Indonesia & Tunghai University, Taiwan
Fadzliwati Mohiddin, University of Technology Brunei, Brunei
Leu Fang-Yie, Tunghai University, Taiwan
Muhammad Syamim Sanip, University of Technology Brunei, Brunei
Alifya Kayla Shafa Susanto, University of Technology Brunei, Brunei
Desi Setiana, Ministry of Law and Human Right, Indonesia & University of Brunei Darussalam, Brunei
Didi Rosiyadi, National Research and Innovation Agencies, Indonesia
Fahmi Ibrahim, University of Technology Brunei, Brunei
Asep Insani, National Research and Innovation Agencies, Indonesia
Uus Khusni, National Research and Innovation Agencies, Indonesia

This study was conducted to investigate e-learning acceptance and factors influencing higher institution students in Brunei Darussalam. Among the factors involved in this study were perceived ease of use, perceived usefulness, self-efficacy, technology availability, and usage and intention to use. Technology acceptance models (TAM) were used as a basis for the study and for hypothesizing the effects of such

variables on the use of e-learning. The findings of this study found that there is significant influence of self-efficacy to perceived ease of use and perceived usefulness while perceived ease of use has direct impact to perceived usefulness and perceived usefulness has influence on intention to use towards e-learning systems.

Chapter 8

Technological Innovations in Supply Chain Management Towards a Circular Economy in the Healthcare Sector of the UAE..... 142

Sumita Dave, Amity University, Chhattisgarh, India

Nikita Shaikh, Amity University, Chhattisgarh, India

Traditional techniques of linear economy generate a lot of waste, which leads to unsustainable practices in the supply chain management. This chapter analyses the impact of circular economic system practices on company overall performance for a circular supply chain and explores the mediating position the technologically driven supply chain plays inside these relationships in the healthcare sector in reference to UAE. UAE and the 2030 Agenda of Sustainable Development Excellence in Implementation 2017 report suggests that UAE raises cognizance of, and integrates, sustainability standards into its agenda to promote sustainable lifestyles. Since most products in UAE are imported, the supply chain is lengthy and fragmented, making procurement expensive. Hence, an innovative technology-driven green supply chain can be an effective solution for both cost and waste reduction.

Chapter 9

Digital Economy Transformation in Nexus With External and Social Sustainability: The Indonesian Experience 156

Arif Budimanta Sebayang, SigmaPhi Research Institute, Indonesia

Telisa Aulia Falianty, Universitas Indonesia, Indonesia

Firdha Anisa Najiya, Sigmaphi Research Institute, Indonesia

Gusti Raganata, SigmaPhi Research Institute, Indonesia

In response to Indonesia's accelerating digital use, this study aims to address challenges to implement digital business models and identify the impact of digital economy to external and social and environmental sustainability. This study uses desk study, descriptive statistical analysis, and quantitative regression model and qualitative information from discussion with relevant stakeholders. This study provides several important results. First, increase in mobile cellular subscription will lead to increase in inequality, while percentage of internet user to population has shown otherwise. Second, the study also found that technology has a possibility to affect environment since it could increase CO2 emission. The digital technology gives the pressure to increase balance of payment deficit. The recommendations include increasing digital access and digital literacy, developing pro-environment technology, and increasing the exports of digitally deliverable services.

Chapter 10

Sustainability and Consumerism: How Green Are the Green Sectors 186

Subhanil Banerjee, Amity University, Chhattisgarh, India

Shilpi Gupta, Amity University, Chhattisgarh, India

Souren Koner, Amity University, Chhattisgarh, India

The Brundtland Commission report Our Common Future in 1987 gave birth to the concept of sustainable

development. The meaning is benefitting the present without compromising the future. It was felt that, unless conventional growth and development are replaced by sustainable development through environmentally friendly actions, doomsday is very near. However, such sustainable development was followed by a global spree of consumerism that only added to the environmental burden. This dichotomy needs to be understood, and for the same purpose, one needs to go back to that point of Earth's history when ecology and economy were synonymous. From then on, the drift between the ecology and economy that has brought us to today's scenario needs to be understood. In this background, the chapter raises questions on how green the green sectors are. Furthermore, can sustainable development and consumerism be captured as one body of 'sustainable consumerism'?

Chapter 11

Recycling Behaviour of Urban Households in the Vietnamese Mekong Delta..... 207

Huynh Thi Dan Xuan, Can Tho University, Vietnam

Tien Dung Khong, Can Tho University, Vietnam

Huynh Viet Khai, Can Tho University, Vietnam

This chapter is aimed at providing new insights into the perception and determinants of municipal solid waste behaviour. A quantitative data set was obtained and analyzed by directly interviewing 579 urban households in the Vietnamese Mekong Delta stratified by urban-type level. Binary Probit model and OLS regression indicate the significant influences of urbanization level, organization membership, the concern to environmental status, and education level of households. Finally, results reveal that the municipal solid waste recycling level can be significantly increased by motivating urban households' incentives; therefore, policymakers in Vietnam as well as in developing countries should also provide more incentive to households by subsidizing the recycled materials (i.e., paper and unusable metal) and well-managed informal recycling systems including itinerant waste buyers.

Chapter 12

How Responsible Are Consumers? Analysis of Food Waste Behavior of Households..... 219

Namita Kapoor, Amity University, Noida, India

One of the most important concern the economies are facing is food security amidst the growing population. The population growth has exerted tremendous pressure on food security and has raised concerns over food sustainability. The sustainability of food waste is an environmental, economic, and social issue, which has useful policy implications. The issue has been studied through the analysis of responsible consumption and food waste. The literature has emphasised improving the efficiency in supply chain to reduce food waste, but researches on food waste at the consumer level are still in the natal stage. It is important to understand to develop the framework for responsible consumption and to assess the factors that may contribute to reduction in food waste at the household level. The study aims to examine the scope of responsible consumption to attain environmental sustainability.

Chapter 13

Recovery of Energy and Materials From Small-Scale Tofu Processing Industries in Indonesia 231

Neni Sintawardani, Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia

Umi Hamidah, Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia

Widyarani, Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia

Diana Rahayuning Wulan, Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia

Dewi Nilawati, Research Unit for Clean Technology, National Research and Innovation Agency (BRIN), Indonesia

Tofu factories are spread across Indonesia as tofu is a cheap source of protein and favorite food for almost all population groups. Most tofu producers are micro/small business owners. In addition to soybeans, clean water is the most important input to produce tofu curd. It will generate a large amount of wastewater and solid waste, which still contains significant amounts of easily biodegradable organic matter. There are often complaints and protests from the public about the pollution in air and water in the area from the discharged waste. Tofu producers know about this, but their limited income and capital force them to ignore the environmental issues. The potential of tofu waste treatment technologies to produce new products or clean materials that can be fed back into the production process is discussed and reviewed to ensure all input materials in the tofu process can be used optimally and efficiently in a closed-loop production process. And it could be implemented easily and economically by the factories.

Chapter 14

The Effect of Chinese Green Transformation on Competitiveness and the Environment 257

Poshan Yu, Soochow University, China

Andong Jiao, Independent Researcher, China

Michael Sampat, Independent Researcher, Canada

People in China are paying more attention to environmental issues as they increase in importance and consequence. At the same time, the Chinese government has gradually begun paying more attention to the environment, advocating sustainable development. The government has been actively developing green financial products such as green loans, green insurance, green funds, and other financial products to help Chinese companies “go green” and reach peak carbon and carbon-neutral goals ahead of schedule. China attaches great importance to its “green transformation” goals, as can be seen from the number of new policies related to green and sustainable development. Under these circumstances, companies must follow the policy and carry out green upgrades or risk total failure. This chapter mainly discusses the background of what firms face in China’s green finance environment, taking clean energy, green buildings, and green transportation as examples of how companies should adapt to these trends and improve their competitiveness.

Chapter 15

Rural Tourism and Its Impact on the Economy: A Study of Lalong Village, Meghalaya 280

Saibal Kumar Saha, Sikkim Manipal Institute of Technology, Sikkim Manipal University, India

Sawarisa Suiam, Assam Royal Global University, India

Ankita Sarangi, Sikkim Manipal Institute of Technology, Sikkim Manipal University, India

The changing tastes and preferences of tourists have given rise to a new form of tourism, rural tourism. This new form of tourism plays an important role to change the rural economy and living standard of villagers. Meghalaya, the abode of clouds, is famous for a number of its villages and attract thousands of tourists every year. This research aims to study the impact of rural tourism on the economy of the village. For this study, Ialong village has been selected, and 150 people were interviewed with the help of a structured questionnaire and insights of people concerned were noted and analyzed. It was found that people believe the facilities of electricity, hygiene, toilets, accommodation have improved and have accounted for more influx of tourists into the region. However, lack of exposure of the different villages and their offerings in advertisement media have limited the potential of growth of tourism in these villages.

Chapter 16

Market Segmentation and Dark Tourism and the (Post) Pandemic Scenario 295

João Miguel Veiga, Polytechnic Institute of Cávado and Ave, Portugal

João Daniel Veloso, Polytechnic Institute of Cávado and Ave, Portugal

Sara Quintão Pereira, Polytechnic Institute of Cávado and Ave, Portugal

*Bruno Barbosa Sousa, Polytechnic Institute of Cávado and Ave (IPCA), Portugal & CiTUR
research member, Portugal*

Dark tourism is a segment of tourism that has been growing in recent decades and is strongly associated with tragedy and mystery. There are several academic researchers who present literature on this specific group of tourist consumers. As a result, 2020 was strongly marked by the pandemic of the new coronavirus (COVID-19). This chapter presents a reflection on the role of dark tourism in the pandemic and post-pandemic period. From an interdisciplinary perspective, this chapter presents contributions to (dark) tourism, marketing, and pandemic management.

Chapter 17

The Projected Images of a Thrift Store Chain in Japan: A Study of Online Interview Materials 311

Bình Nghiệm-Phú, University of Hyogo, Japan

Being thrifty and frugal has become a distinct lifestyle choice. An insightful knowledge about thrifty and frugal consumers on the demand side has been revealed by previous studies. However, related issues on the supply side have largely been neglected. Therefore, this study aims to examine the projection of the thrift store images. By analyzing interviews displayed on public websites with the director and staff of Treasure Factory, a big thrift store chain in Japan, this study has revealed that the company is actively projecting its images. Among seven images, Treasure Factory is especially focusing on products, purchase processes and distribution channels (place), and customer benefits (psychology). The remaining images (prices, promotion, customers or people, and partnerships) are less emphasized but still harmoniously synchronize with and support the main images. Implications for the theory behind thrift stores and for the actual management of them are discussed based on these findings.

Chapter 18

COVID-19 Health Pandemic: A Turnaround in Economic Infrastructure 329

*Saibal Kumar Saha, Sikkim Manipal Institute of Technology, Sikkim Manipal University,
India*

Bedanta Bora, Sikkim Manipal Institute of Technology, Sikkim Manipal University, India

*Anindita Adhikary, Sikkim Manipal Institute of Technology, Sikkim Manipal University,
India*

Sangita Saha, Sikkim Manipal Institute of Technology, Sikkim Manipal University, India

The COVID-19 pandemic has caused numerous deaths, drained resources, halted trade, and shattered economies across the world. Humankind is faced with the challenge of survival, putting a halt on the growth dynamics. Lockdowns imposed by governments have flattened the curve of COVID-19 victims, but only to delay the spread of the deadly virus. Till the time a complete cure is discovered, people have managed to find ways to prevent the spread of the virus by developing new norms of day-to-day survival. The study aims to highlight the COVID-19 crisis and measures to maintain sustainability in the new normal. The methodology used is primarily based on published literature and data. Findings of the study indicate that there is absolute uncertainty on 'What Next' and 'How'. Hence, it is concluded that any resurgence attempt to equipose this catastrophe is predicted to be prolonged and so its end results.

Compilation of References	343
About the Contributors	408
Index.....	416

Preface

INTRODUCTION

After the COVID-19 outbreak in 2020, societies, economies, countries and regions face unprecedented challenges in several dimensions simultaneously, mainly, health, social, economic dimensions. Countries need to recover pre-pandemic economic growth fastly, boost productivity and job creation, invest in smart healthcare systems and services and work towards a climate-neutral and circular economy.

On the one hand, companies and economies need to use the opportunities of the transition to a greener economy. The demand for greener products and services can boost the creation of new jobs. The circular economy, with its potential impact on the life cycle of products, can contribute to the creation of sustainable growth and jobs (Ordóñez, Xi and Almunawar, 2021; Ordóñez *et al.*, 2021).

The New Circular Economy Action Plan of the European Commission for a Cleaner and More Competitive Europe (approved in March 2020) (European Commission, 2020) addresses actions to make sustainable products the norm in the European Union or focus on specific sectors that use most resources and that have potential for circularity (for example, electronics, food, textiles, vehicles, water). This plan supports the European Green Deal.

There are not many publications that address this combination of topics (circular, digital, green, sustainable performance) and even less publications that explore these issues in the Asian region/ASEAN. This book will clearly fill this gap offering readers a rich collection of chapters with innovative concepts, strategies, and solutions to understand key issues in the digital, circular, and green economy.

OBJECTIVE

The book explores new and emerging frameworks, tools, strategies to support companies and economies towards the green and digital transformation. It will analyze the role of disruptive technologies, cutting-edge green technologies and in these emerging practices in Asia and how they can boost the creation of new business opportunities, more jobs and economic growth for the recovery of economies in post-covid-19 scenarios.

It aims to be an international platform to bring together academics, scholars, researchers, decision makers, policy makers, and practitioners to share new theories, research findings, and case studies, to enhance understanding and collaboration in green growth, digital economy, environmental impact, green public procurement, sustainable performance, the transition to a more circular economy, etc.

TARGET AUDIENCE

Professors in academia, deans, heads of departments, director of masters, students (undergraduate and postgraduate level), politicians, policy makers, corporate heads of firms, senior general managers, managing directors, information technology directors and managers, libraries, etc.

CONTENTS OF THE BOOK

The book presents a collection of 18 book chapters addressing key topics like circular and digital economy, digital transformation, electronic payment services, the development of a national innovation system, green issues and sustainability and covering different countries like Bangladesh, Brunei, China India, Indonesia, UAE and Vietnam.

Chapter 1, titled “Influence of Corporate Sustainability on Providing Electronic Payment Services by Banking Industry in India” (by Shweta Sharma and Aakanksha Agarwal), examines “the role of sustainable finance practices and their impact on digital banking services in India. An increased frequency of internet use for various digital banking services provides an opportunity to inbuilt the banking industry with various online services. This study reviews the literature on sustainable corporate finance and the adoption of e-banking services. The study uses an exploratory research-based approach to understand the usage rate and adoption of internet banking. A questionnaire-based survey was conducted on 325 respondents. Findings of the study suggest that there is a gradual increase in the adoption of internet banking, but major barriers in adoption are a threat of security, privacy and trust”.

Chapter 2, titled “Policies and Innovations of Financial Technology Business Models in the Digital Economy Era on the E-Business Ecosystem in Indonesia” (by Ahmad Setiawan, Amri Dunan and Bambang Mudjiyanto), affirms that “the rapid development of technology and information systems continues to give birth to various innovations, especially those related to financial technology to meet the various needs of the community, including access to financial services and processing of financial transactions. Financial Technology (Fintech) is the implementation and utilization of technology to improve financial and banking services. The development of financial technology in Indonesia itself is growing rapidly, along with the development of existing technology. Fintech is developed by utilizing the latest software, internet and computing technologies. Based on this, this study examines the development of innovation and policies for the fintech business model in the e-business ecosystem in Indonesia. This research is a qualitative research, with data collection methods through focus group discussions, in-depth interviews, and literature studies. This paper recommends that the government develop and make policies for fintech business model innovation in the e-business ecosystem in Indonesia”.

Chapter 3, titled “Advanced Technological Factors Affecting Digital Banking Usage Intention” (by Chua Chen and Omkar Dastane), studies the “impact of various innovation technology factors on digital banking customers’ usage intention. The selected factors are online banking, mobile payment, artificial intelligence-based robot advisor and cloud-based services. Th study develops conceptual model against theoretical background of the Innovation Diffusion Theory, Technology Acceptance Model and Unified Theory of Acceptance and Use of Technology. Empirical data was collected through online survey using a self-administered questionnaire. Quantitative research method was employed with a total sample size of 302 respondents using snowball sampling technique. Normality & reliability tests were performed followed by confirmatory factory analysis, validity assessment and structural equation modelling using

Preface

AMOS 24. The findings confirm positive significant impact of artificial intelligence-based robot advisor and cloud-based services on usage intention. Theoretical contribution, managerial implications are then discussed along with limitations of current study and future research avenues”.

Chapter 4, titled “Factors Affecting IoT-Based Business Management in the Post-Pandemic Period” (by Mahadi Miraz, Ferdoush Saleheen, Mohammad Almunawar, Farhana Sumi, Shumi Sarkar and Mohammad Hasan), analyzes “the relationship between facilitating condition, digital literacy, pandemic adoption, social influence, application use intention, and IoT-based business. Also, the research used systematic random sampling was employed in this study to achieve the most rigorous analysis of the possible research objectives, even though 277 legitimate replies were received in response to the survey questions asked at the online-based companies in Bangladesh. The scope of this study is the urban SME industry in Bangladesh. Besides that, the data was being analyzed with the help of Partial Least Squares Structural Equation Modeling (PLS-SEM). These research findings showed that facilitating condition (FC), digital literacy (DL), pandemic adoption (PA), social influence (SI), Application use intention (AUI), and IoT-based business (dependent variable) effect in SME business industries in Bangladesh”.

Chapter 5, titled “Framework for Assessing Online Shopping Use Under the Digital Transformation of the Economy in a Post-Pandemic Era” (by Abubakar Mukhtar Yakasai, Mohammad Almunawar and Muhammad Anshari), states that “the sudden appearance of Covid-19 has positively ameliorated digital presence generally as well as B2C e-shopping transactions. This situation attracts researchers’ interest to unravel the effect of Covid-19 vis-à-vis various e-commerce activities. Recent studies have already shown a direct impact of the pandemic on many businesses, especially B2C transactions. However, its moderation effect, and its effect as a control variable, were scarcely traced in the literature. Hence, the chapter explains and proposes a framework for assessing online shopping use under the digital transformation in a post-pandemic era, including both a moderating and a control effect of the Covid-19 pandemic. Building on the TAM theoretical model, the proposed framework added risk factors and channel credibility as additional independent variables, and the Covid-19 pandemic as both moderating and a control variable, respectively. Using existing literature, the authors establish relationships among variables and conceptualise both the moderating and control effects of the Covid-19 pandemic, respectively”.

Chapter 6, titled “Developing a National Innovation System in Small States: A Case for Brunei Darussalam’s Economic Development – A Catalyst for Digitalization Catch-Up and Economic Growth” (by Amirul Noeh, Pg Siti Rozaidah Pg Idris and Muhammad Anshari Ali), presents the results of a study with “some empirical insights for adopting a National Innovation System (NIS) to catalyze capacity building in small states with relatively low technology-based research and development resources. These countries may have to start further back than other nations; however, this paper maintains that with the right NIS, latecomers can have the advantage of catching up economically. This study explores Brunei Darussalam’s journey to catalyze innovation for sustainable economic growth, particularly digitalization and deep tech. The study found that establishing a national innovation ecosystem could be effective, with national consensus and acceptance behind the approach. It emphasizes building critical infrastructures, institutions and governance to promote efficient knowledge flow, talent development, digital literacy and overall absorptive capacity. Because Brunei is a small state, coordinating and facilitating cohesive linkages among its key stakeholders can strategically mobilize change. As Brunei Darussalam embarks on such a trajectory, it must determine a relevant model”.

Chapter 7, “Business Process Reengineering of Digital Learning Ecosystem: Green Strategy for Recovery and Sustainability” (by Heru Susanto, Fadzliwati Mohiddin, Leu Fang-Yie, Muhammad Sanip, Alifya Kayla Susanto, Desi Setiana, Didi Rosiyadi, Fahmi Ibrahim and Asep Insani, Uus Khusni),

discusses the results of a study “conducted to investigate e-learning acceptance and factors influencing higher institutions students in Brunei Darussalam. Among the factors involved in this study were perceived ease of use, perceived usefulness, self-efficacy, technology availability and usage and intention to use. Technology acceptance models (TAM) were used as a basis for the study and for hypothesizing the effects of such variables on the use of e-learning. The findings of this study found that there is significant influence of self-efficacy to perceived ease of use and perceived usefulness while perceived ease of use have direct impact to perceived usefulness and perceived usefulness have influence to intention to use towards e-learning systems”.

Chapter 8, titled “Technological Innovations in Supply Chain Management Towards a Circular Economy in the Healthcare Sector of UAE” (by Sumita Dave and Nikita Shaikh), states that “traditional techniques of linear economy generate a lot of waste which leads to unsustainable practices in the supply chain management. This chapter analyses the impact of circular economic system practices on company’s overall performance for a circular supply chain and explores the mediating position of technologically driven supply chain plays inside these relationships in the healthcare sector in reference to UAE. UAE and the 2030 Agenda of Sustainable Development Excellence in Implementation 2017 report suggests that UAE raises cognizance of, and integrates, sustainability standards into its agenda to promote sustainable lifestyles. Since most products in UAE are imported, the supply chain is lengthy and fragmented making procurement expensive. Hence, an innovative technology driven green supply chain can be an effective solution for both cost and waste reduction”.

Chapter 9, titled “Digital Economy Transformation in Nexus with External and Social Sustainability: Indonesian Experience” (by Arif Budimanta Sebayang, Telisa Aulia Falianty, Firdha Anisa Najiya and Gusti Raganata), states that “in response to Indonesia’s accelerating digital use, this study aims to address challenges to implement digital business models and identify the impact of digital economy to external and social & environment sustainability. This study uses desk study, descriptive statistical analysis and quantitative regression model, and qualitative information from discussion with relevant stakeholders. This study provides several important results. First, increase in mobile cellular subscription will lead to increase in inequality, while percentage of internet user to population shown otherwise. Second, the study also found that technology has a possibility to affect environment since it could increase CO₂ emission. Second, the study also found that technology has a possibility to affect environment since it could increase CO₂ emission. The digital technology gives the pressure to increase Balance of payment deficit. The recommendations: increasing the digital access, digital literacy, developing pro-environment technology, and increasing the exports of digitally deliverable services”.

Chapter 10, titled “Sustainability and Consumerism: How Green Are the Green Sectors?” (by Subhanil Banerjee, Shilpi Gupta and Souren Koner), affirms that “the Brundtland Commission report Our Common Future in 1987 gave birth to the concept of sustainable development. The meaning is benefitting the present without compromising the future. It was felt that unless conventional growth and development are replaced by sustainable development through environment-friendly actions then doomsday is very near. However, such sustainable development was followed by a global spree of consumerism that only added to the environmental burden. This dichotomy needs to be understood and for the same purpose, one needs to go back to that point of Earth’s history when ecology and economy were synonymous. From then on needs to be understood the drift between the ecology and economy that has brought us to today’s scenario. In this background, the present article raises questions on how green is the green sectors. Furthermore, can sustainable development and consumerism can be captured as one body ‘sustainable consumerism’”.

Preface

Chapter 11, “Recycling Behaviour of Urban Households in the Vietnamese Mekong Delta” (by Huynh Xuan, Tien Dung Khong and Huynh Khai), offers “new insights into the perception and determinants of municipal solid waste behaviour. A quantitative data set was obtained to analyzed by directly interviewing 579 urban households in in the Vietnamese Mekong Delta stratified by urban-type level. Binary Probit model and OLS regression indicate the significant influences of urbanization level, organization membership, the concern to environmental status, and education level of households. Finally, results reveal that the municipal solid waste recycling level can be significantly increased by motivating urban households’ incentives, therefore, policymakers in Vietnam as well as in developing countries should also provide more incentive to households by subsidy the recycled materials (i.e. paper and unusable metal) and well-managed informal recycling systems including itinerant waste buyers”.

Chapter 12, “How Responsible Are the Consumers? Analysis of Food Waste Behavior of Household” (by Namita Kapoor), affirms that “one of the most important concerns with the economies facing is food security amidst the growing population. The population growth has exerted tremendous pressure on food security and has raised concerns over food sustainability. The sustainability of food waste is an environmental, economic and social issue which has useful policy implications. The issue has been studied through the analysis of responsible consumption and food waste. The literature has emphasized on improving the efficiency in supply chain to reduce food waste but research on food waste at the consumer level is still at the natal stage. It is important to understand to develop the framework for responsible consumption and to assess the factors which may contribute to reduction in food waste at the household level. The study aims to examine the scope of responsible consumption to attain environment sustainability”.

Chapter 13, titled “Recovery of Energy and Materials From Small-Scale Tofu Processing Industries in Indonesia” (by Neni Sintawardani, Umi Hamidah, Widyarani, Diana Wulan and Dewi Nilawati), observes that “tofu factories spread across Indonesia as tofu is a cheap source of protein and favorite food for almost all population groups. Most tofu producers are micro/small business owners. In addition to soybeans, clean water is the most important input to produce tofu curd. It will generate a large amount of wastewater and solid waste, which still contains significant amounts of easily biodegradable organic matter. There are often complaints and protests from the public about the pollution in air and water in the area from the discharged waste. Tofu producers know about this, but their limited income and capital force them to ignore the environmental issues. The potential of tofu waste treatment technologies to produce new products or clean materials that can be fed back into the production process is discussed and reviewed to ensure all input materials in the tofu process can be used optimally and efficiently in a closed-loop production process. And it could be implemented easily and economically by the factories”.

Chapter 14, titled “The Effect of Chinese Green Transformation on Competitiveness and the Environment” (by Poshan Yu, Andong Jiao and Michael Sampat), states that “people in China are paying more attention to environmental issues as they increase in importance and consequence. At the same time, the Chinese government has gradually begun paying more attention to the environment, advocating sustainable development. The government has been actively developing green financial products such as green loans, green insurance, green funds, and other financial products to help Chinese companies “go green” and reach peak carbon and carbon-neutral goals ahead of schedule. China attaches great importance to its “green transformation” goals, as can be seen from the number of new policies related to green and sustainable development. Under these circumstances, companies must follow the policy and carry out green upgrades or risk total failure. This chapter mainly discusses the background of what firms face in

China's green finance environment, taking clean energy, green buildings, and green transportation as examples of how companies should adapt to these trends and improve their competitiveness".

Chapter 15, "Rural Tourism and its Impact on the Economy: A Study of Ialong Village, Meghalaya" (by Saibal Saha, Sawarisa Suam and Ankita Sarangi), affirms that "the changing tastes and preferences of tourists have given rise to a new form of tourism, rural tourism. This new form of tourism plays an important role to change the rural economy and living standard of villagers. Meghalaya, the abode of clouds, is famous for a number of its villages and attract thousands of tourists every year. This research aims to study the impact of rural tourism on the economy of the village. For this study, Ialong village has been selected and 150 people were interviewed with the help of a structured questionnaire and insights of people concerned were noted and analyzed. It was found that people believe the facilities of electricity, hygiene, toilets, accommodation have improved and have accounted for more influx of tourists into the region. However, lack of exposure of the different villages and their offerings in advertisement media have limited the potentials of growth of tourism in these villages".

Chapter 16, "Market Segmentation and Dark Tourism and the (Post) Pandemic Scenario" (by Bruno Sousa, João Veiga, João Veloso and Sara Pereira), observes that "dark tourism is a segment of tourism that has been growing in recent decades and is strongly associated with tragedy and mystery. There are several academic researchers who present literature on this specific group of tourist consumers. As a result, 2020 was strongly marked by the pandemic of the new coronavirus (covid-19). This chapter presents a reflection on the role of dark tourism in the pandemic and post-pandemic period. From an interdisciplinary perspective, this chapter presents contributions to (dark) tourism, marketing and pandemic management".

Chapter 17, titled "The Projected Images of a Thrift Store Chain in Japan: A Study of Online Interview Materials" (by Bình Nghiễm-Phú), states that "being thrifty and frugal has become a distinct lifestyle choice. An insightful knowledge about thrifty and frugal consumers on the demand side has been revealed by previous studies. However, related issues on the supply side have largely been neglected. Therefore, this study aims to examine the projection of the thrift store images. By analyzing interviews displayed on public websites with the director and staff of Treasure Factory, a big thrift store chain in Japan, this study has revealed that the company is actively projecting its images. Among seven images, Treasure Factory is especially focusing on products, purchase processes and distribution channels (place), and customer benefits (psychology). The remaining images (prices, promotion, customers or people, and partnerships) are less emphasized but still harmoniously synchronize with and support the main images. Implications for the theory behind thrift stores and for the actual management of them are discussed based on these findings".

Chapter 18, titled "COVID-19 Health Pandemic: A Turnaround in Economic Infrastructure" (by Saibal Saha, Bedanta Bora, Anindita Adhikary and Sangita Saha), states that "the 100th anniversary of health pandemic has introduced a rarely used term 'Social Distancing'. The pandemics occurring every century between 1720 and 2020 has paralyzed the world. Covid-1 pandemic has caused numerous deaths, drained resources, halted trade, and shattered economies across the world. Humankind is faced with the challenge of survival, putting a halt on the growth dynamics. Lockdown imposed by Governments have flattened the curve of COVID-19 victims, but only to delay the spread of the deadly virus. Till the time a complete cure is discovered, people have managed to find ways to prevent the spread of the virus by developing new norms of day-to-day survival. The study aims to highlight the crisis born by COVID-19 and measures to maintain sustainability in the new normal. The methodology used is primarily based on published literature and data. Findings of the study indicate that there is absolute uncertainty on 'What

Preface

Next’ and ‘How’. Hence, it is concluded that any resurgence attempt to equipose this catastrophe is predicted to be prolonged and so its end results”.

Patricia Ordóñez de Pablos
The University of Oviedo, Spain

Xi Zhang
Tianjin University, China

Mohammad Nabil Almunawar
Universiti Brunei Darussalam, Brunei

REFERENCES

European Commission. (2020). *New Circular Economy Action Plan of the European Commission for a Cleaner and More Competitive Europe*. <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN>

Ordóñez de Pablos, P., Zhang, X., Almunawar, M. N., & Gayo Labra, J. E. (2021). *Handbook of Research on Big Data, Green Growth, and Technology Disruption in Asian Companies and Societies*. IGI-Global.

Ordóñez de Pablos, P., Zhang, X., & Almunawar, N. (2021). *Handbook of Research on Disruptive Innovation and Digital Transformation in Asia*. IGI-Global. doi:10.4018/978-1-7998-6477-6

Chapter 1

Influence of Corporate Sustainability on Providing Electronic Payment Services by the Banking Industry in India

Shweta Sharma

Malaviya National Institute of Management, India

Aakanksha Agarwal

Malaviya National Institute of Technology, India

ABSTRACT

This study investigates the role of sustainable finance practices and their impact on digital banking services in India. An increased frequency of internet use for various digital banking services provides an opportunity to build the banking industry with various online services. This study reviews the literature on sustainable corporate finance and the adoption of e-banking services. The study uses an exploratory research-based approach to understand the usage rate and adoption of internet banking. A questionnaire-based survey was conducted on 325 respondents. Findings of the study suggest that there is a gradual increase in the adoption of internet banking, but major barriers in adoption are a threat of security, privacy, and trust.

INTRODUCTION

Corporate sustainability refers to meeting the requirements of present stakeholders without compromising with the needs of future generations. This definition not only envelops the business houses but also covers the overarching sphere of diverse stakeholders directly or indirectly connected with the company (Dyllick and Hockerts, 2002). In this context, sustainability means to protect and sustain the resources for the later needs. This sustainability view entails considering the company's financial needs to achieve strategic and profit-driven responses to various issues that arise by an organizational activity in today's

DOI: 10.4018/978-1-7998-9664-7.ch001

scenario for future outcomes. However, the most prominent definition for sustainability had broadly based on the triple bottom line concept. If a company endeavors to include sustainability in its day-to-day activities, managers have to consider all the aspects related to the term corporate sustainability to integrate with the business strategies (Epstein and Roy,2001). Corporate sustainability also defines the relationship existing between sustainability and the required funds by the company. In further context, the social responsibility of a business is to earn a profit, as stated by Milton Friedman. A company is constructed to earn stakeholder response and profits through short-run returns and long-run resilience. To achieve a sustainable economy, finance helps to gain societal benefits by agreeing to lend to, invest in, and underwriting businesses to manage the impact of risk on returns. Sustainable finance refers to integrating financial decisions and business strategy by taking due account of environmental, social, and governance criteria into the strategic business decisions. These strategic decisions help increase the benefit of an investment for the longer-term period to extend stakeholders via linking to sustainable economic events. However, to achieve the goal of corporate sustainability, various factors act as enablers, one such enabler being sustainable finance.

In view of Migliorelli, sustainable finance is defined as “finance to support sectors or activities that contribute to the achievement of, or the improvement in, at least one of the relevant sustainability dimensions.” Sustainable finance is the financial tool for supporting sustainable development encompassing the three spheres: economic, environmental, and social (Ryszawaska,2016). Earth summit in Rio in 1992 led to a concrete definition of sustainable finance. According to the center for responsible business, ‘sustainable finance is the practice for creating economic and social value through financial models, products, and markets that are sustainable over time (Centre for responsible Biz, 2016). Ryszawaska, (2016) emphasis the need for sustainable finance for sustainability transitions. He gives a framework presenting sustainable finance assets sustainability implementation.

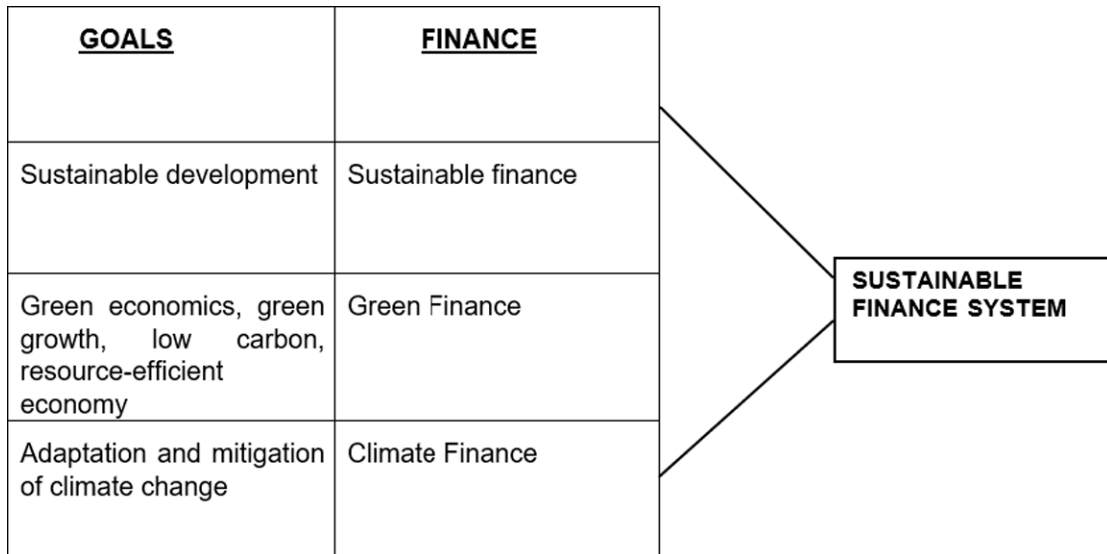
Triple Bottom Line Sustainability

Triple bottom line sustainability is defined as an accounting framework that incorporates 3P’s to determine the performance with social, environmental, and financial factors (John Elkington, 1994). The 3 P’s of triple bottom line sustainability are – Profit, People, and Planet. These P’s help create value for an organization’s successful tomorrow and also help to utilize the opportunities to find a path to solve various societal and organizational problems. Business performance is measured by Triple bottom lines of sustainability which fit in with financial and societal aspects (Elkington, J., 2013).

People + Profit + Planet = Corporate Stakeholder’s responsibility

The three lines of TBL sustainability are interconnected to increase the wealth of the stakeholder’s responsibility profit of a company which further determines the corporate performance level. Corporate performance depends upon the strategy formulated by the managers of a company. Still, somehow, these strategies depend on the environmental, economic, and societal lines stated in the triple bottom line of sustainability (Norman, W., & MacDonald, C., 2004). This term determines the relation of people with profit and planet to gain a sustainable and equitable advantage in the competitive environment. As a sustainable corporate performance supplement, TBL acts as a major driver for shift in business practices and strategies from just a business perspective to a planet and people-oriented perspective (Slaper, T. F., & Hall, T. J., 2011).

Figure 1.



Further, in line with the notion of sustainability, corporations that aim to establish a good reputation by gaining stakeholders’ faith determine, monitor, and report social, environmental, and economic impacts of their operations. The need for the inclusion of 3 components, namely, social, economic, and environmental, bring out the concept of TBL (Mihriban Coskun Arslam, Harum Kisacik, 2017). However, the economic dogma will not be compromised but instead complemented by the other two objectives of TBL as long as it leads to shareholder wealth maximization (christofi and sisaye, 2012).

Similarly, in further context, Digital banking benefits all businesses by providing accessibility and efficiency to the masses. It is personalized and caters to the personal needs of consumers. However, when the aspect of the triple bottom line gets infused in the setting of digital banking, it tends to serve people from all classes. But, the users from the bottom of the pyramid are the worst affected when it

Figure 2.

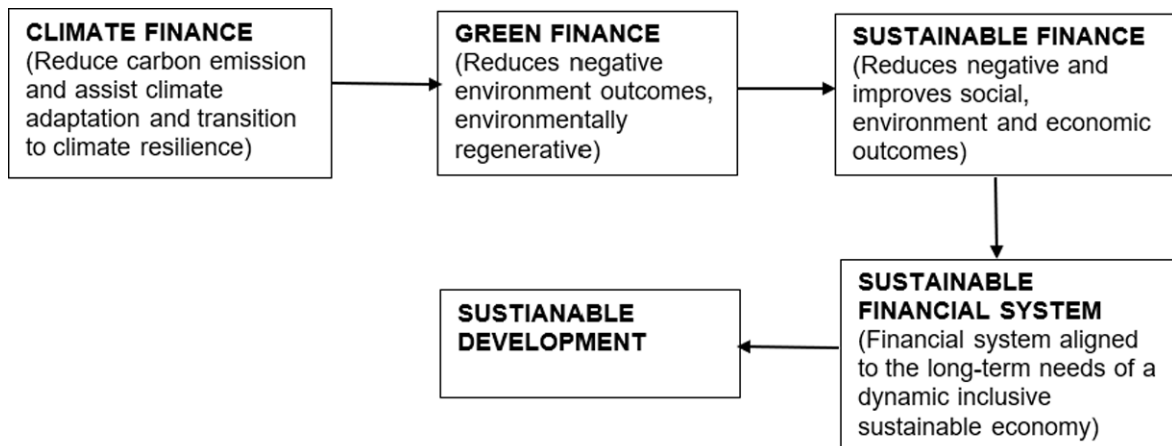


Figure 3. Interconnection between 3 P's of triple bottom line sustainability (Dalibozhko and Krakovetskaya, 2018)



comes to misinformation and exploitation. certain factors limit the efficiency of digital banking services among the bottom line consumers-

- Information overload
- Framing effects
- Inertia
- Endowment effect

Over-optimism and time inconsistency (CHALLENGES TO CONSUMER POLICY IN THE DIGITAL AGE Background Report G20 International Conference on Consumer Policy, 2019)

Need for Sustainable Finance

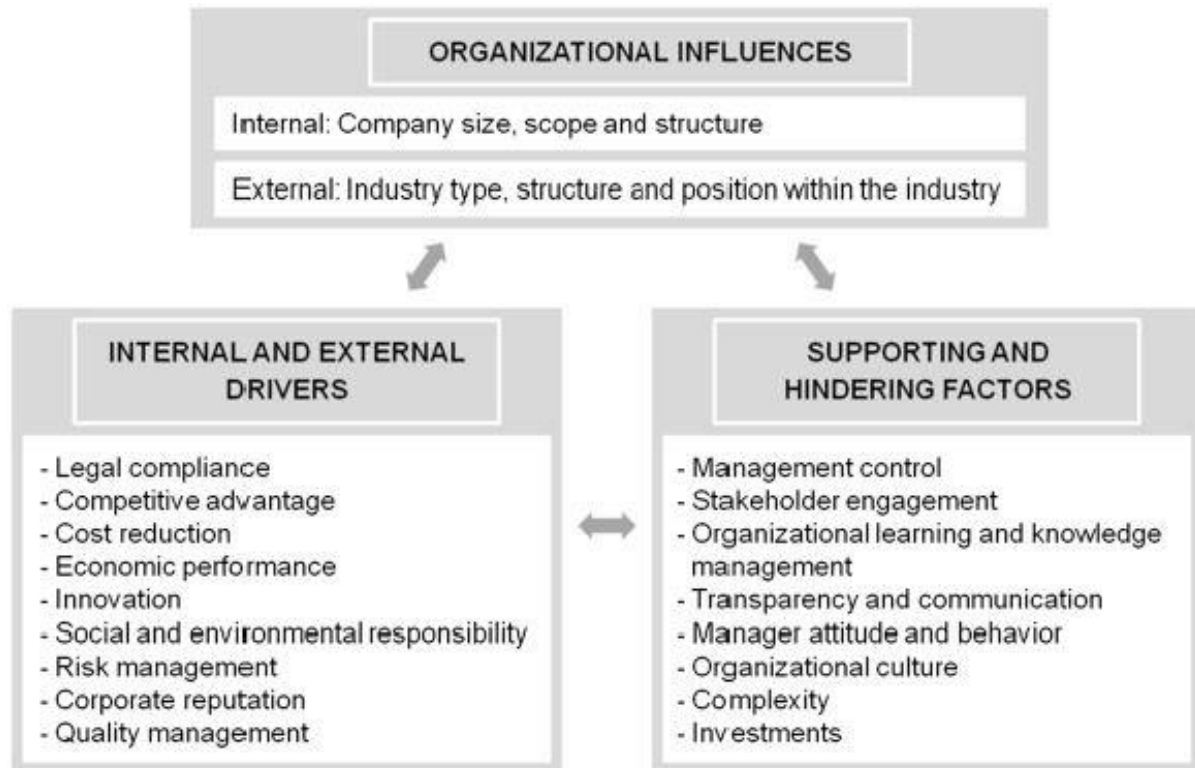
Recent times have shown a gradual increase in discontent in society regarding the financial market. It is leading to an emerging need to make an agreement to reform the financial system. Sustainable finance is an essential step towards these reforms. It provides an opportunity for the market to make a profit for a more extended period and support sustainable changes in the current environment to get a better future (Soppe, 2004). It is required to support various financial instrument services to develop and implement a business strategy to attain stakeholder's responsibility profit.

Business does not have any role without society; similarly, a community has no existence without business. To inculcate corporate sustainability in a business strategy requires society acceptance which is mainly affected by internal and external drivers such as legal compliance, reduction in the cost, company performance, quality management, and so on (Migliorelli, 2021). These internal and external drivers affect the hiding and supporting factors that impact corporate social performance. These drivers

Influence of Corporate Sustainability on Providing Electronic Payment Services

are – stakeholder interest, stakeholder control and wealth, transparency in communicating information, management role in the development of business strategy, and many more.

Figure 4. Evolving issues in incorporation of corporate sustainability into business strategy (Mayring,2002, Mayring,2014)



INDICATION OF EFFECT OF SUSTAINABLE BANKING PRACTICES ON BANKING INDUSTRY

Banking industry sustainability practices recognize the importance of corporate growth and profitability. It requires the corporation to pursue societal goals, specifically sustainable development - environmental protection, social justice and equity, and economic development (Wilson, 2003). Kumar and Prakash (2019) also evaluate the status quo of the banking sector in India towards the adoption of sustainable banking practices. They take both public and private sector banks under the study's purview and conduct an unstructured interview for senior bank officials. In this study, 14 banks and nine interviews are covered for the analysis. Secondary data is also resorted to assess the readiness of the Indian banking sector about sustainability adoption. The Finding of this study suggests that environmental policy is more prominent in public sector banks than private sector banks. Also, none of the banks had subscribed to any international standards or guidelines like the Global reporting initiative, World business council for sustainable development, etc.

Similarly, Olmo, et al. (2021) analyze how sustainable banking practices affect the profitability and the insolvency risks in banks, also, how sustainable banking affects the market power and efficiency on banks' profitability. The study analyzed an unbalanced panel data of 1236 banks using a 2-step system-GMM approach. The findings of the survey report a positive link between sustainability practices at banks and profitability. Similarly, another study regarding the evaluation of issues and impact of internet banking facilities at banks in the UK was conducted by Jayawardhena and Foley (2000). The study conceptually identifies 12 internet banking facilities operation implemented in various banks. Various challenges are located through the paper regarding the adoption of internet banking, such as increasing competition, customers' demands, the continual need for innovations, etc.

Role of New Technologies in Banking Industry Concerning ESG Framework

The emerging propagation of internet usage opened a new and more convenient way of performing various financial transactions. It influences consumer adoption of internet banking and online banking services. The various changes have taken place in the banking industry. In which one of the finest examples is the Mobile Banking app. By using it, a consumer can easily manage its account by sitting anywhere in the world. One can see its account balance, download its bank statement, apply for a credit card, make bill payments, and even apply, activate, or deactivate ATM cards. These new innovative technologies indulge consumers more and more in online financial transaction services (Roy & Sinha, 2014). New innovative technologies have played an essential role in a paradigm shift from conventional traditional banking to technology-enabled online banking services.

Some new technology emerging in context to the Indian banking industry is (Anbalagan, 2017) –

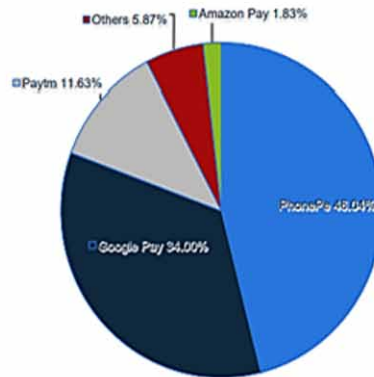
1. **Fintech:** Fintech is summarized to use new technologies to disrupt various financial services in the banking industry. The use of innovative technologies helps customer to perform their work efficiently and more conveniently (Puschmann, T., 2017).
2. **Blockchain:** It is a technology in which data is gathered in the form of a block. This block is further distributed to other computer networks where additional data is added without disrupting its origin. This information is safer as it follows a decentralization process that facilitates and automates inter-organizational processes in the banking industry (Taufiq, R., Hidayanto, A. N., & Prabowo, H., 2018). With the help of this, customer information is highly secured by transmitting it into several blocks by making duplicate copies of it which are further coded to other networks so that hackers cannot get complete branch information from any particular central line (Nguyen, Q. K., 2016).
3. **Artificial Intelligence:** This technology helps develop the machine system, which replaces the requirement of human intelligence (Smith, A., & Nobanee, H. (2020). It is considered to expert in decrypting the signature, handwriting, and other things while performing various banking financial services. As people are using online modes to make the payment at multiple sites and platforms, artificial intelligence also helps detect fraud by observing users (Alzaidi, A. A., 2018).

SUSTAINABLE FINANCE AND FINTECH

Fintech stands for 'financial technology innovation.' As per the World Bank, Fintech is defined as the process of generating and developing the opportunities and challenges in the financial sector for finan-

Figure 5.

Unified Payment Interface (UPI) usage across India in June 2021, by platform
UPI usage in India in February 2021, by platform



cial institutions and regulators. New company's competing in the traditional financial service market is dependent on new techniques emerging to capture customer-centric services (Dapp, T., Slomka, L., AG, D. B., & Hoffmann, R., 2014). Earlier, the Traditional Banking system did not include the digital availability of services related to financing. But at present, the new system encompasses digital banking, which makes the services available to customers with ease (Vyas, S. D., 2012). Traditional banking requires proper licensing before operating a banking financial services. Their cost of funding is less than their new competitors emerged in the market due to fintech (Macchiavello and Siri, 2020).

In contrast, the fintech banking startup does not require any license from the government at the beginner stage. Their legal compliances are also less as compared to the traditional banking approach. With the help of fintech, new competitors capture higher market share by making themselves customer-specific oriented (Vyas, S. D., 2012). Fintech banking system can be defined as intermediation of financial services through innovative technology models.

Sustainable finance and fintech have two different aspects, but their integration can make the banking system easy to access with more transparency. (Macchiavello and Siri, 2020). During the pandemic, the global crisis has opened a new side to think about it and inculcate sustainability and technology in the financial service sector in a more prominent mode to get better outcomes. Many companies have used fintech to get into the financial industry to provide financial services like Amazon pay, Google pay, Paytm, and many more (Xavier vives, 2017). Fig.3 depicts recent data trends on Unified Payment Interface (UPI) across India; maximum users prefer PhonePe (46%) as a medium of payment followed by Google Pay (34%). The new business strategy followed by all key market players is to provide technology-based banking services to capture the market share. Customers' acceptance of this strategy has made them gain a competitive advantage over the traditional banking system (Singh, B., & Malhotra, P., 2004). This further made the market to cover the largest segment in Digital transactions with a projected value of Rs.8,870,602m in 2021.

Financial technologies have emerged as a backbone for achieving sustainability in the banking industry (Starnawska, S. E., 2021). Digital transaction across India is showing an increasing trend, as shown in

Figure 6.

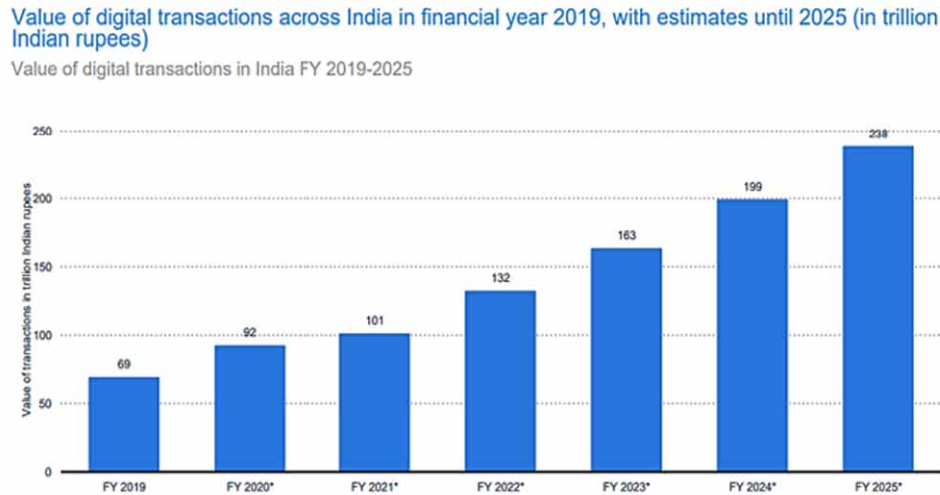
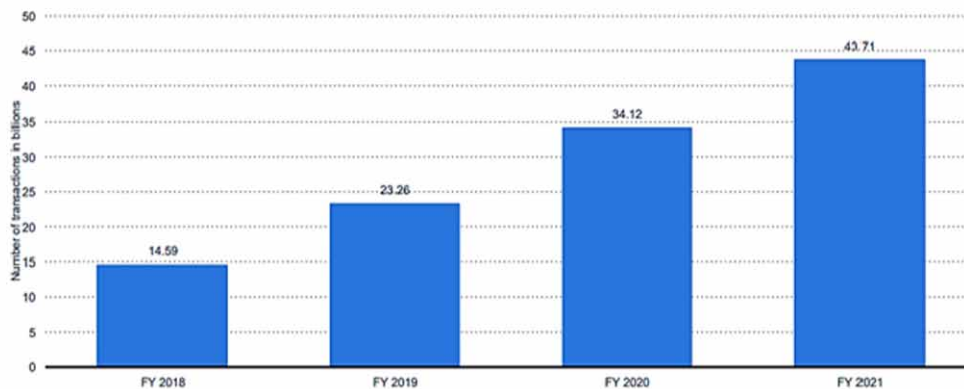


figure 4. The estimated digital transaction for 2025 is 238 trillion rupees, approximately 135.64% more than the 2021 digital transaction recorded as per RBI and PWC India.

The Indian economy is entering the era of information technology by accepting industrial revolution 4.0, big data, digital currency, and artificial intelligence (Abdillah, G., Harahap, W., & Muda, I., 2019). Gradually it has been shifted to the online platform to reach and capture a high market share. Online platform trading requires various electronic payment services to complement their gateways. Building the future in the upcoming era will require a more secure online payment service that can be accessed from any place at any time. The current lockdown situation in every part of the world has significantly impacted the online trading platform, easily depicted in Figure 5. Every aspect of life started dealing with IT in one way or another. In every aspect, the banking sector approach will provide more significant support to the economy to grow and build stability in the financial performance of the trading sector (Arunachalam, L. D. M. S., & Sivasubramanian, M., 2007). With this change, the bank has to trigger all the new technology requirements and get updated to work efficiently and effectively (Dhanwani, S. K., 2014). To cope with the rapid change in technology by adopting electronic payment services, the Reserve Bank of India is also taking the initiative and the Institute of banking research to develop technology by constantly enhancing the system privacy and security model (Singh, S. K., 2020). The mainstream of traditional banking, considered for future online up gradation, is cheque processing and lockbox services as these services are still done after visiting the bank branch. So nowadays, people avoid going for a cheque transaction. To avoid this barrier, it is also undergoing electronic processing functionality (Arunachalam, L. D. M. S., & Sivasubramanian, M., 2007).

Figure 7.

Total number of digital payments across India from financial year 2018 to 2021 (in billions)
Volume of digital payments India FY 2018-2021



THEORY AND PRIOR EVIDENCE ON BANKING INDUSTRY AND SUSTAINABILITY

During the course of the development of the sustainability debate, advancements towards the constituents of a firm's environment started. It was initially limited to the competitors, suppliers, and customers alone, which included the social and natural environment as well. Studies started including financial benefits of having sustainability in their decision-making along with the possibilities of competitive advantage. Such kind of evolvement can be attributed to the adoption of corporate sustainability. Prior research is motivated by four prominent theories:

1. Corporate Social Performance Theory

This approach views firms as social institutions, and paying back their ethical obligation is considered to be a part of society. Research in this regard has been aimed to provide it on a global scale (Ruf, et.al.,2001). This theory leads to the conceptualization of Corporate Social Responsibility (CSR) and Corporate Social Performance (CSP). Carroll (1979) presented a 3-dimensional definition to this theory-

- a. Specification of the nature of Social Responsibilities (Economic, Legal and Discretionary)
- b. Specification to the nature of Social Issues (Consumerism, Environment, Discrimination, Product safety, Occupational safety, Shareholders)
- c. Specification to the nature of Corporate Social Responsiveness (Reaction to Pro-action).

2. Stakeholder Theory

It was given by Freeman (1984) in his book, 'Strategic Management- 'A Stakeholder Approach. He did the mapping of the origin of the term "stakeholder" in the studies from Stanford Research Institute in 1963. He explained "stakeholder as an individual or a group of individuals that affect(s) or is affected by the decisions of a business house, thus providing for including their interests in strategic decision making." Friedman (1970) to take up a broader view while taking up strategic

Influence of Corporate Sustainability on Providing Electronic Payment Services

It is sometimes considered a road ahead of the Shareholder approach of management decisions. This theory developed from giving a definition to stakeholders and adhering to their impacts and demands to linking crucial stakeholders and firms (Freeman, et.al.,2010).

3. Corporate Social Performance and Financial Performance

This stream addresses the concept of whether there is an association between corporate social performance and financial gains of a firm, and if it is so, is it a direct positive linkage or negative (Waddock, S. A., & Graves, S. B., 1997). Mixed results were obtained from the studies suitable when this stream emerged in the 1970s.

4. Green Management

This debate started post the World Commission on Environment and Development (WCED) Report in 1987. A particular association between firms and the natural environment was noted in the literature. The Triple Bottom Line concept was popularized in studies. The interplay between the firm environment and society gave rise to influential studies (Donald S, S., 2009). There was an immediate rise in Environment Compliances for corporates leading to the literature on interlinkages between ‘proactive’ environmental strategies of a firm, abilities, financial performance, and competitive advantage (Molina-Azorín, et.al., 2009). This Encashment of natural resources and services has increased manifolds due to rapid expansion in the consumption of resources and materials. Such events have led to a responsible action towards a systematic shift to sustainability.

The most prominent study in this area has been done by Bowen, (1953) and Friedman, 1962, and 1970. These studies include records of corporate power and what roles does a firm plays in society at large.

ADOPTION OF NEW TECHNOLOGIES BY THE BANKING INDUSTRY TO OBTAIN SUSTAINABLE FINANCE

In today’s context, the Indian banking industry is one of the most booming industries. About 34 banks are working in India, in which 12 banks are public sector banks and 22 banks are private sector banks. Banks are more focused on providing easiness to their customer by adopting various new technologies to access the account from anywhere in India without any delay. Many banks have adopted various technological services like ATM, Bank Personal App, Internet banking, etc., for their customer (Anbalagan, 2017).

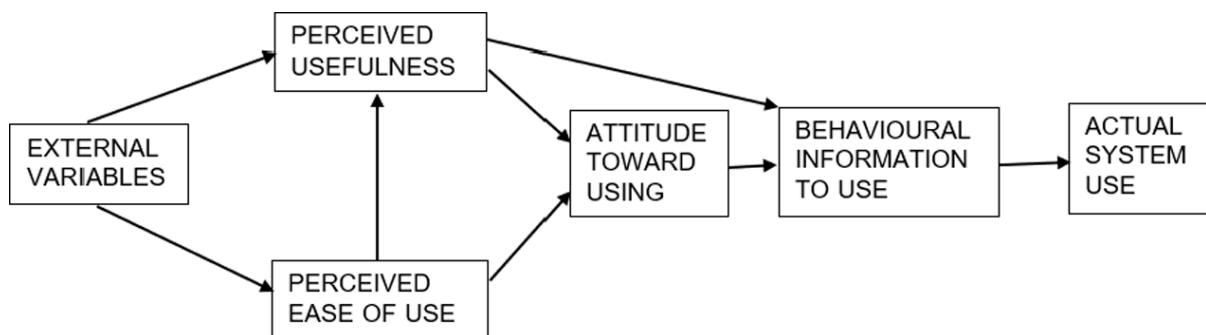
Finland firstly adopted Technology-enabled banking in 1996, which is further followed up by other countries. The adoption of technology is changing the world from coins and papers to cashless banking transactions. It has developed different modes of payment under the E- payment system like wallet, Unified Payment Interface, Bank transfer, etc. (Kabir, Ahmi & Saidin, 2015). Technology encourages internet banking to facilitate change in the demand of consumers towards digital banking services. The adoption of the technology enables corporate sustainability to emerge efficiently. Technology impact has been seen on societal, economic, and environmental factors related to the banking sector. Technology usage consequences have been perceived towards customer satisfaction and its empowerment (Forcadell, Aracil & Ubeda, 2019).

Despite the proliferating impact of technology on the banking industry, it becomes obligatory for banks to assess the readiness level or customer perception for technology adoption. Past studies are evident that managers have used Technology Acceptance Model (TAM), or the Unified Theory of Acceptance and Use of Technology (UTAUT) model, to examine the factors affecting the adoption of mobile banking (Mashagba & Nassar, 2012). In our study, we use Technology Acceptance Model to understand the customer's behavioral intent for technology adoption.

Technology Acceptance Model (TAM)

The technology acceptance model (TAM), propounded by Davis et al. (1989), is among the most acceptable and influential models in information systems, technology, and services. The model is unanimously accepted as a framework proficient at predicting user acceptance of new technology. TAM is an extension of the theory of reasoned action (TRA) (Fishbein and Ajzen, 1980). It expanded the existing theory by adding two belief factors, perceived usefulness and perceived ease of use, that substitutes various TRA's attitude measures. These two factors are believed to showcase an individual's intention to use a technology-based system with the purpose to use acting as a mediator between perception and actual usage. In general, TAM possesses the capability of explaining the variance in usage intentions up to the range of 40% and 30% in system usage (Meister and Compeau, 2002). However, to further increase the predicting capability of TAM, it was recommended to analyze the impact of external variables (Davis, 1993). In lie to this view, Legris et al. (2003) also addressed the need to understand the influence of external variables as they provide a stimulus for the use of technology.

Figure 8.



RESEARCH OBJECTIVES

1. To check the level of awareness about digital payment services in the Indian context.
2. To investigate customers' opinions regarding perceived ease of use of digital payment services.
3. To analyze the safety, privacy, and trust that users hold towards digital banking payment services in India.
4. To measure the perceived usefulness of digital banking in cities population of India.

METHODOLOGY

The present study is classified under descriptive research type. This type of research describes or explains the characteristics of the phenomenon that is being investigated. It primarily focuses on elucidating the nature of a demographic segment. Thus, it could be said that this type of study answers the ‘What’ of the research subject without looking for the ‘Why’ of the concerned phenomenon. A case in point has been surveyed and reported in the descriptive study with an aim to investigate an electronic payment services adoption by an individual. For this, a pilot survey has been conducted in cities to get a significant focus on results concerning awareness and usage of digital payment services among customers in India. This survey became necessary to understand customer actual behavior and preferences related to digital payment services, which further helps the government modify digital payment policies to maintain an appropriate and suitable regulatory framework.

Survey Demographic Specification

Society is a set of elements that have one or several standard specifications in research. The society concept is attributed to people who have generalizations. In our context, society covers people belonging to different age groups.

Prior to the final distribution of the survey instrument to the target population, the expert panel held two justification sessions to finalize the set of questions, and all the queries were answered in the session. After post finalization of the instrument, a convenient sampling method was adopted to reach out to the target population. The questionnaire was floated to 700 people, and sufficient time was given to them to respond to the questions and return back the same for the rest of the research. Subsequently, we received 325 responses which were 46.43% of the total respondents. The detail about demographic data of respondents is mentioned in Table 1.

Table 1. Demographic data of respondents

DEMOGRAPHIC	CHARACTERISTICS	FREQUENCY	(%)
GENDER	MALE	188	57.85
	FEMALE	137	42.15
AGE	BELOW 18	-	-
	18 TO 29	163	50.15
	30 TO 44	125	38.47
	45 TO 59	33	10.15
	60 & ABOVE	4	1.23

Data Analysis

The section delineates the analysis for the questions based on three constructs. The constructs chosen based on the literature review include: perceived ease of use; security, privacy, and trust; and perceived usefulness of digital marketing.

Influence of Corporate Sustainability on Providing Electronic Payment Services

The first construct of our study relates to awareness. The questions are intended to gather the essential basic information. The analysis revealed that internet usage practice is growing among people and more tremendous among males. According to sample statistics, 94.68% of males, 84% of females responded positively to whether they use internet banking or not. However, for those who do not use technology till date, security-related concerns head the main reasons as per the data shown in table 2.

Table 2. Awareness data of the respondents

CONSTRUCT		MALE		FEMALE	
		NO.	(%)	NO.	(%)
AWARENESS	1. Do you use internet banking?				
	• Yes	178	94.68	115	83.94
	• No	10	5.32	22	16.06
	2. If you have never used internet banking, what are the main reasons?				
	• Concerned about security	4	40	13	59.09
	• Don't get on with technology	3	30	7	31.81
	• Don't see any real value	3	30	2	9.1
	3. Technique used for using online banking				
	• Banking software	118	66.29	91	79.13
	• Web browser	50	28.09	21	18.26
• Web browser with authenticated devices	10	5.62	3	2.61	

For the second construct, the data analysis unfolds that people still believe in making a personal visit to the branch at least once a year. Almost 57% of males and 68% of females prefer visiting the branch on a monthly basis as shown in table 3. Nonetheless, we also obtained favorable results for the utilization of online services via bank app. More than 50% of males and females utilize online services on a weekly basis. It was further noticed that mobile banking services had gained popularity and familiarity among the population as they were deployed daily. It could be deduced that due to ease of use and convenience, people are shifting towards online banking applications. Yet, when they were asked what are the significant setbacks while using the online application, the majority of the respondent's that is, 90% of males and 71% of females, showed their concern regarding the non-availability of all the facilities. Thus, banking organizations can utilize the data to make further advancements and develop new and advanced facilities to serve their customers at their doorsteps.

Our following construct aims to know people's opinions regarding online facilities' most foremost concerns: governance issues. The questions under this construct relate to security, privacy, and trust. However, the majority of the population feels that internet banking has made their life much more easier. Still, unfortunately, if we talk about their awareness regarding the same, data reveals unsatisfactory results, especially in females. The irony here is, when they were asked what could protect them from varied online banking frauds, 89% of females and 68% of males chose their self-awareness to be their defending medium against the prevailing fraudulent practices as per the data shown in the table 4. However, according to sample statistics, 63% of females and 50% of males do not even read the security guidelines before making the transactions or using online services.

Influence of Corporate Sustainability on Providing Electronic Payment Services

Table 3. Perceived ease of use data of the respondents

CONSTRUCT		MALE		FEMALE		
		NO.	(%)	NO.	(%)	
PERCEIVED EASE OF USE		42	22.34	33	24.08	
		107	56.91	93	67.88	
	1.FREQUENCY OF USING BANKING SERVICES BY PERSONAL VISIT OR THROUGH ONLINE MODE	26	13.82	7	5.10	
	• PERSONAL BRANCH VISIT	2	1.06	1	0.72	
	• ONLINE SERVICES VIA BANK APP	11	5.85	3	2.18	
	• MOBILE BANKING SERVICES	2	1.06	2	1.45	
	2. MAIN REASON FOR CHOOSING ONLINE BANK APP FOR PAYMENT SERVICES	- Yearly	32	17.02	31	22.62
	• CONVENIENCE	- Monthly	108	57.44	76	55.47
	• SAFE AND SECURE	- Weekly	32	17.02	7	5.10
	• LOW SERVICE CHARGES	- Daily	14	7.44	21	15.32
	• EASY TO HANDLE AND MAINTAIN BANK STATEMENT	- Never	3	1.59	2	1.45
	3.WHAT FOR YOU ARE THE MAJOR BARRIERS OF ONLINE BANKING?	- Yearly	11	5.85	10	7.29
	• DON'T TRUST THE BANK SECURITY	- Monthly	58	30.85	4	2.91
	• DON'T HAVE A SECURE COMPUTER	- Weekly	105	55.85	60	43.79
	• DON'T LIKE ENTERING DATA DIGITALLY	- Daily	11	5.85	24	17.51
	• FINDING THE TECHNOLOGY DIFFICULT	- Never	152	80.85	110	80.29
	• INCONVENIENT	- Yearly	9	4.76	-	-
	• DOESN'T PROVIDE A SERVICE	- Monthly	7	3.72	17	12.40
	• NO BARRIERS	- Weekly	20	10.63	10	7.29
		- Daily	13	6.91	14	10.22
	- Never	5	2.66	1	0.73	
		12	6.38	16	11.68	
		5	2.66	7	5.11	
		4	2.13	2	1.46	
		90	47.87	71	51.82	
		59	31.38	26	18.98	

Table 4.Safety, secure and trust data of the respondents

CONSTRUCT		MALE		FEMALE		
		NO.	(%)	NO.	(%)	
SECURE, PRIVACY AND TRUST	1.WHICH OF THE FOLLOWING APPLY TO YOU?					
	• DO YOU THINK THAT USING INTERNET BANKING MAKWES YOUR LIFE EASIER?					
	• HAVE YOU READ THE BANK ONLINE SECURITY PROCEDURES? (THIS WOULD HAVE BEEN SHOWN TO YOU IN POST OR SHOWN TO YOU ELECTRONICALLY WHEN YOU SIGNED UP)		178	94.68	119	86.85
	• HAVE YOU EVER LOST MONEY DUE TO DIGITAL FRAUD		10	5.32	18	13.14
	• HAVE YOU EVER HAD CASH LOST OR STOLEN?	- YES	94	50	50	36.50
	2.WHAT ARE THE SECURITY MEASURES THAT COULD SECURE YOU AGAINST VARIOUS KINDS OF ONLINE BANKING ATTACKS?	- NO	94	50	87	63.50
	• SELF- AWARENESS IN SECURITY	- YES	64	34.04	63	45.99
	• INSTALLING ANTI-MALICIOUS SOFTWARE	- YES	124	65.95	74	54.01
	• LIMITING ONLINE ACTIVITIES	- NO	138	73.40	106	77.37
	• USER EDUCATION	- YES	50	26.60	31	22.63
	• INCREASING/ UPDATING LEVEL OF ONLINE BANKING SECURITY	- NO	128	68.09	89	64.96
	• I DON'T KNOW	- YES	11	5.85	3	2.19
		- NO	3	1.96	7	5.11
			13	6.91	7	5.11
			25	13.29	16	11.68
			8	4.25	15	10.95

Influence of Corporate Sustainability on Providing Electronic Payment Services

Lastly, our study intended to identify the perceived usefulness of digital marketing. As per the responses, most of the population (63% male and 58.39% female) strongly agree that E-payment facilities are efficient in terms of cost and time. Moreover, we received positive responses for E-payment when compared with cash. 52.66% of males and 51.82 of females prefer E-payment over cash facilities, as shown in table 5.

Therefore, it could be deduced that people are embracing and accepting technology in the banking sector. However, it is of utmost importance to educate users and spread awareness regarding the rules and regulations; and privacy-related affairs to eliminate fraudulent practices. Also, if possible, banking organizations should explore designing interventions that may assist users in easy adoption and usage of emerging technology.

Table 5. Perceived usefulness of digital banking data of the respondents

CONSTRUCT			MALE		FEMALE	
			NO.	%	NO.	%
PERCEIVED USEFULNESS OF DIGITAL BANKING	1.E-PAYMENT SYSTEM SAVE YOUR TIME AND MONEY 2.E-PAYMENT SYSTEM ARE BETTER THAN CASH 3.E-PAYMENT OFFERS A GREATER CHOICE FOR CONSUMER AND MERCHANT IN THE WAY THEY SEND AND RECEIVE PAYMENT	- STRONGLY AGREE	119	63.30	80	58.39
		- AGREE	52	27.66	31	22.63
		- NEUTRAL	9	4.79	22	16.06
		- DISAGREE	4	2.13	2	1.46
		- STRONGLY DISAGREE	4	2.12	4	2.92
		- STRONGLY AGREE	57	30.32	30	21.90
		- AGREE	99	52.66	71	51.82
		- NEUTRAL	21	11.18	26	18.98
		- DISAGREE	5	2.66	7	5.11
		- STRONGLY DISAGREE	6	3.19	3	2.19
		- STRONGLY AGREE	40	21.28	17	12.41
		- AGREE	96	51.06	66	48.18
		- NEUTRAL	45	23.94	47	34.31
		- DISAGREE	2	1.06	5	3.65
- STRONGLY DISAGREE	5	2.66	2	1.46		

Barriers to Adoption of Digital Payment Services by Customers in India

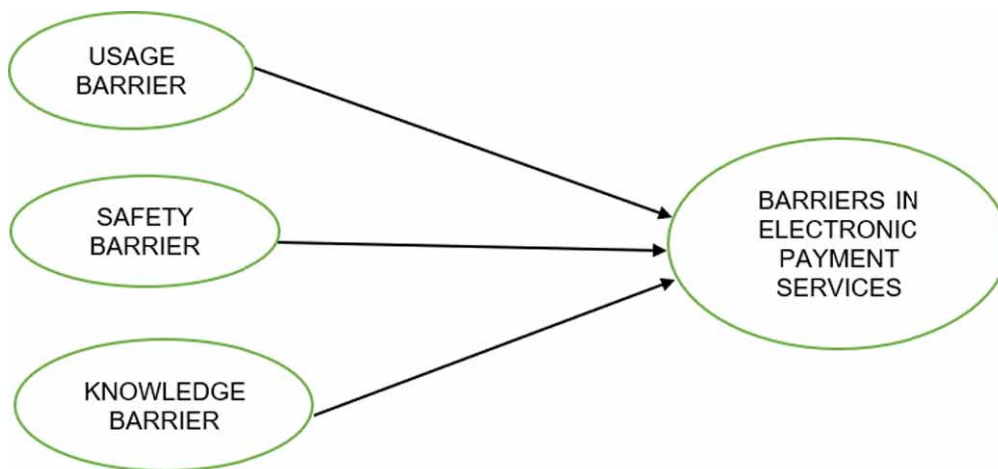
In India, the number of active mobile phone users is very high; still, the rate of use of digital payment services is very low. However, after demonetization and COVID-19 mobile technology acts as a catalyst for financial transactions using different online platforms. These digital transactions by using online platforms became an essential aspect for the customers who are tired of the traditional banking system. But there seems to be a barrier that pushes back the customer from enrolling in digital financial services. These barriers are stated below-

1. **USAGE BARRIER-** The usage barrier is related to the compatibility of innovation in digital payment with existing workflows and practices (Ram and sheth, 1989). The main obstacle in using electronic payment financial services by customers is a lack of technology readiness. The lack of technology readiness includes slower transaction speed, small screens, and difficulty in interpreting text and graphics (Lee and chung, 2009; Bruner and kumar, 2005). This led to users' impairment of

the usability of mobile payment services and led to the usage barrier, which influences and makes the potential customer resist the adoption of electronic payment financial services.

2. **SECURITY BARRIER-** Rapid changes in technology led to undergo the radical transformation in digital payment services. This emerging technology and functionalities among digital channels create security concerns. Securing mobile payment services has become a significant issue and challenge for the user. There is a high chance of getting trapped in fraud by the attacker.
3. **KNOWLEDGE BARRIER-** This barrier arises when the customer's existing value and knowledge are incompatible with the current digital payment services innovation scenario. Especially elderly customers are more afraid of using online services as they are not well aware of the processes to complete the transaction.

Figure 9.



CONCLUSION AND LIMITATION

The study results present a review on acceptance and adoption of e- payment services by consumers in India after incorporating corporate sustainability in the working of the banking industry. As in line with the global industries' move in acquiring the latest advanced technology to stay ahead of competitors, banks throughout the world and India have notably moved in the same direction. To obtain this position, every banking firm is spending its cost in developing a successful mobile banking platform for their customer. This platform adoption by their customer also helps reduce their operating cost further. But the above shown descriptive result define the pattern and behavior of an individual towards an acceptance and adoption of digital payment services in their daily life, and this result indicates that a large number of customers still do not prefer to use these available digital payment services due to various security and technological reason they faced in accepting it.

Future research can be done in the context of the rural population. Further comparative analysis can be done between the urban and rural people regarding barriers and the adoption of electronic payment services. Future research scholars can also study the financial and non-financial impact of digital banking exploitation and fears among bottom line users. Further research could also address the barrier,

Influence of Corporate Sustainability on Providing Electronic Payment Services

focusing on how elderly customers face in adopting electronic payment services. The solution to it can be suggested to increase the usage rate for digital payment services users.

REFERENCES

- Abdillah, G., Harahap, W., & Muda, I. (2019). Future electronics payment system model. *Journal of Physics: Conference Series*, 1230(1), 012068. doi:10.1088/1742-6596/1230/1/012068
- Achour, N., Pantartzis, E., Pascale, F., & Price, A. D. (2015). Integration of resilience and sustainability: From theory to application. *International Journal of Disaster Resilience in the Built Environment*, 6(3), 347–362. doi:10.1108/IJDRBE-05-2013-0016
- Aigbe, P., & Akpojaro, J. (2014). Analysis of security issues in electronic payment systems. *International Journal of Computers and Applications*, 108(10).
- Al Mashagba, F. F., & Nassar, M. O. (2012). Modified UTAUT model to study the factors affecting the adoption of mobile banking in Jordan. *International Journal of Sciences, Basic and Applied Research*, 6(1), 83–94.
- Alzaidi, A. A. (2018). Impact of artificial intelligence on performance of banking industry in Middle East. *International Journal of Computer Science and Network Security*, 18(10), 140–148.
- Anbalagan, G. (2017). New technological changes in Indian banking sector. *International Journal of Scientific Research and Management*, 5(9), 7015–7021. doi:10.18535/ijstrm/v5i9.11
- Anbalagan, G. (2017). New technological changes in Indian banking sector. *International Journal of Scientific Research and Management*, 5(9), 7015–7021. doi:10.18535/ijstrm/v5i9.11
- Arunachalam, L. D. M. S., & Sivasubramanian, M. (2007). The future of internet banking in India. *Academic Open Internet Journal*, 20.
- Bergendahl, G., & Lindblom, T. (2007). Pricing of payment services: A comparative analysis of paper-based banking and electronic banking. *Service Industries Journal*, 27(6), 687–707. doi:10.1080/02642060701453148
- Bruner, G. C. II, & Kumar, A. (2005). Explaining consumer acceptance of handheld Internet devices. *Journal of Business Research*, 58(5), 553–558. doi:10.1016/j.jbusres.2003.08.002
- Carroll, A. B. (1979). A three-dimensional conceptual model of corporate performance. *Academy of Management Review*, 4(4), 497–505. doi:10.2307/257850
- Chaimaa, B., Najib, E., & Rachid, H. (2021). E-banking Overview: Concepts, Challenges and Solutions. *Wireless Personal Communications*, 117(2), 1059–1078. doi:10.1007/11277-020-07911-0
- ClarkG. L.FeinerA.ViehsM. (2015). From the stockholder to the stakeholder: How sustainability can drive financial outperformance. Available at SSRN 2508281.
- Compeau, D. R., & Meister, D. (2002). Infusion of innovation adoption: An individual perspective. *Proceedings of the ASAC*, 23-33.

Influence of Corporate Sustainability on Providing Electronic Payment Services

Dapp, T., & Slomka, L., AG, D. B., & Hoffmann, R. (2014). Fintech—The digital (r) evolution in the financial sector. *Deutsche Bank Research*, *11*, 1–39.

David-West, O., Iheanachor, N., & Umukoro, I. (2020). Sustainable business models for the creation of mobile financial services in Nigeria. *Journal of Innovation & Knowledge*, *5*(2), 105–116. doi:10.1016/j.jik.2019.03.001

Davis, F. D. (1993). User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies*, *38*(3), 475–487. doi:10.1006/imms.1993.1022

Dhanwani, S. K. (2014). Recent Trends in Indian Banking Industry. *ABHINAV, National Monthly Refereed Journal of Research in Commerce & Management*, (3).

Donald, S. S. (2009). Green management matters only if it yields more green: An economic/strategic perspective. *The Academy of Management Perspectives*, *23*(3), 5–16. doi:10.5465/amp.2009.43479260

Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. *Business Strategy and the Environment*, *11*(2), 130–141. doi:10.1002/bse.323

Elkington, J. (1994). Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *California Management Review*, *36*(2), 90–100. doi:10.2307/41165746

Elkington, J. (2001). The triple bottom line for 21st century business. *The Earthscan Reader in Business and Sustainable Development*, 20–43.

Elkington, J. (2004). Enter the triple bottom line. *The triple bottom line: Does it all add up*, *11*(12), 1–16.

Elkington, J. (2013). Enter the triple bottom line. In *The triple bottom line* (pp. 23–38). Routledge.

Epstein, M. J., & Roy, M. J. (2001). Sustainability in action: Identifying and measuring the key performance drivers. *Long Range Planning*, *34*(5), 585–604. doi:10.1016/S0024-6301(01)00084-X

Epstein, M. J., & Roy, M. J. (2003). Making the business case for sustainability: Linking social and environmental actions to financial performance. *Journal of Corporate Citizenship*, *2003*(9), 79–96. doi:10.9774/GLEAF.4700.2003.sp.00009

Forcadell, F. J., Aracil, E., & Úbeda, F. (2019). The influence of innovation on corporate sustainability in the international banking industry. *Sustainability*, *11*(11), 3210. doi:10.3390/s11113210

Forcadell, F. J., Aracil, E., & Ubeda, F. (2020). Using reputation for corporate sustainability to tackle banks digitalization challenges. *Business Strategy and the Environment*, *29*(6), 2181–2193. doi:10.1002/bse.2494

Freeman, R. E., Harrison, J. S., Wicks, A. C., Parmar, B. L., & De Colle, S. (2010). *Stakeholder theory: The state of the art*. Academic Press.

Ho, S. S., & Ng, V. T. (1994). Customers' risk perceptions of electronic payment systems. *International Journal of Bank Marketing*, *12*(8), 26–38. doi:10.1108/02652329410069029

Influence of Corporate Sustainability on Providing Electronic Payment Services

- Kabir, M. A., Saidin, S. Z., & Ahmi, A. (2015, August). Adoption of e-payment systems: a review of literature. In *Proceedings of the International Conference on E-commerce (Vol. 2012, pp. 112-120)*. Academic Press.
- Kaur, J. (n.d.). Innovation in Indian Banking Sector. *Parichay: Maharaja Surajmal Institute Journal of Applied Research*, 1.
- Kolodiziev, O., Krupka, M., Shulga, N., Kulchytsky, M., & Lozynska, O. (2021). *The level of digital transformation affecting the competitiveness of banks*. Academic Press.
- Lee, K. C., & Chung, N. (2009). Understanding factors affecting trust in and satisfaction with mobile banking in Korea: A modified DeLone and McLean's model perspective. *Interacting with Computers*, 21(5-6), 385–392. doi:10.1016/j.intcom.2009.06.004
- Legris, P., Ingham, J., & Colletette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, 40(3), 191–204. doi:10.1016/S0378-7206(01)00143-4
- Macchiavello, E., & Siri, M. (2020). *Sustainable Finance and Fintech: Can Technology Contribute to Achieving Environmental Goals? A Preliminary Assessment of 'Green FinTech'*. Academic Press.
- Mallat, N. (2007). Exploring consumer adoption of mobile payments—A qualitative study. *The Journal of Strategic Information Systems*, 16(4), 413–432. doi:10.1016/j.jsis.2007.08.001
- Marchese, D., Reynolds, E., Bates, M. E., Morgan, H., Clark, S. S., & Linkov, I. (2018). Resilience and sustainability: Similarities and differences in environmental management applications. *The Science of the Total Environment*, 613, 1275–1283. doi:10.1016/j.scitotenv.2017.09.086 PMID:28962075
- Mejia-Escobar, J. C., González-Ruiz, J. D., & Duque-Grisales, E. (2020). Sustainable Financial Products in the Latin America Banking Industry: Current Status and Insights. *Sustainability*, 12(14), 5648. doi:10.3390/s12145648
- Migliorelli, M. (2021). What Do We Mean by Sustainable Finance? Assessing Existing Frameworks and Policy Risks. *Sustainability*, 13(2), 975. doi:10.3390/s13020975
- Mishra, R. K., & Kiranmai, J. (2009). E-banking: A case of India. *ICFAI Journal of Public Administration*, 5(1).
- Molina-Azorín, J. F., Claver-Cortés, E., López-Gamero, M. D., & Tarí, J. J. (2009). Green management and financial performance: A literature review. *Management Decision*, 47(7), 1080–1100. doi:10.1108/00251740910978313
- Nguyen, Q. K. (2016, November). Blockchain-a financial technology for future sustainable development. In *2016 3rd International conference on green technology and sustainable development (GTSD)* (pp. 51-54). IEEE. 10.1109/GTSD.2016.22
- Norman, W., & MacDonald, C. (2004). Getting to the bottom of “triple bottom line”. *Business Ethics Quarterly*, 14(2), 243–262. doi:10.5840/beq200414211

- Puschmann, T. (2017). Fintech. *Business & Information Systems Engineering*, 59(1), 69–76. doi:10.1007/12599-017-0464-6
- Ram, S., & Sheth, J. N. (1989). Consumer resistance to innovations: The marketing problem and its solutions. *Journal of Consumer Marketing*, 6(2), 5–14. doi:10.1108/EUM0000000002542
- Roy, S., & Sinha, I. (2014). Determinants of customers' acceptance of electronic payment system in Indian banking sector—A study. *International Journal of Scientific and Engineering Research*, 5(1), 177–187.
- Ruf, B. M., Muralidhar, K., Brown, R. M., Janney, J. J., & Paul, K. (2001). An empirical investigation of the relationship between change in corporate social performance and financial performance: A stakeholder theory perspective. *Journal of Business Ethics*, 32(2), 143–156. doi:10.1023/A:1010786912118
- Sahu, G. P., & Singh, N. K. (2017, November). Paradigm shift of Indian cash-based economy to cash-less economy: a study on Allahabad City. In *Conference on e-Business, e-Services and e-Society* (pp. 453-461). Springer.
- Sakpal, S., & Soni, R. (n.d.). *A Study of Opportunities and Challenges Faced Towards Sustainability of Digital Payment Banks in India*. Academic Press.
- Singh, B., & Malhotra, P. (2004). Adoption of Internet banking: An empirical investigation of Indian banking Sector. *Journal of Internet Banking and Commerce*, 9(2), 9909–05.
- Singh, S. K. (2020). *E-Payment—A Study of Banking System in India*. Academic Press.
- Slaper, T. F., & Hall, T. J. (2011). The triple bottom line: What is it and how does it work. *Indiana Business Review*, 86(1), 4-8.
- SmithA.NobaneeH. (2020). Artificial Intelligence: In Banking a Mini-Review. Available at SSRN 3539171.
- Soppe, A. (2004). Sustainable corporate finance. *Journal of Business Ethics*, 53(1), 213–224. doi:10.1023/B:BUSI.0000039410.18373.12
- Starnawska, S. E. (2021). Sustainability in the Banking Industry Through Technological Transformation. In *The Palgrave Handbook of Corporate Sustainability in the Digital Era* (pp. 429–453). Palgrave Macmillan. doi:10.1007/978-3-030-42412-1_22
- Suoranta, M., & Mattila, M. (2004). Mobile banking and consumer behaviour: New insights into the diffusion pattern. *Journal of Financial Services Marketing*, 8(4), 354–366. doi:10.1057/palgrave.fsm.4770132
- Taufiq, R., Hidayanto, A. N., & Prabowo, H. (2018, September). The affecting factors of blockchain technology adoption of payments systems in Indonesia banking industry. In *2018 International Conference on Information Management and Technology (ICIMTech)* (pp. 506-510). IEEE. 10.1109/ICIMTech.2018.8528104
- Tsiakis, T., & Sthephanides, G. (2005). The concept of security and trust in electronic payments. *Computers & Security*, 24(1), 10–15. doi:10.1016/j.cose.2004.11.001
- Urban, M. A., & Wójcik, D. (2019). Dirty banking: Probing the gap in sustainable finance. *Sustainability*, 11(6), 1745. doi:10.3390/u11061745

Influence of Corporate Sustainability on Providing Electronic Payment Services

Vives, X. (2017). The impact of FinTech on banking. *European Economy*, (2), 97–105.

Vyas, S. D. (2012). Impact of e-banking on traditional banking services. *arXiv preprint arXiv:1209.2368*.

Waddock, S. A., & Graves, S. B. (1997). The corporate social performance–financial performance link. *Strategic Management Journal*, 18(4), 303–319. doi:10.1002/(SICI)1097-0266(199704)18:4<303::AID-SMJ869>3.0.CO;2-G

Chapter 2

Policies and Innovations of Financial Technology Business Models in the Digital Economy Era on the E-Business Ecosystem in Indonesia

Ahmad Budi Setiawan

Ministry of Communication and Information Technology, Indonesia

Amri Dunan

 <https://orcid.org/0000-0002-4168-597X>

Ministry of Communication and Information Technology, Indonesia

Bambang Mudjiyanto

Ministry of Communication and Information Technology, Indonesia

ABSTRACT

The rapid development of technology and information systems continues to give birth to various innovations, especially those related to financial technology to meet the various needs of the community, including access to financial services and processing of financial transactions. Financial technology (FinTech) is the implementation and utilization of technology to improve financial and banking services. The development of financial technology in Indonesia itself is growing rapidly, along with the development of existing technology. FinTech is developed by utilizing the latest software, internet, and computing technologies. Based on this, this study examines the development of innovation and policies for the fintech business model in the e-business ecosystem in Indonesia. This research is a qualitative research with data collection methods through focus group discussions, in-depth interviews, and literature studies. This chapter recommends that the government develop and make policies for fintech business model innovation in the e-business ecosystem in Indonesia.

DOI: 10.4018/978-1-7998-9664-7.ch002

INTRODUCTION

Information and Communication Technology is essential in business processes, goods, and services to achieve a competitive advantage. Information and Communication Technology changes the way people work (the way people work) while also changing how companies compete (the way businesses compete). Information and Communication Technology Support develops new courses of transacting (e-commerce). The development of the e-commerce function encourages the emergence of e-business. E-business is the practice of managing critical business processes such as product design, management of raw material supply, sales, and service provision through information/communication technology and computerized data (Alter, 2002). In other words, e-business can be defined as the use of Information and Communication Technology in supporting all business activities.

E-Business is becoming more and more popular, and policymakers understand that Information Technology cannot act alone. Several vital aspects must be conditioned, such as Business Strategy, Planning, Organizing, Finance, Law, and Risk Management. These aspects that need to be drilled are crucial so that E-Business can develop positively. There are several critical views on E-Business as outlined by Martin V. Deisie and friends; one of these views states that E-Business is a must. Technology will continue to change, and e-business will continue to appear and exist more in the future in various fields. E-business will become the standard of operation limited to Financial Services, printing, and retail. The executives' vision will be the critical point for the successful implementation of E-Business.

The rapid development of E-Business has become a new phenomenon in the digital economy in Indonesia. This fact is expected to have a more positive impact on the prosperity of the digital economy in Indonesia. This is related to the condition of the vast country of Indonesia, consisting of 16 thousand islands with a population of around 240 million people, which is a challenge for the Government to carry out equitable economic development in all fields. E-business is electronic trading activity in a broad sense. One part of the activity of E-Business that is currently very hot is E-Commerce, which includes trading via the internet (internet commerce), trading with internet web facilities (web-commerce), and trading with structured data exchange systems electronically (electronically). Meanwhile, Kulhmann et al. (2018) suggest four main areas to support the development of an enabling environment for inclusive digital economy policies: consumer protection, data confidentiality, cybersecurity, and electronic payments.

The Indonesian Central Statistics Agency stated that currently, the digital economy's contribution in Indonesia has only reached 5% of the Gross Domestic Product (GDP) (CBS, 2018). However, the growth prospects are pretty bright if you look at the value of online shopping transactions (e-commerce), which reached US\$130 billion in 2020. With a large population and total smartphone device, connections exceed 371 million units. In the future, Indonesia will become a digital ecosystem with the largest market in Southeast Asia. The development of this digital ecosystem cannot be separated from several driving aspects, such as infrastructure development (both hardware and software), the large number of social media users, the massive use of data, and the ease of obtaining a connected device to the internet. Nevertheless, the country's information communication and technology (ICT) infrastructure is still a chore in equity. Currently, the user center and digital infrastructure development are still centered on the island of Java.

Meanwhile, the number of internet users in rural areas is difficult to increase due to limited infrastructure (MASTEL, APJII, ATSI, 2017). The data also shows that domestic ICT companies continue to experience growth (BEKRAF, 2019). For example, on-demand transportation services initiated by GO-JEK and Grab.

The expansion of e-commerce users with the dominance of Tokopedia, Lazada, and Bukalapak is the growth of payment technology services (financial technology or fintech) in the country such as Gopay, OVO, and DANA. Fintech is further predicted to disrupt the conventional banking business model in the next ten years and become a key ‘driver’ technology in developing this information technology-based economy. In addition, fintech is also projected to be a solution to the problem of financial inclusion in the country. To date, less than half of Indonesia’s adult population (over 15 years) has access to formal financial services (The Global Findex Database, 2017). The emergence of fintech is believed to reduce public dependence on conventional banking financial services.

PROBLEM STATEMENT, RESEARCH QUESTIONS, AND OBJECTIVES

Electronic Payment is a digital payment service that facilitates bank and non-bank payments, either through conventional means using credit and debit cards or with electronic wallets provided by non-bank third parties, better known as providers of financial technology services. FinTech can be defined as a segment of the startup world that has a focus on maximizing the use of technology to change, accelerate or sharpen various aspects of financial services currently available, simple examples such as gopay, ovo, tcash, amartha, doku, and others, but there are many types of fintech. FinTech results from a combination of financial services and technology are changed the business model from conventional to moderate, which initially had to pay face-to-face and carry a certain amount of cash. Now can make long-distance transactions by making payments that can be made in just seconds. Bank Indonesia Regulation Number, 19/12/PBI/2017 concerning the Implementation of Financial Technology, defines Financial Technology as the use of technology in the financial system that produces new products, services, technology, and business models and can have an impact on monetary stability, financial system stability, and efficiency, smoothness, security and reliability of the payment system.

Despite the rapid development of financial technology and its use in society, there are currently no specific regulations and policies governing the business ecosystem of financial technology models in Indonesia. Meanwhile, in implementing the financial technology business model in Indonesia, the most fundamental problem is the need for government regulations to manage the security of the digital ecosystem and also to provide a regulatory framework that is conducive to encouraging innovation (Rumata & Sastrosubroto, 2020, pp. 7–9). To release a regulation in the field of the digital economy is a big challenge and not easy because it is very dynamic and technical. So often, the formulation of policies in the digital economy cannot always follow and accommodate developments and innovations (Beaumier et al., 2020; OECD, 2019; Bukht & Heeks, 2018, pp. 9–10). Therefore, a practical, dynamic regulatory approach to address these challenges is fundamental. Based on these problems, this paper discusses how regulations and innovations are developed to support the growth and development of the financial technology business model in Indonesia’s era of the digital economy.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Financial Technology

Financial Technology (Fintech) has a broad meaning and understanding. The FinTech concept is a line of business based on the use of software or applications in providing financial services. Usually, FinTech comes as a startup or startup company. A research institute NDRC (The National Digital Research Center), says that Fintech is a term for innovation in financial services, where technology is the key. Meanwhile, according to the former Governor of Bank Indonesia, Agus DW Martowardojo, in his keynote speech at the 2016 Indonesia Fintech Festival and Conference in Jakarta, Fintech is a financial service based on information technology such as big data, cloud computing, and distributed ledger systems.

While Fintech Weekly mentions on its website that Fintech describes a business that aims at providing financial services by making use of software and modern technology. Business processes that can be completed with fintech include payment, investment, financing, insurance, cross-process and infrastructure. A simple example of using fintech is e-banking technology that uses smartphones as a medium to interact with banks.

Fintech is a business that aims to provide financial services by utilizing modern software and technology. Meanwhile, Douglas W Arner, 2015 mentions that “Financial technology” or “Fintech” refers to technology-enabled financial solutions. Fintech refers to a technology that provides an economical solution. Priadiono, Hukum, Esa, & West (2016) said that Financial Technology (Fintech) combines technology and financial features. It can also be interpreted as innovation in the financial sector with a touch of modern technology. Based on Dorfleitner, Hornuf, Schmitt, & Weber (2017), Fintech is a high-speed and dynamic moving industry with many different business models. Meanwhile, according to Hsueh (2017), Financial Technology also referred to as Fintech, is a new financial service model developed through information technology innovation.

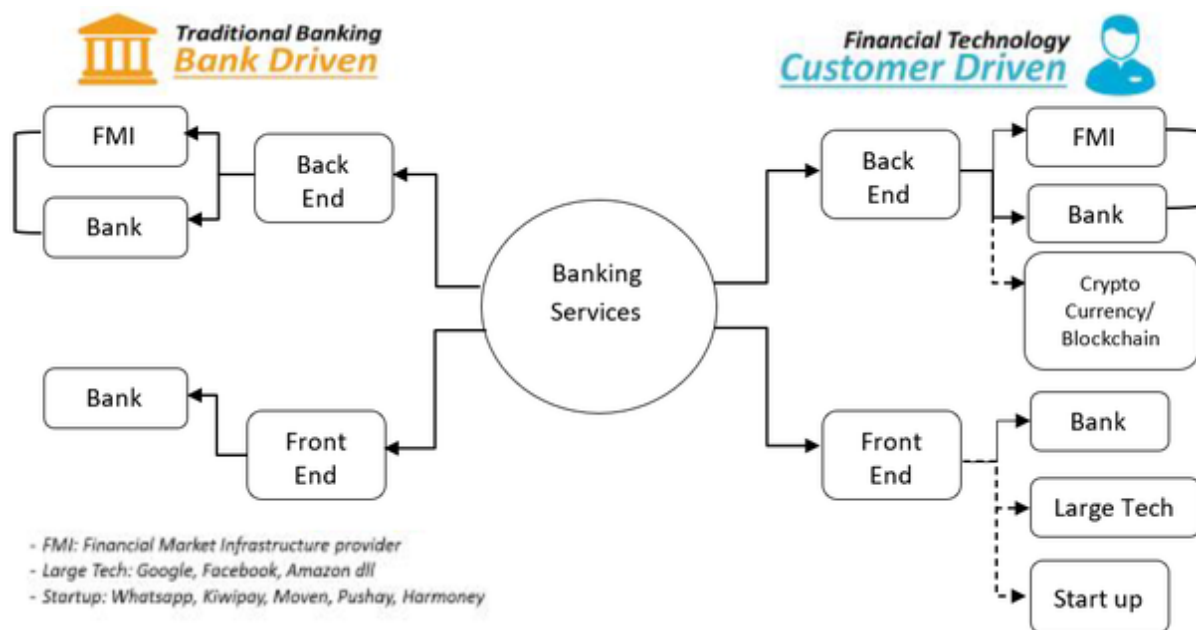
From some of the definitions above, it can be concluded that Fintech is a service that provides financial product products by using and utilizing developing information technology. According to Hsueh (2017), there are three types of financial technology as follows:

1. Third-party payment systems. Examples of third-party payment systems are cross-border, online-to-offline (O2O), mobile payment systems, and payment platforms that provide services such as bank payments and transfers.
2. Peer-to-Peer (P2P) Lending. Peer-to-Peer Lending is a platform that brings lenders and borrowers together via the internet. Peer-to-Peer Lending provides credit and risk management mechanisms. This platform helps lenders and borrowers meet their individual needs and efficiently use money. According to Ge, Feng, Gu, & Zhang (2017), Peer-to-Peer Lending is a process of borrowing money between two unrelated individuals directly through an online platform, without the intervention of traditional financial intermediaries such as banks. According to Dorfleitner et al. (2016), Peer-to-Peer Lending is a major innovation related to the banking sector. In recent years, the number of platforms offering such services and transactions has increased. Peer-to-Peer Lending is an Internet-based business model that meets the needs of loans between financial intermediaries (Hsueh, 2017).
3. Crowdfunding is a type of Fintech in which a concept or product such as design, program, content, and creative work is publicly published, and people who are interested and want to support the

concept or product can provide financial support. Crowdfunding can be used to reduce entrepreneurial financial needs and predict market demand.

The fintech industry itself is different from the traditional banking industry. In Figure 1, it can be seen that the fundamental difference between the two lies in the driving aspect of the industry. The driving aspect of the traditional banking industry is the banking institution itself, while the current fintech industry is driven by the needs of the customer or the industry's market. Innovations made by startups in the fintech industry aim to respond to customer needs and adapt to trends in customer behavior. It has led to a paradigm shift in the industry in the financial sector. Figure 1 below explains the difference in the business process paradigm between traditional banking and financial technology

Figure 1. Traditional banking industry vs. financial technology industry



A paradigm shift in the industry in the financial sector can occur due to the phenomenon of disruptive innovation. Disruptive innovation successfully transforms an existing system or market by introducing practicality, ease of access, convenience, and economic costs. This term was first introduced by Clayton M. Christensen and Joseph Bower in 1995. This disruptive innovation usually takes specific market segments that are less desirable or considered less critical for market authorities, but the innovation is a breakthrough and can redefine existing systems or markets (Darma, 2018).

Digital Economy Indonesia

The digital revolution has changed the way products and services are developed, produced, and sold. This has impacted the number of multinational companies and startups (OECD, 2015, p. 52). Coupled

with the emergence of the Covid-19 pandemic, many consumers tend to choose online shopping, thereby increasing the demand for remote or online transactions and faster and safer payment solutions. Changes in consumer interest in the online market have led to the emergence of new business models that affect the market and transform conventional businesses in the retail, transportation and logistics, banking services, manufacturing, agriculture, education, healthcare, and media sectors (BI, 2019; OECD, 2015, pp. 53-54).

The business sectors where digital technology is integrated into their daily operations have shaped the framework of the digital economy (see Box 1). Banks and banking companies are at the forefront of delivering digital versions of their conventional services, but non-bank, non-banking startups have also built new payment mechanisms using digital technology. This payment mechanism has reduced the transaction costs of entrepreneurs, which in turn also has an impact on consumers. Consumers also benefit from this ever-available online service (OECD, 2015, p. 52).

The digital economy is formed by business actors who use digital information and the internet to increase efficiency, productivity, market reach, and operational costs (Rillo, 2018; Kuhlmann et al., 2018, p.9; OECD, 2015). The digital economy facilitates inclusive economic development; for example, digital financial services make transactions cheap and efficient, without which cash transactions would be required (Manyika et al., 2016) and in addition, these digital services provide access to 44.3% of Indonesian adults who do not have a formal bank account (Schueth & Simorangkir, 2018).

Indonesia has the most extensive digital economy worth US\$ 100 billion among ASEAN countries, equivalent to 41% of transaction value in the ASEAN region (Davis et al., 2019). In 2019, the percentage of transaction value was higher than the relative size of the Indonesian economy as a whole among ASEAN countries, which was 35%. Indonesia's online supplier-consumer or business-to-consumer (B2C) market alone is estimated to be worth US\$13.6 billion in 2019. The B2C market is dominated by transactions at online travel agencies (58.9%), followed by online shopping and categories retail (14.6%) (JP Morgan, 2019).

In the first half of 2020, around 630 digital service providers in Indonesia processed transactions worth US\$ 41 billion. The electronic market represents more than half of this value, followed by transactions at online travel agencies (24%), online taxis (15%), and online media (10%) (Davis et al., 2019, p.21). One of the leading associations in this sector, the Indonesian E-Commerce Association (idEA), represents members in ten business sectors: banking, classifieds, daily promotions, directories, digital infrastructure, logistics, online marketplaces, online retail stores individuals, payment gateways, and travel. These sectors cover virtually all types of online transactions, between companies, consumer-company, consumer-consumer, consumer-enterprise, and even between companies-government (Rosyidi, 2019, p.212).

The transaction value (GMV) of Indonesia's digital economy has grown by more than 40% annually since 2015 and is predicted to reach US\$ 130 billion by 2025, making Indonesia the most promising digital market in Southeast Asia (Davis et al., 2019, p. 4). In comparison, the digital economies of Malaysia, Thailand, and Singapore grew between 20% and 30%. 175.4 million internet users cause Indonesia's rapid development (as of January 2020), increasing due to the efficiency and convenience of online markets, travel agencies, online taxi applications, and electronic payments. This ultimately gave birth to investor confidence in Indonesia's digital sector (We are Social & Hootsuite, 2020; Davis et al., 2019, pp. 10, 18).

Some of the challenges in the process of achieving digital economic progress are cyber security that can disrupt business smoothness, industrial fragmentation between one company and another, the dominance of imported products in online buying and selling platforms which are feared to hamper the growth of local industries, and limited human resources in the field of technology. Moreover, information

that still reaches less than 10% of needs. Policy recommendations to address these challenges include making massive and sustainable national digitalization policies, supportive legal policies for the digital industry, expanding tax incentives for domestic startups and regulatory certainty for investors, sustainable programs encouraging the growth of new talents and technopreneurs, and developing innovative technologies and products.

METHODOLOGY

This study uses a descriptive qualitative approach. According to Moleong (2014), qualitative analysis is a research procedure that produces data in words, either orally or in writing. According to Notoatmodjo (2002), the descriptive is a research method carried out with the main aim of helping researchers get an objective picture of a situation.

The data used in this study are primary data obtained from Focus Group Discussion (FGD) and in-depth interviews, primary data obtained through literature studies from various relevant reference sources, and related policies issued by the Government. Other data in this study were obtained through secondary data, namely, data obtained indirectly by researchers (Purwanto, 2018). The informants involved in this study can be seen in Table 1.

Table 1. List of informants

Activity	Informants	Institution
Focus Group Discussion	Prof. DR. Eriyatno	The Research Center of Expert System Technology
	Ir. Neil L Himman	Creative Economy Agency of Indonesia
	DR. Widyo Gunadi	Financial Services Authority, Indonesia
	DR. Yosamartha	Bank of Indonesia
	Steve Saerang	PT. Telkomsel Indonesia
	DR. Lala Kolopaking	Bogor Agricultural Institute
	DR. Iding Chaidir	National Research Council
Deep Interview	Brigitta R. Aryanti	GOPAY
	Jim Oklahoma	iGrow

The data that has been collected is then processed using Milles and Huberman's interactive model consisting of data collection, data reduction, data display, and conclusion (Milles & Huberman, 2005). Data analysis was carried out on the statements of research informants, especially on statements that matched the keywords or concepts used in this study. The analysis technique used in this study uses content analysis. Content analysis is an analytical technique carried out by concluding by identifying the specific characteristics of a message objectively and systematically (Holsti, 1969).

RESULT

Analysis and Findings

Technology is overgrowing in meeting human needs for information and various other electronic services in today's modern era. By using technology, everything feels more effective and efficient in its use. With the use of technology, people are greatly helped to get a service. Similarly, there has also been a significant development in the financial sector. Technology and finance have a relationship with each other.

With Fintech, even remote communities can use technology-based financial services without traveling long distances to get financial services. According to data from the 2014 World Bank, the number of Indonesians who already have accounts at formal financial institutions is only around 36%, the remaining 64% of Indonesians do not have accounts and have access to formal financial institutions or often referred to as unbanked. More than half of Indonesian people have not been served by financial services such as banks. It is an opportunity for businesses engaged in finance to take advantage of technology. For example, Investee, a Fintech startup engaged in peer-to-peer lending, brings together people with funding needs (borrowers) and willing to lend their funds (lenders). This makes it easier for people to make investments or get funding for businesses more easily without meeting face-to-face with long distances. Another benefit of lenders is that they directly get profit-sharing paid by the borrower without any costs.

In funding and lending, other businesses engaged in the Fintech sector are transportation services such as Gojek, which has issued GoPay, Uber, and Grab, which issued the Grab wallet product. Currently, Fintech players in Indonesia are still dominant in the payment business (39%), loans (24%), and the rest are in the form of aggregators, crowdfunding, and others (CNBC News, 2018). Fintech has the potential to benefit various parties, from business people to people who use Fintech services and economic growth. Fintech also plays a role in accelerating the expansion of the reach of financial services (Hadad, 2017). The role is almost the same as that carried out by the Islamic finance industry, but the difference is that Fintech maximizes the use of technology in its transactions and reduces physical evidence. It makes financial transactions more practical, safe, and modern (Mawarni, 2017). In Indonesia, many startup companies use Fintech services and are known to be better than other financial industries with too rigid and strict rules. Meanwhile, Fintech uses technology, software, and data which are certainly more effective and efficient.

Fintech is further predicted to disrupt the conventional banking business model in the next ten years and become a key 'driver' technology in developing this information technology-based economy. In addition, fintech is also projected to be a solution to the problem of financial inclusion in the country. Less than half of Indonesia's adult population (over 15 years) has access to formal financial services (The Global Findex Database, 2017). The emergence of fintech is believed to reduce public dependence on conventional banking financial services.

Along with the widespread development of digital infrastructure services in Indonesia, the digital ecosystem is rising to a higher level. This is evidenced by the rapid growth of ICT startup companies in 2018. The data shows that domestic ICT companies continue to experience growth (BEKRAF, 2019). For example, the on-demand transportation service initiated by GO-JEK and Grab, the more comprehensive e-commerce users with the dominance of Tokopedia, Lazada, and Bukalapak to the growth of payment technology services (financial technology or fintech) in the country such as Gopay, OVO, and FUND.

Figure 2. Indonesian's Fintech map (CNBC News, 2018)



The Potential of Fin-Tech in Indonesia

In developing product innovation based on digital technology, there will be challenges that need to be faced by industry players, including fintech platform developers in the financial sector. In Table 2, it can be seen what challenges may be faced in the development of the financial sector in Indonesia in the era of the digital economy.

It was previously mentioned that with a fintech application or platform, people included in the unbanked population could begin to experience financial service facilities. Quoted from an article on Indonesia.go.id website (2019), the Chairman of the OJK Board of Commissioners, Wimboh Santoso, stated that financial technology in Indonesia is developing extraordinary because it can reach remote areas. It is estimated that P2P Lending fintech services in Indonesia have reached 5,160,120 customers, of which there was an increase of approximately 18.91% in January 2019.

This positive impact arises because of digital product innovation in the fintech industry, which uses a customer-driven paradigm (emphasis on meeting customer needs) in the development of the financial

Table 2. Challenges of Fin-TEch development in Indonesia

Aspect	Challenges
Platform	The fintech platform causes groups of people who are included in the unbanked population to be able to experience financial service facilities. However, in the unbanked population, there are also groups of people engaged in the micro-agriculture sector and living in rural areas, which financial service providers, including fintech, have not fully reached. So fintech organizers can develop these community groups to use their products.
	The existing fintech platforms are still general and do not talk about locality values that exist in society, even though with the condition of Indonesia as an archipelagic country with various cultures, locality values are essential.
Security	There is still a need for many improvements related to the system's security level built by the organizers. One of them is related to the KYC (<i>Know Your Customer</i>) process.
	Each fintech application provider or developer has its QR code, then distributed to merchants. It is possible if one merchant cooperates with more than one fintech so that the QR code that merchants need to display will be many.
Service and Third Party	In the era of the digital economy, financing services allow abuse opportunities that lead to criminal crimes in the digital world.
	Many insurance parties still do not want to cooperate with Fintech Lending.
Regulatory and Institutional	Regulations in Supporting Fintech Development related to digital signatures and digital documents to optimize the potential of the Fintech industry (Otoritas Jasa Keuangan, 2016).
	Coordination between Related Institutions and Ministries to optimize the potential of Fintech with a complex business environment is also necessary to support various ministries and related institutions. (Otoritas Jasa Keuangan, 2016)

sector. Business processes in the financial sector in the digital economy era are faster and easier to use, not too strict with regulations, but still following the regulations that the relevant regulators have determined. Developments that occur in the fintech industry in Indonesia not only have an impact on the industry in the financial sector but also become a structural solution for the growth of the electronic-based trading industry (e-commerce), encourage the growth of small and medium enterprises (SMEs), and encourage the birth of new entrepreneurs in Indonesia. Indonesia.

However, although fintech can reach the unbanked population, in the unbanked population, there are also groups of people who work in the micro-agriculture sector and live in rural areas, which financial service providers, including fintech, have not fully reached. Thus, financial service providers in the fintech industry still need to develop so that these community groups can utilize their products.

The condition of Indonesia with a variety of cultures also turned out to be a challenge in the development of the fintech industry. The existing fintech platforms already have incredible innovation and business processes, but they still do not talk about local values in society. Innovation and business development of fintech platforms are still general, so it is necessary to develop end-to-end business cycle policies related to Indonesian locality values. Especially for financial service activities with financing or funding schemes. The development of a fintech platform does not always have to be packaged on a large scale, and it is also necessary to consider developing a fintech platform on a local scale so that the facilities provided can be more in line with the needs of the local community.

The study conducted by Chrismastianto (2017) stated that the number of users of financial technology services in Indonesia is not in line with the number of internet users themselves. The number of people

who use financial technology services in Indonesia is still deficient, this happens because Indonesia is an archipelagic country and still has limitations on equitable distribution of internet infrastructure. People living in 3T areas (Front, Outermost, and Remote) do not have adequate infrastructure to use financial technology services (Chrismastianto, 2017).

The development of the fintech industry in Indonesia has opened up more opportunities for the increasing number of digital application-based financial service providers. It is undoubtedly a challenge because there will be more and more financial products, be it for payment instruments or financing financial services.

One of the challenges faced by players in the fintech industry today is the level of security of the system built by the organizers. In addition, there is something called know your customer in the implementation of financial services, where the actor or application developer should know who their customer or customer is. It is one of them used to verify the identity of users so that application developers can verify them. Usually, the KYC process is carried out face-to-face in conventional financial services. On technology-based fintech platforms, this KYC process needs to be mediated by electronic media, or what is currently called electronic know your customer (e-KYC). The e-KYC process is carried out through the media, not face-to-face. Usually, customers are asked to upload documents such as e-KTP and selfie photos that can be used to validate the user's identity.

According to one informant, the e-KYC process will be faster if it is coordinated with the Dukcapil Office regarding the verification of e-KTP data. The verification and validation process for e-KYC data is still done manually using the human-based method, so there is still the possibility of human error.

Another challenge faced is related to QR code technology. Each fintech application provider or developer has its QR code, then distributed to merchants. It is possible that if one merchant cooperates with more than one fintech so that the QR code that merchants need to display will be many. In this regard, Bank Indonesia will standardize the QR code. So that in the future, only a single QR code is needed for transactions through various fintech platforms.

In addition to providing various payment instruments, there will also be more and more fintech platforms with financing financial services. In 2018 the Ministry of Communication and Information closed 385 illegal fintech platforms, and in 2019 OJK found there were approximately 144 illegal fintech platforms. Many of the emergence of illegal fintech that is not registered with the OJK is due to a large number of foreign fintech and the cheapness of fintech technology sold by China, causing illegal fintech to be scattered everywhere. It shows that the development of the financial sector, especially in financing services, in the digital economy era allows for abuse opportunities that lead to criminal crimes in the digital world.

Moreover, there are several problems with Fintech Funding Operators, such as the lack of data to assess the feasibility of prospective borrowers' feasibility and the lack of public education regarding fintech lending. Where this has led to many complaints of legal problems related to fintech peer-to-peer lending in Indonesia, such as the occurrence of an intimidating and terror-filled billing process, interest schemes that are not calculated, as well as regulations related to fines and provisions (administrative fees) that are not transparent in Indonesia. Whether it happened at fintech registered with OJK or not, to anticipate this, literacy related to financial services in this digital economy era needs to be emphasized and concerned for the community. In addition, many insurers still do not want to cooperate with Fintech Lending due to applying the precautionary principle, which is different from funding made by banks that require insurance for their customers. The advantages and disadvantages of Fin-Tech According to

Table 3. Fin-Tech advantages and disadvantages

Advantages	Disadvantages
They were serving Indonesian people whom the traditional financial industry has not served due to strict banking regulations and the limitations of the traditional banking industry in serving the community in certain areas.	Fintech is a party that does not have a license to transfer funds and is less established in running its business with significant capital when compared to banks.
To become an alternative to funding other than traditional financial industry services where the community needs a more democratic and transparent financing alternative.	Some Fintech companies do not yet have physical offices and lack experience in carrying out security systems and product integrity

the Financial Services Authority (2016), the advantages of Fintech are described in the following table procedures.

Many fintech players or actors in Indonesia are developing various platforms. In general, the fintech industry in Indonesia can be grouped into 3 (three) groups, namely:

1. The payment system is developing as a non-cash payment instrument that can be used for transactions with merchants. Examples: OVO, Go-Pay, Dana, LinkAja. Currently developing technologies for these payment systems are QR Code and NFC.
2. Funding/financing (lending), for fintech players in the lending sector in Indonesia, are grouped into several parts, namely:
 - Peer-to-peer lending is a platform that connects borrowers (debtors) and people who borrow funds (creditors).
 - Balance sheet lending, a platform that provides loans directly from their funds. Example: UangTeman, Julo, Tunai Kita, Doctor Rupiah.
 - An online loan provider (online credit) is a platform that provides credit facilities for transactions made online. Example: Akulaku, Kredivo, Cicil.
 - An online loan provider with a pawn mechanism is a platform that provides loan funds with a pawn mechanism.
3. Other fintech providers of fintech platforms are outside the payment and funding system. In this other fintech group, the fintech organization that can be entirely developed is the fintech provider in crowdfunding for social and digital banking purposes—examples: Kitabisa.com, Jenius by BTPN, Digibank by DBS.

In this other fintech group, some of the players are incumbents who carry out development and innovation, such as banking institutions that have begun to explore digital banking. Meanwhile, regulations on fintech as a payment system follow the regulations issued by the OJK and Bank Indonesia. Bank Indonesia, the regulator that oversees Payment System Financial Technology, regulates balance restrictions concerning electronic money as stated in Bank Indonesia Regulation No. 2/6/PBI/2018. For unregistered e-money, the maximum balance is IDR 2,000,000, and for registered e-money, the maximum balance is IDR 2,000,000. E-money maximum balance is Rp. 10,000,000,-. The scope of the payment system is divided into two, namely closed loop and open loop. Closed loops can only be used for payments within the system of an application. Meanwhile, the open-loop can be used for payments outside the application system.

Strategy and Policy for Financial Technology Development in Indonesia

In mapping the existing fintech platforms in Indonesia, we can see the form of the platform and the types of financial services provided by each provider. It can be estimated that for the next one year, the forms and types of financial services that will develop will more or less conform to the map. Fintech will not only be used for profit-generating purposes but also for non-profits (for funding social activities and social assistance).

With the development of fintech lending in the fintech-market ecosystem in Indonesia, it is also possible for related fintech such as fintech credit scoring, fintech aggregators to develop. Moreover, with the emergence of fintech in the investment sector. It will also develop for commodity investment in the future. However, it still does not rule out the possibility of new changes or innovations in the financial sector.

Several things might also develop, such as integrating the fintech provider platform with other platforms such as the marketplace or e-commerce. This is because fintech provider platforms embedded with other platforms will be more widely used. Overall payment system interconnectivity through national payment gateways and the increasing number of conventional banks turning to digital banking driven by the development of the fintech industry. Although once again, this can become a reality, or there will be other innovations because, after all, future fintech trends cannot be predicted with certainty because fintech developments depend on the technology to be used.

The development of the fintech industry that supports Indonesia's digital economy cannot be done simply by predicting the development trend of the fintech industry. The development of this industry needs to be carried out using the principle of prioritizing economic stability and locality values that exist in Indonesia and continuing to open up technological development innovations that will support the development of the fintech industry and the financial sector in general. In addition to innovating to develop platforms, fintech operators will also pay attention to platform stability. The innovations carried out will focus on the technology used and the business process. So in this process, the involvement and synergy of the younger generation with professional groups is needed to make valuable innovations.

Several criteria can be considered as financial technology, among others, the technology developed is innovative, then the technology can have an impact on existing products, services, technology, and/or financial business models; c. can provide benefits to the community; d. can be used widely, and e. other criteria determined by Bank Indonesia. The development of policies and regulations related to the fintech industry ecosystem can be carried out through several scopes of regulatory policies for the implementation of Financial Technology, which include, among others:

1. Registration;
2. Regulatory Sandbox;
3. Permits and approvals; and
4. Monitoring and supervision.

The Financial Technology business operator must be a business entity. In regulations in Indonesia, Bank Indonesia requires Financial Technology business operators who will or have carried out mandatory activities to register with Bank Indonesia, except for Payment System Service Providers who have obtained permission from Bank Indonesia and Financial Technology Operators under the authority of other authorities. Therefore, a Payment System Service Provider that has obtained a license from Bank Indonesia must still submit information to Bank Indonesia regarding new products, services, technology,

Policies and Innovations of Financial Technology Business Models in the Digital Economy Era

and business models that meet the criteria for Financial Technology. In contrast, Financial Technology Operators under the authority of other institutions operating Financial Technology in the payment system sector must register with Bank Indonesia. (Bank of Indonesia, 2017)

Meanwhile, the registration policy is carried out by submitting a written application accompanied by filling out and sending the registration form online or, if it is not yet available, submitting it by letter to Bank Indonesia by the party authorized to represent the Financial Technology Operator. Furthermore, Financial Technology business operators who have registered with Bank Indonesia are obliged to implement several things as follows:

1. Applying the principle of consumer protection following the products, services, technology, and/or business models being implemented;
2. Maintain the confidentiality of consumer data and/or information, including transaction data and information;
3. Applying the principles of risk management and prudence;
4. Using rupiah in every transaction conducted within the territory of the Unitary State of the Republic of Indonesia under the provisions of the laws and regulations governing currency;
5. Apply the principle of anti-money laundering and prevention of terrorism financing under the provisions of the laws and regulations governing anti-money laundering and prevention of terrorism financing; and
6. Comply with the provisions of other laws and regulations; as well as
7. Carry out payment system activities using virtual

After the financial technology business operator registers, the following policy implemented by Bank Indonesia is to issue a license from Bank Indonesia, which is required for every Financial Technology Operator that is included in the category of Payment System Service Provider. Payment System Service Providers that produce new products, services, technology, and business models, which are:

1. Development of payment system service activities; and
2. Product development and payment system service activities, but do not meet the criteria as Financial Technology

Before continuing to market products and services and use technology and business models, they must first obtain approval from Bank Indonesia. Bank Indonesia approval is also required if a Payment System Service Provider Cooperation is with a registered Financial Technology Operator.[14] The following policy to continue to develop the financial technology sector in Indonesia is to supervise and monitor business actors in the financial technology sector, especially startup players, through the regulatory sandbox by Bank Indonesia or OJK. The purpose of monitoring actors through this regulatory sandbox is to provide protection, both for consumers, potential users, and provide legal certainty for business actors in the financial technology sector that is currently developing (Karo & Luna, 2019).

The Regulatory Sandbox is a secure, limited trial space to test Financial Technology Providers and their products, services, technology, and business models. The registered Bank Indonesia determines the implementation that can be tested in the Regulatory Sandbox. Information and explanations for the determination of the Regulatory Sandbox trial are carried out by presenting to Bank Indonesia at least the business model and risk management and submit complete documents to Bank Indonesia. In the

event that the Financial Technology Operators have made a presentation and the results of the research documents are declared complete, appropriate, and correct, Bank Indonesia shall determine the Financial Technology Operators and their products, services, technology, and business models to be tested in the Regulatory Sandbox. The trial period in the Regulatory Sandbox is set no later than 6 (six) months from the date of Bank Indonesia's determination of the product, service, technology, and business model trial scenario. If necessary, the period can be extended 1 (one) time for 6 (six) months.

After going through the Regulatory Sandbox, Bank Indonesia determines the status of the Financial Technology Operator test results in the form of a. succeed; b. not successful, or c. other status determined by Bank Indonesia. If the trial is declared successful and the product, service, technology, and business model includes Financial Technology in the payment system category, the Financial Technology Operator is prohibited from marketing the product, service, technology, and business model being tested before first applying for a license and approval in accordance with Bank Indonesia regulations governing the implementation of payment transaction processing.

Suppose the trial is declared unsuccessful and the product, service, technology, and business model includes Financial Technology in the payment system category. In that case, the Financial Technology Operator is prohibited from marketing the product and service and using the technology and business model being tested.

If the product, service, technology, and business model includes Financial Technology other than the payment system category, Bank Indonesia may submit the status of the trial results to the competent authority. Bank Indonesia monitors Financial Technology Operators with the obligation to submit data and information requested by Bank Indonesia. Bank Indonesia supervises Financial Technology Operators in the form of Payment System Service Providers that have obtained licenses and approvals from Bank Indonesia.

Nevertheless, on the other hand, fintech also has an impact on other aspects. Fintech Operators must carry out administrative management, from registration to monitoring and supervision. This obligation must be fulfilled so that the fintech owned is not legally challenged until it is sanctioned by the state in business closure or declared as an illegal business. For Fintech users, vigilance is also needed in choosing and using fintech services because as the number of fintech users increases, reports of criminal acts from the fintech also increase.

Problems that fintech users often face problems including high loan interest rates, intimidating billing, the spread of borrowers' data, and fraud. Not only users who get the threat of loss, but it also turns out that fintech organizers are not immune from fraud in this electronic transaction. Fintech organizers also have to bear losses because users use fraudulent methods to gain profits, for example consumers who use fake accounts to get promo vouchers from fintech organizers engaged in the payment system that offers promotions for its customers. Thus, the fintech era requires the role of advocates for both organizers and fintech users. For fintech operators, advocates can ensure required legal compliance and minimize the potential risk of harmful transactions through legal documents' legal review function that binds the parties to the litigation function if a criminal act occurs. For fintech users, advocates have a strategic role in fighting for rights and justice if they become victims of illegal fintech and harm the legal interests of users.

The Existence of Financial Technology in the e-Business Ecosystem in Indonesia

The existence of fintech in the current technological era continues to increase along with more and more innovative ideas to create new products through technology. The public also now has a great interest in the conveniences offered by fintech because activities are becoming more efficient with the services provided by fintech.

In Indonesia itself, FinTech is present as one of the catalysts in increasing financial inclusion. Indonesia has more than 200 million people spread over a vast archipelago. Such geographical conditions make it a challenge for traditional banking to reach people in the interior of Indonesia.

The FinTech ecosystem in Indonesia consists of several product classifications. Among the various existing applications, including lending services and crowdfunding. Through this application that provides online loan services, people who need funds create an account on the lending and crowdfunding service and upload information regarding the number of funds needed, using the funds, and other relevant information. On the other hand, those who have a surplus of funds only need to look at the “catalog” of the applicant for funds and select one or several debtors. In this mechanism, generally, the unmet funding needs are only short-term funding needs with varying interest rates. Several startup companies that provide this product include Investree, Uang Teman, and Modalku.

Other products that are also widely offered by Fintech startups are payment and remittance services. In general, this business model is based on cashless transactions. This electronic money (e-money) can be stored as data on a card, QR Code, or mobile phone device so that customers can make transactions anytime, anywhere, without the need to carry cash. Several players in payment and remittance services, including Dimo, Kartuku, Dompetku, and Doku, are several startups from Indonesia engaged in this field.

In addition to providing payment services, many financial technology-based startups also provide investment management services. Not only serve the buying and selling activities of investment products, but this startup also provides information related to the capital market and various investment instruments, such as stocks and mutual funds.

Bareksa is two startup companies that provide these services. Furthermore, there are also startup companies that provide educational services and personal financial management. This startup offers various information on financial products ranging from credit, savings, insurance, and investment. Not only that, but some startups also make it easy to do simple financial records. Several startup companies that provide this service include Cekaja.com, Duitpintar, AlatDuit, and Jurnal.

In addition to the various startups above, other startup companies are engaged in more specific financial services—for example, iGrow. Furthermore, TaniHub, a startup engaged in agricultural finance; Iwak is a startup company that provides financing services in the fisheries sector; Jojonomic, which provides reimbursement management services; and Privy ID, which provides digital identity and signature features for various electronic transaction validations.

CONCLUSION

The impact of Financial Technology on the Indonesian economy is very diverse. Business actors are required to follow the development of an increasingly modern era. They are innovating not only in products but also in finance by utilizing technology. With the existence of FinTech, some community

activities can be streamlined, making it very easy. Nevertheless, the benefits come from FinTech itself. There are also some threats that the Government needs to watch out for so that regulations can be made as soon as possible.

Regarding the regulatory process, co-management is the most promising approach to designing and implementing safe, inclusive, and adaptive policies across all four key areas in the rapidly changing digital economy. Suppose Indonesia can successfully improve its regulatory conditions through adequate joint arrangements. In that case, this will create a safe environment for consumers and facilitate the growth of business presence and encourage more business actors, especially micro, small and medium enterprises, to enter the digital economy.

Policy reform in the digital sector is one of the critical elements that can encourage the growth of the telecommunications industry in Indonesia. For example, the distribution of 4G technology outside Java deserves attention. A high-speed connection is an essential requirement in developing the digital economy. The step of expanding investment in the telecommunications sector is a powerful way to answer the complex challenge of equitable distribution of ICT infrastructure in Indonesia.

This business ecosystem requires faster and more accurate decision-making based on artificial intelligence through a simpler model with Blockchain-based transaction speed. Blockchain is a system of recording transactions in multiple databases spread across multiple computers, each containing identical records. This system is also known as a distributed ledger. With this decentralized transaction record, it is almost impossible to hack or modify unilaterally without changing the majority of all the databases.

ACKNOWLEDGMENT

The Centre of Research and Development supported this work on Informatics Application, Information, and Public Communication, Research, and Development Agency in Indonesia's Ministry of Communication and Information Technology. The views expressed in this paper are those of the authors and do not reflect the Government's official position. Any errors remain our responsibility.

REFERENCES

AFTECH. (2020). *Daftar Member Asosiasi Fintech Indonesia*. Retrieved September 4, 2020, from <https://fintech.id/id>

APJII. (2017). *Survei Penetrasi dan Perilaku Pengguna Internet Indonesia tahun 2017*. Asosiasi Penyelenggara Jasa Internet Indonesia.

Arner, D. W., Barberis, J., & Buckley, R. P. (2015). The evolution of Fintech: A new post-crisis paradigm. *Geo. J. Int'l L.*, 47, 1271. doi:10.2139/ssrn.2676553

Bank of Indonesia. (2017). *Bank of Indonesia Regulation Number 19/12/PBI/2017 concerning Implementation of Financial Technology*. Author.

Chrismastianto, I. A. W. (2017). Analisis SWOT implementasi teknologi finansial terhadap kualitas layanan perbankan di Indonesia. *Jurnal Ekonomi Dan Bisnis*, 20(1), 134–136. doi:10.24914/jeb.v20i1.641

Policies and Innovations of Financial Technology Business Models in the Digital Economy Era

Darma, W, & ... (2018). *Inovasi Diskruptif (Disruptive Innovation)*. Dalam Pendidikan.

Government of the Republic of Indonesia (GoI). (2007). Law No. 17 Year 2007 on Long Term National Development Plan Year 2005-2025. Indonesia

Government of the Republic of Indonesia (GoI). (2014). Law No. 3 of 2014 concerning on Industry. Indonesia.

GPFI. (2014). *Financial Inclusion Action Plan*. GPFI.

Harvey, D. (2012). *Rebel Cities: From the Right to the City to the Urban Revolution*. Verso.

Hiyanti, H., Nugroho, L., Sukmadilaga, C., & Fitrijanti, T. (2020). Peluang dan Tantangan Fintech (Financial Technology) Syariah di Indonesia. *Jurnal Ilmiah Ekonomi Islam*, 5(3), 326–333. doi:10.29040/jiei.v5i3.578

Hurun, A. M., & Setiyanto, A. (1999). Peluang dan Kendala Pengembangan Teknologi Madya Bagi Agroindustri. Pusat Penelitian dan Pengembangan Sosial Ekonomi Pertanian.

IMD. (2017). *The 2017 IMD World Digital Competitiveness Ranking - Top performers*. IMD World Competitiveness Center. www.imd.org/wcc

Indonesia.go.id. (2019). *Jasa Peer to Peer Lending Semakin Seksi*. Retrieved June 27, 2019, from <https://www.indonesia.go.id/narasi/indonesia-dalam-angka/ekonomi/jasa-peer-to-peer-lending-semakin-seksi>

Ingale, S. T., Naik, V. G., & Talathi, J. M. (2007). Entrepreneur e-Agribusiness. *Sciences et Techniques (Paris)*, (February).

Kaplan, S., & Sawhney, M. (2000). E-Hubs: New B2B market. *Harvard Business Review*, 78(3), 102–103.

Karo, R. K., & Luna, L. (2019). Pengawasan Teknologi Finansial Melalui Regulatory Sandbox Oleh Bank Indonesia Atau Otoritas Jasa Keuangan Berdasarkan Perspektif Keadilan Bermartabat. Transparansi. *Jurnal Ilmiah Ilmu Administrasi*, 2(2), 116–125. doi:10.31334/transparansi.v2i2.547

Lampropoulos, G., Siakas, K., & Anastasiadis, T. (2019). Internet of Things in the Context of Industry 4.0: An Overview. *International Journal of Entrepreneurial Knowledge*, 7(1). DOI: doi:10.2478/ijek-2019-0001

Leroux, M., Wortman, M., & Mathias, E. (2001). The dominant factor influencing the development of business-to-business (B2B) e-commerce in agriculture. *The International Food and Agribusiness Management Review*, 4, 206–211.

Milles, M. B., & Huberman, A. M. (2005). *Qualitative data analysis (translation)*. UI Press.

Nurangraeni, I. (2020). Inovasi Financial Technology (Fintech) pada Asuransi Syariah (Studi kasus: PT Duta Danadyakasa Teknologi). *JESI*, 9(2), 94–103. doi:10.21927/jesi.2019.9(2).94-103

Organization for Economic Co-operation and Development. (2007). *Public-Private Dialogue in Developing Countries: Opportunities, Risks, and Pre-Conditions*. <https://www.oecd.org/dev/39517753.pdf>

Organization for Economic Co-operation and Development. (2015). *Addressing the Tax Challenges of the Digital Economy*. OECD/G20 Base Erosion and Profit Shifting Project. <https://www.oecd-library.org/docserver/9789264241046-en.pdf?expires=1594712019&id=id&accname=guest&checksum=6444D20F31B1777C9815383E985F8D82>

Organization for Economic Co-operation and Development. (2019). *Regulatory effectiveness in the era of digitalization*. <https://www.oecd.org/gov/regulatory-policy/Regulatory-effectiveness-in-the-era-of-digitalisation.pdf>

Otoritas Jasa Keuangan. (2020a). *Grup Inovasi Keuangan Digital Otoritas Jasa Keuangan: Daftar Penyelenggara Inovasi Keuangan Digital Per Juni 2020*. <https://www.ojk.go.id/id/berita-dan-kegiatan/publikasi/Pages/-Penyelenggara-IKD-dengan-Status-Tercatat-di-OJK-per-Juni-2020.aspx>

Otoritas Jasa Keuangan. (2020b). *Perkembangan Fintech Lending (Pendanaan Gotong Royong Online)*. <https://www.ojk.go.id/id/kanal/iknb/data-dan-statistik/fintech/default.aspx>

Pikiran-rakyat.com. (2019). *Fintech: Diantara Peluang dan Tantangan*. Retrieved September 4, 2020, from <https://www.pikiran-rakyat.com/ekonomi/pr-01320871/fintech-diantara-peluang-dan-tantangan>

Rahadiyan, I., & Sari, A. R. (2019). Peluang dan tantangan implementasi fintech peer to peer lending sebagai salah satu upaya peningkatan kesejahteraan masyarakat Indonesia. *Defendonesia*, 4(1), 18–28. doi:10.54755/defendonesia.v4i1.79

Riedel, J. (1992). Economic Development in East Asia: Doing What Is Commonly Happening. In H. Hughes (Ed.), *The Success of Industrialization in East Asia*. PT. Gramedia Pustaka Utama.

Rumata, V. M., & Sastrosubroto, A. S. (2020). The Paradox of Indonesian Digital Economy Development. In *E-Business*. IntechOpen.

Saragih, B., & Krisnamurthi, B. (1992). *Agroindustry as a Leading Sector in PJP-II (Agroindustry as a leading sector)*. Supporting paper in a panel discussion on Education and Research Towards Agro-Industry Development in Long-term Development - Phase II. Institut Pertanian Bogor.

Setiawan, A.B. (2018). Business Revolution Based On Platform As a Digital Economic Activator In Indonesia. *Journal of Telematics and Information Society*, 9(1), 61-76.

Simatupang, P., & Purwoto, A. (1990). *Pengembangan Agroindustri Sebagai Penggerak Pembangunan Desa*. Prosiding Agroindustri Faktor Penunjang Pembangunan Pertanian di Indonesia. Pusat Penelitian Sosial Ekonomi Pertanian.

Soekartawi. (2005). *Agro-Industry in the Socio-Economic Perspective*. PT Raja Grafindo Persada.

Soekartawi. (2005a). *Agribisnis: Teori dan Aplikasinya [Agribusiness: Theory and Practice]* (8th ed.). RajaGrafindo Persada.

Soumik, R. (2019). *Fintech companies prove Gates' point: Banking is necessary, banks are not*. Retrieved September 4, 2020, from <https://techwireasia.com/2019/11/fintech-companies-prove-gates-point-banking-is-necessary-banks-are-not/>

Policies and Innovations of Financial Technology Business Models in the Digital Economy Era

Supriyati, A. S., Suryani, E., & Tarigan, H. (2006). Analisis Peningkatan Nilai Tambah melalui Pengembangan Agroindustri di Pedesaan. Laporan Penelitian. Pusat Analisis Sosial Ekonomi dan Kebijakan Pertanian.

Supriyati, A., & Suryani, E. (2006). Peranan, peluang dan kendala pengembangan agroindustri di Indonesia. *Forum Penelitian Agro Ekonomi*, 24(2), 92 – 106.

Tambunan, M., & Priyanto, S. H. (2005). Changes in Economic Structure and the Role of Agro-Industry in the Process of Agricultural Industrialization in Indonesia. In *Economic Thoughts and Problems in Indonesia in the Last Half Century*. Canisius Collaboration and Indonesian Economic Bachelor Association.

Tapscott, D. (1997). *The digital economy: Promise and peril in the age of networked intelligence*. New York: McGraw-Hill.

The Agency of and Human Resources Research and Development. (2019). *Development and Strategy of Digital Economy Development Direction*. Joint research between the Center of Research and Development on Informatics Application, Information and Public Communication, Research and Development Agency in the Ministry of Communication and Information Technology of the Republic of Indonesia and Bogor Institute of Agricultural.

Todaro, M. P., & Smith, S. C. (2006). *Economic Development*. Erlangga.

United Nation Conference on Trade and Development. (2019). *Digital Economy Report 2019-Value Creation and Capture: Implication For Developing Countries*. United Nations.

Van Ark, B., Erumban, A., Corrado, C., & Levanon, G. (2016). *Navigating the new digital economy: driving digital growth and productivity from installation to deployment*. Academic Press.

World Economic Forum. (2018). *Future of Jobs Survey 2018*. <http://reports.weforum.org/future-of-jobs-2018/strategic-drivers-of-new-business-models/>

Wulandari, P. A. (2017). Analisis SWOT Perkembangan Finansial Teknologi Di Indonesia. *Proceeding of National Conference on Asbis*, 2(1), 376–383.

Yarli, D. (2018). Analisis Akad Tijarah pada Transaksi Fintech Syariah dengan Pendekatan Maqhasid. *YUDISIA: Jurnal Pemikiran Hukum Dan Hukum Islam*, 9(2).

Zimmermann, H-D. (2000). Understanding the Digital Economy: Challengers for New Business Models. *AMCIS 2000 Proceedings*, Paper 402.

ADDITIONAL READING

Apo. (2015). Advancing Australia as a Digital Economy. Access from: <https://apo.org.au/files/Resource/Advancing-Australia-as-a-Digital-Economy-BOOKWEB.pdf>

Braun, A.-T. (2018). Colangelo, Eduardo., Steckel, Thilo., (2018), “Farming in The Era of Industrie 4.0”, 51st CIRP Conference on Manufacturing System, Science Direct [Published by Elsevier BV]. *Procedia CIRP*, 72, 979–984. doi:10.1016/j.procir.2018.03.176

Policies and Innovations of Financial Technology Business Models in the Digital Economy Era

Dalle, J. (2016). Menyoal Ekonomi Digital. online newspaper: Republika.co.id. Access from: <http://www.republika.co.id/berita/koran/opinikoran/16/03/24/o4jd0n10-menyoal-ekonomi-digital>

Deloitte Acces Economic. (2015). *UKM Pemicu Kemajuan Indonesia, Istrumen Pertumbuhan Nusantara*. Deloitte Acces Economic.

Hartman, A., & Sifonis, J. (2000). *Net Ready-Strategies for Success in the E-Conomy*. McGraw-Hill.

Kling, R., & Lamb, R. (1999). IT and Organizational Change in Digital Economies: A Socio-Technical Approach. Paper prepared for the conference on Understanding the Digital Economy: Data, Tools and Research. Washington, DC 10.1145/572183.572189

Malecki & Moriset. (2008). *The Digital Economy: Business Organization, Production Processes, and Regional Developments*. Routledge.

Chapter 3

Advanced Technological Factors Affecting Digital Banking Usage Intention

Chua (Jane) Soh Chen

Anglia Ruskin University, UK

Omkar Dastane

 <https://orcid.org/0000-0002-9921-859X>

FTMS Global, Malaysia

ABSTRACT

This research-based chapter investigates impact of various innovation technology factors on digital banking customers' usage intention. The selected factors are online banking, mobile payment, artificial intelligence-based robot advisors, and cloud-based services. The study develops conceptual model against theoretical background of the innovation diffusion theory, technology acceptance model, and unified theory of acceptance and use of technology. Empirical data was collected through online survey using a self-administered questionnaire. Quantitative research method was employed with a total sample size of 302 respondents using snowball sampling technique. Normality and reliability tests were performed followed by confirmatory factor analysis, validity assessment, and structural equation modelling using AMOS 24. The findings confirm positive significant impact of artificial intelligence-based robot advisor and cloud-based services on usage intention. Theoretical contribution and managerial implications are then discussed along with limitations of the current study and future research avenues.

INTRODUCTION

The rapid evolution of technology has transformed the way people perform banking by first enabling them to execute multiple banking transactions electronically by using a personal computer; and subsequently by enabling the same on a smartphone or a tablet whenever needed. As a result of such evolution, the banking services moved from physical branches to web-based, from the human interaction to the

DOI: 10.4018/978-1-7998-9664-7.ch003

E-customer service activities, chatbots, and virtual assistants using the computerised communication platforms (Bergström, Svenningsson, & Thoresson, 2018; Jünger & Mietzner, 202). Banking industry had to react to several changes including but not limited to customer preferences, increasing competition from non-bank players such as fintech, shifting in social trends, change in the regulation of financial service industry, and technological innovation and advancement (Jünger & Mietzner, 2020). The financial service industry, particularly banking players, has responded to such dynamic market changes by adopting different types of delivery channel strategies. In addition, the growing competition forced banking players to rely heavily and invest a substantial capital on the use of technological innovations to gain the competitive advantage and make their operations more efficient (Ogedengbe & Abdul-Talib, 2020).

The adoption of innovation and technology in Malaysian banking sector started in the 1980s, with the introduction of credit cards, automated teller machine (ATM) networks, followed by electronic banking using phone and internet in the late 1990s. Over the past 10 years, banking sector in Malaysia has progressed rapidly to the digital world due to the unprecedented proliferation of wide range of smart devices (BNM, 2018). This success is also attributed to high internet penetration rates in the country. The volume of internet banking transactions by individuals in Malaysia increased during over the time, from 449 million transactions in 2016, to 1.16 billion transactions in 2020. In other words, digital consumers represent a large population of the entire Malaysian banking ecosystem, with indications that population of using digital channels will continue to rise. This belief or expectation is further supported with only a minor segment of banking customers have yet to try OB (11%) and mobile banking (14%), as reported by AIF (2016). Over one-third of all banking customers are regularly using online and mobile banking on a monthly basis. Presently, the Malaysian banking sector rely heavily on the use of technology to create a nimble environment that is responsive to the new business requirement and arrive at the virtual banking using the digital and artificial intelligence (Belanche et al., 2019). Some of the major players in the Malaysian banking sector have taken steps to enhance and expand their banking experience through technological innovations.

However, such technological advancement requires significant incremental spending over years. It is estimated that the requirement is around 4.2% of total bank spending annually and mostly driven by new investment spending (Gareth, Stephen, Hua, & Juan., 2018). Similarly, for the players in Asia Pacific, whereby the IT spending is expected to hit US\$25 billion in 2020, have grown by more than 10% from 2016. This includes spending on develop the analytics capabilities, enhance the customer facing platforms and security (Asian Banking & Finance, 2016). Therefore, incorporating technological factors must be based on consumer research. This change in the customer interaction forces banking players to develop an in-depth understanding of digital customer needs, preferences and identify key drivers and constraints, to continue improve the customer-facing interface and experience. A brand-new holistic strategy is required under this changing financial landscape, not only to meet the anytime and anywhere needs, but also to extend to those not currently bank (Jünger & Mietzner, 2020). In the light of such advancement in technological innovations, it will be meaningful for researchers and banks' management to understand customers' usage intention (UI) and what advanced technological factors affect the same in the context of digital banking services. Identifying impact of such variables will improve the likelihood of increasing the UI rate of these services, by deepening the knowledge about the variables which facilitate or hinder the UI process. Extant literature possess definite research gap in this regard which ensures novelty of current study. Therefore, the aim of the study is to examine the various innovation and technology dimensions and their impact on customers' UI in Malaysian banking sector. These innovation and technology dimensions are OB, mobile payment (MP), AI robo-advisor (RA) and

cloud-based services (CB). Objectives of this study are as follows: To examine the impact of selected innovation and technology dimensions on customers' UI. Corresponding research questions are what is the impact of selected innovation and technology dimensions on customers' UI?

LITERATURE REVIEW

Critical Review of Key Theories

The Innovation Diffusion Theory (IDT)

IDT, one of the oldest social science theories, developed by Rogers (1955; 2003), suggests that adoption of a new idea, behaviour, innovation does not happen simultaneously in a social system; rather a process whereby some people are more likely to adopt the innovation than others, due to the different characteristics or beliefs. Rogers (2003) pointed out the five key beliefs that influence individuals to accept an innovation, namely relative advantage, compatibility, complexity, trialability, and observability. Relative advantage measures the degree to which an innovation is considered as more superior as compared to the existing one. Relative advantage results in economic profitability, lower costs, reduction in discomfort, time saving and advances in social status (Aizstrauta, Ginters, & Eroles et al., 2015). Compatibility is the level of affinity of the innovation with the users' existing values, past experiences, skills and habits. An individual may perceive the new solution to be compatible if it has a greater fit to the present experience and lead to the higher propensity for adoption (Aizstrauta et al., 2015). Complexity is the degree to which an innovation is perceived as difficult to understand and use, similar to the perceived ease of use construct in TAM. Trialability describes how easy an innovation may be experimented with before adoption. The prior experiment allows the potential adopters to minimise the uncertainty and hence are more likely to adopt it (Rogers, 2003). Finally, observability is the extent to which the innovation provides tangible results and is easily visible to others.

Technology Acceptance Model (TAM)

TAM is developed from Ajzen (1991) Theory of Reasoned Action (TRA) model and commonly adopted in examining the user's acceptance of technologies such as internet banking (Alwan & Al-Zubi, 2016; Nasri & Charfeddine, 2012), mobile banking (Lule, Omwansa, & Waema, 2012; Payne, Peltier, & Barger, 2018), MP (Upadhyay & Jahanyan, 2016) and business intelligence (Bach, Čeljo, & Zoroja, 2016). TAM suggested the two key determinants in the adoption of new technologies, namely perceived usefulness and perceived ease of use. Perceived usefulness ascertains the extent of one believes that the use of the system will improve the performance and perceived ease of use measures the extent of the belief that the use of system is effortless (Davis, 1989). Studies found that TAM is not sufficiently explains the characteristic affecting the user acceptance (Agag & El-Masry, 2017; Al-Sharafi, Arshah, Herzallah, & Abu-Shanab, 2018) and it underwent several enhancements, notably TAM2 and TAM3. In TAM2, social influence processes include subjective norm, voluntariness, and image as the causal antecedents explains the impacts of intention and willingness in accepting new technologies were added into the model. In addition, TAM2 also proposes four cognitive instrumental processes, namely job relevance, output quality, result demonstrability, and perceived ease of use (Venkatesh & Davis, 2000).

Venkatesh & Bala (2008) has further combined TAM2 and the model of the determinants of perceived ease of use to develop an integrated model of technology acceptance known as TAM3. TAM3 has incorporated individual differences (computer self-efficacy, computer anxiety and computer playfulness), system characteristics (perceived enjoyment and objective usability), social influence and facilitating conditions (perceptions of external control) which are determinants of perceived usefulness and perceived ease of use. In this model, the relationship between perceived ease of use to perceived usefulness, computer anxiety to perceived ease of use and perceived ease of use to behavioural intention were moderated by experiences. Some researchers have extended the original TAM to include the perceived credibility, perceived self-efficacy and perceived financial cost (Ariff et al., 2012; Tung, Yu, & Yu, 2014) and social influences (Cheng, 2019) whereby these have been addressed by the enhancements in TAM2 and TAM3.

Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al. (2003) developed the UTAUT model to explain the intentions towards the use of the new technologies and its subsequent usage behaviour. The model was integrated from elements of eight prominent models, namely Theory of Reasoned Behaviour (TRA), TAM, TPB, the Motivational Model (MM), combined TAM and TPB model (C-TAM-TPB), the model of PC Utilisation (MPCU), the Innovation Diffusion Theory (IDT) and the Social Cognitive Theory (SCT). According to UTAUT model, the intended adoption of technology is governed through three predictors including performance expectancy, effort expectancy and social influence while facilitating condition affects the actual usage behaviour. Additionally, the moderating factors such as gender, age, experience, and voluntariness of use have incorporated into the model. Performance expectancy refers to the extent to which an individual perceives that using a system will benefit in job performance. Perceived usefulness in TAM, extrinsic motivation in MM, job-fit in MPCU, relative advantage in IDT and outcome expectation in SCT are similar variables to performance expectancy. Effort expectancy is the second construct in the UTAUT model that measures the level of ease of use associated with the use of a technology. Perceived ease of use in TAM, complexity in MPCU and ease of use in IDT are the corresponding predictors. Social influence ascertains the degree to which others believe he or she will affect someone to use the new technology. Many researchers have considered this driver in their studies such as subjective norm in TRA, social factor in MPCU and image in IDT (Bongju, 2019). Generally, UTAUT model was able to explain 70% of the variance in behavioural intention to use a technology. The model is adopted in various studies relating to technology such as MP (de Sena Abrahão et al., 2016), mobile learning (Onaolapo & Oyewole, 2018), RA (Bongju, 2019) and m-commerce (Chong, 2013).

Latest Empirical Studies

Fathima & Muthumani (2015) using a model that combined the factors based on previous studies examined user's acceptance of internet banking technology and its predictive components. The results revealed that perceived usefulness, trust, perceived credibility and perceived ease of use are the most influential factors explaining the adoption of internet banking. Susanto et al. (2016) has developed an extended framework based on the expectation-confirmation model (ECM) by integrating factors that are important to smartphone banking services, namely trust, perceived security and privacy (as extrinsic motivation) and self-efficacy. The framework investigated the determinants of continuance intention to use smartphone banking services among smartphone users who also subscribed to OB services. The

finding provided evidence that perceived usefulness, self-efficacy, and user satisfaction play critical roles in influencing continuance use intention. Empirical research conducted by Alwan & Al-Zubi (2016) examined the relationship perceived privacy and security, perceived ease of use, web service quality, customer trust, customer feedback and internet banking usage intention. The study found that all corresponding independent variables have significantly impacted the internet banking adoption and usage intention with website quality being the best predictor followed by customer trust. Oliveira, Thomas, Baptista & Campos (2016) advanced their study on MP adoption by combining both well-known theories, UTAUT and IDT. The extended model was tested and found that compatibility with lifestyle, perceived security, performance expectations, innovativeness and social influence significantly affected UI. Mei & Aun (2019) examined the influence of convenience, confidentiality and social influence on consumers' perceived usefulness of m-wallet. It was concluded that convenience posed the highest positive influence on consumer's perceived usefulness of m-wallet, followed by social influence factor.

Research Gap

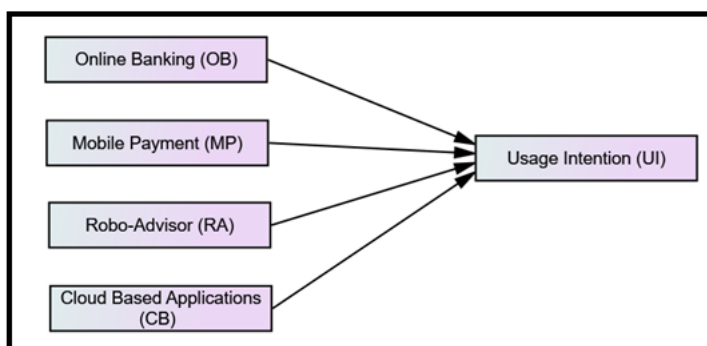
Numerous studies examined customer acceptance towards banking information system globally (Suh and Han, 2002; Yousafzai et al., 2010) and locally (Sohail and Shanmugham, 2003; Amin et al., 2008) in the past decade. Other studies focussed on the customer privacy in the use of internet or adoption of technology such as big data (Bertino, 2015; Hui Dastane, Johari, & Roslee, 2021), online privacy (Doig, 2016) and internet of things (Caron et al., 2016), digital retailing (Donni, Dastane, Haba & Selvaraj, 2018; Pei & Dastane, 2021).

A review of electronic banking adoption studies shows that a large portion of the published research was conducted in developed and industrialized countries (Jayawardhena and Foley, 2000; Kolodinsky, Hogarth, and Hilgert, 2004; Yiu, Grant, and Edgar, 2007). In contrast, little is written in developing countries (Al-Somali, Gholami, and Clegg, 2009; Jabnoun and Al-Tamimi, 2003). Furthermore, most of the research available in the banking context deals with internet banking only (Jagannathan et al., 2010; Raviadarani, Dastane, Ma'arif, & Mohd Satar, 2019). However, when a customer is confronted with more services delivery channels, choosing among the alternative delivery channel were studied between personal and technology enabled services.

As in most IT UI studies, it is often difficult to predict the UI behaviours of e-commerce consumers due to the complexity and uncertainty involved in the decision-making process (Chong, 2013). Several prior studies have proposed a variety of models to explain the factors affecting consumers' adoption as well as UI of digital banking. A recent descriptive literature review shows that interest in the topic of internet banking adoption grew significantly between 1999 and 2012, and it remains a popular topic of research (Raviadarani *et al.*, 2019). However, despite more than a decade of research, the extant digital banking UI literature remains somewhat fragmented (Onaolapo & Oyewole, 2018). The emphasis was more on various adoption factors such as ease of use, performance expectancy, perceived usefulness etc. but the technological innovations have evolved over the period of time.

Recently, the development of such innovations has resulted in many factors such as MP, artificial intelligent based RA as well as cloud-based services. This warrant needs to investigate further on such factors impact on UI of banking consumers.

Figure 1. Proposed conceptual framework



Conceptual Framework

Against aforementioned theoretical background and stated research gap, following conceptual framework is thus proposed as displayed in figure 1:

Hypothesis Development

Past research found that relative advantage of an innovation has a positive effect on UI (Johnson et al., 2018). Such factors have been found to be a significant predictor of technology in various studies such as adoption of mobile banking (Al-Jabri & Sohail, 2012), MP (Johnson, Kiser, Washington, & Torres 2018) and cloud computing (Shiau & Chau, 2016).

Online banking has been adopted successfully by several countries and researchers have identified aspects of online banking which are important to boost UI. Yuan, Lai & Chu (2019) confirmed aspects related to commitment and trust as important OB aspects influencing UI. Several studies based on well-established models such as IDT, TAM and UTAUT confirm positive impact of perceived used of use and perceived usefulness as factors of OB impacting UI (Ogedengbe, & Abdul-Talib, 2020; Singh, & Srivastava, 2020). According to Shankar and Rishi (2020), OB aspects like convenience and comfort has positive significant impact on UI. This has to be also tested in current context of digital banking. The construct of OB in this study encompasses such aspects impacting UI and so in the context of digital banking, following hypothesis is developed.

H1: OB has significant positive effects on the UI

Mobile apps offer additional value elements than desktop-based e-commerce (Dastane, Goi, & Rab-banee, 2020) and these aspects may influence usage intention. Mobile payment impacts usage intention in the context banking (Lwoga & Lwoga, 2017), e-commerce (Putritama, 2019), m-commerce (Yeh, 2020). Upadhyay & Jahanyan (2016) investigated that perception on system quality, usefulness and user-friendliness, task-fit, connectivity, discomfort and structural assurance to encourage the UI of MP services are prominent. On the other hand, perception regarding monetary value or costs was tested to be insignificant. Same observation was found in the study undertaken by de Abrahão et al. (2016) which posited that relationship between perceived cost and UI on MP was insignificant. Determinants of mobile

Advanced Technological Factors Affecting Digital Banking Usage Intention

banking continuance were studied by several researchers and MP is identified as key aspect influencing UI (Albashrawi & Yu, 2020; Foroughi, Iranmanesh, & Hyun, 2019). Therefore, in the context of digital banking, following hypothesis is formulated.

H2: MP has significant positive effects on the UI

A study by Belanche, Casaló & Flavián (2019) indicated that customers' attitudes and interpersonal subjective norms were found to be key determinants of the adoption of RA and this further improved RI. It has been argued that the perception of usefulness was relatively higher for users with previous knowledge on robotics and AI system as opposed to users with lower familiarity however, RA has improved UI (Jünger & Mietzner, 2020). Bongju (2019) have adopted UTAUT model to investigate the factors affecting acceptance intention to RA and its impact on UI. Effort expectancy, social influence, and trust were found to have significant direct effect on the acceptance intention to RA services and results in UI. Several researchers enhanced TAM and included aspects related to RA and AI and concluded that various AI aspects impacts UI for banking services (Riza & Hafizi, 2020; Wu & Gao, 2021). On contrary, mixed views are expressed on the influence of AI and RA on UI (Cocca, 2016, Jung, Glaser, & Köpplin, 2019; Leong & Sung, 2018). Following hypothesis is thus developed in the context of digital banking.

H3: RA has a significant positive effect on the UI

According to Asadi et al. (2017) perceived usefulness, perceived ease of use, cost, attitudes toward cloud-based services and trust have significant effects on users' intention to adopt CB services. Arpaci (2016) built a research framework based on TAM in order to identify factors that affect the intentions in using mobile cloud storage services resulting in better UI. Results indicated that perceived usefulness, subjective norm, and trust have posited significant positive effect on behavioural intentions. CB applications impact on UI in the context of e-commerce and m-commerce has been tested recently (Khidzir, Ghani, & Guan, 2017; Khatun, Palas, & Ray, 2017). Thus, following hypothesis is developed in the context of digital banking:

H4: CB have a significant positive effect on UI

RESEARCH METHODOLOGY

The causal research is adopted in this research project as recommended by Saunders et al. (2015). In this research, the primary data is collected through structured survey questionnaire in order to collect information on the users' perception towards innovation and technology applications in Malaysian banking. Thus, the survey questionnaires that constructed in "google form" format are electronically distributed to participants through online portal such as linked-in, Facebook and google, in view of its negligible cost in data collection. The data is collected from a convenience sample of individuals, irrespective of their banking purpose, banking service provider, gender, occupation, or income.

In this study, the self-administered research instrument is adopted according to the variables used and do not require interviewer in presence to facilitate the survey. The survey questions are developed based on the past research which has been undertaken by other researchers, thus it improves the reliability of

the research questions. The disadvantages of survey instrument such as low response rate and difficulty in understanding questionnaire was also considered. For the survey instrument, 42 statements that represented the all variables and 7 statements about the demographic information of the respondents. The researcher divided the questionnaire into three sections. First section related with prior banking experience. Second section related with feedback about banking systems. Finally, third section is consisted on the demographic information. The demographic section included gender, age group, education level, monthly income, employment status, investment experience and years of investment experience. The questionnaire constructed based on a 7-point Likert scale ranging from strongly disagree to strongly agree.

The target population in this study is bankable population in Malaysia. While it is not possible to study the entire bankable population of 24 million in Malaysia (BNM, 2018), thus this research will be targeting 250 respondents as a sample size based on the rule-of-five technique for sample selection (42 items multiply with 5). The past researches were using sample size in between 162 to 400 respondents (Asadi et al., 2017; Dastane, 2020; Dastane & Fazlin, 2017; Mei & Aun, 2019). Since the structural equation modelling recommends sampling of 200 as fair and 300 as good, the targeted sample size for this study is deemed justifiable (Yildirim & Coreia, 2015). Finally, a total of 302 questionnaires were received and were fit to be used as sampling population in this research. This research adopts snowball sampling approach and targeting among the Malaysian banking customers, in line with the research objective to understand the UI concern among the banking customers. To ensue potential participants are fully aware about this research, a consent statement will be incorporated as the first page of the questionnaire (Mahon, 2013). After completion of data collection, various statistical data analysis methods will be performed to determine the relationship between variables via IBM Statistical Package for Social Science (SPSS). The data analysis plan in this research covers descriptive analysis, normality analysis, reliability test utilising SPSS 26. Confirmatory Factory Analysis (CFA) and variance analysis were obtained in the subsequent stage. In order to determine the overall fit of the measurement model, Structural Equation Model (SEM) was developed using AMOS 24. CB-SEM is used mostly when researchers have an existing theory to test, whereas PLS-SEM is appropriate in the exploratory stage for theory building and prediction. If the goal of one's research is model fit, then one can go for CB-SEM but if researcher want to maximize the R square opt for PLS-SEM. Also, PLS-SEM is preferable when you have higher order models and formative measure constructs (Hair et al., 2010). Considering these recommendations, CB-SEM is used instead of SMART PLS.

ANALYSIS AND RESULTS

Demographic Analysis

The data consists of a total of 302 responses received, of which 163 are from female respondents (54.0%) and remaining 139 are male (46.0%). The participants are primarily the digital natives with aged from 31 to 40 with 128 responses (42.4%), followed by 84 respondents (27.8%) are between age of 41 to 50 and 71 respondents (23.5%) are between 21 to 30 years old. Only 3 and 16 respondents with age 20 and below and aged above 50 respectively. In terms of educational level, the result indicated that most of the respondents possess high level of educational level as 228 out of 302 respondents (75.5%) are diploma or degree holder and 53 people are having postgraduate background. There are 15 respondents recorded as high school level and only 6 are under high school education. According to the findings, nearly 70% of

Advanced Technological Factors Affecting Digital Banking Usage Intention

the respondents' monthly income are higher than the median monthly household income of MYR5,228 (DOSM, 2017) with 47 people (15.6%) earned from MYR5K to MYR7K, 60 people (19.9%) earned from MYR7K to MYR10K and 105 people (34.8%) earned over MYR10K. There are 90 responses are below the median monthly household income, of which 47 (15.6%) and 43 people (14.2%) earning MYR3K and less and MYR3K to MYR5K respectively. The educational and income level determines the literacy level as well as an indication of the middle class in the country, which will lead to the differences in type and expectation of services or products. There are five employment categories in the data collection. 241 respondents (79.8%) are employed and the remaining encompassing 29 self-employed respondents (9.6%), followed by 23 (7.6%) respondents are student or unemployed, 7 (2.3%) housewife or retiree and 2 (0.7%) are government servant.

The other part of survey is aiming to examine respondents' investment experience as well as their experience in using each innovation and technology to meet its financial needs. 218 respondents (72.2%) are the experienced investor in either share market, unit trust, crypto-currency or forex, of which 16.6% with less than 2 years of investment experience, 13.6% of respondents with investment experience of 2 to 4 years, 9.3% with 4 to 6 years of investment experience and 32.8% with more than 6 years of investment experience. Most respondents have experienced in OB (98.3%) and MP (84.8%). Only 83 respondents (27.5%) are RA users and 27 of them have experienced the RA for financial planning purpose. As pointed out by Susanto et al. (2016), prior use strongly affected perceived privacy that eventually affected trust; while trust exerted significant impact on user satisfaction of which the satisfaction contributed to use intention.

Normality Assessment

Table 1 below displays the univariate descriptive statistics, skewness and kurtosis values for all items. Descriptive statistics summarise the data into the few key values (mean, mode, median, standard deviation and variance). Skewness and kurtosis are used to define the shape of the distributions. As shown in the table 1, all constructs are within 2 standard deviations, indicating the sample distribution is relatively normal. As a rule of thumb, the acceptable range for skewness and kurtosis values should be within +/- 1.0 and +/- 2.0 respectively (Garson, 2012). Skewness values for most constructs are within +/- 1.0 indicated the distribution is approximately symmetric. The negative skewness values for almost all constructs re-affirmed the sample distribution is skewed to the left. Similar conclusion based on kurtosis values suggested the normal distribution, where the values for most constructs are within +/- 2.0.

Reliability Assessment

Cronbach's Alpha results are shown in table 2 below with the value ranges from 0.795 to 0.918. The findings concluded that the items of model are acceptable with value greater than benchmark of 0.7. The overall Cronbach's alpha scoring of 0.958 from the 37 items also indicated a high reliability and consistency in reflecting the scale. In view of the reliable result, no significant changes were made to the research instrument.

Advanced Technological Factors Affecting Digital Banking Usage Intention

Table 1. Descriptive and normality test (SPSS 26.0)

	Mean	Median	Mode	Std. Deviation	Variance	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
OB1	6.421	7	7	0.9977	0.995	-2.74	0.14	9.621	0.28
OB2	6.281	7	7	1.0392	1.08	-2.158	0.14	6.175	0.28
OB3	6.242	7	7	1.0268	1.054	-1.926	0.14	4.792	0.28
OB4	5.04	5	6	1.6661	2.776	-0.805	0.14	-0.081	0.28
OB5	5.07	5	5	1.4393	2.072	-0.849	0.14	0.534	0.28
MP1	5.738	6	7	1.3398	1.795	-1.365	0.14	1.975	0.28
MP2	5.844	6	7	1.2703	1.614	-1.467	0.14	2.758	0.28
MP3	5.904	6	7	1.2257	1.502	-1.614	0.14	3.427	0.28
MP4	5.629	6	7	1.4124	1.995	-1.259	0.14	1.657	0.28
MP5	4.424	5	4	1.6361	2.677	-0.4	0.14	-0.394	0.28
MP6	4.807	5	5	1.5131	2.289	-0.64	0.14	0.13	0.28
RA1	3.772	4	4	1.5044	2.263	-0.189	0.14	-0.31	0.28
RA2	3.679	4	4	1.494	2.232	-0.148	0.14	-0.337	0.28
RA3	3.705	4	4	1.6229	2.634	-0.121	0.14	-0.758	0.28
RA4	3.142	3	1	1.7453	3.046	0.207	0.14	-1.15	0.28
RA5	3.46	4	4	1.7924	3.213	0.016	0.14	-1.182	0.28
RA6	3.493	4	4	1.5047	2.264	0.063	0.14	-0.492	0.28
RA7	3.51	4	4	1.4667	2.151	-0.109	0.14	-0.595	0.28
CB1	4.636	5	4	1.4985	2.246	-0.518	0.14	-0.166	0.28
CB2	5.113	5	5	1.4377	2.067	-0.759	0.14	0.497	0.28
CB3	5.096	5	6	1.4944	2.233	-0.857	0.14	0.456	0.28
CB4	4.593	5	4	1.621	2.628	-0.467	0.14	-0.402	0.28
CB5	4.689	5	5	1.5981	2.554	-0.666	0.14	-0.052	0.28
CB6	4.166	4	4	1.5159	2.298	-0.375	0.14	-0.224	0.28
CB7	4.225	4	4	1.5148	2.295	-0.375	0.14	-0.276	0.28
PV1	4.897	5	6	1.54	2.371	-0.7	0.14	0.027	0.28
PV2	4.861	5	5	1.536	2.359	-0.723	0.14	0.342	0.28
PV3	3.699	4	4	1.4254	2.032	-0.032	0.14	-0.395	0.28
PV4	4.053	4	4	1.5521	2.409	-0.282	0.14	-0.5	0.28
UI1	5.987	6	6.0 ^a	1.1727	1.375	-1.841	0.14	4.637	0.28
UI2	5.93	6	6	1.0621	1.128	-1.736	0.14	4.998	0.28
UI3	5.142	5	6	1.623	2.634	-0.866	0.14	0.217	0.28
UI4	5.328	6	6	1.3401	1.796	-1	0.14	1.346	0.28
UI5	3.54	4	4	1.6108	2.595	0.113	0.14	-0.673	0.28
UI6	3.99	4	4	1.5541	2.415	-0.272	0.14	-0.523	0.28
UI7	3.381	4	4	1.6274	2.649	0.203	0.14	-0.667	0.28
UI8	4.477	5	4	1.6029	2.569	-0.394	0.14	-0.35	0.28
OB	5.811	6.000	6.600	0.9437	0.891	-1.743	0.14	4.892	0.28
MP	5.392	5.667	5.830	1.1738	1.378	-1.181	0.14	2.067	0.28
RA	3.537	3.714	4.000	1.2076	1.458	-0.028	0.14	-0.424	0.28
CB	4.645	4.857	4.860	1.2510	1.565	-0.67	0.14	0.297	0.28
PV	4.378	4.500	4.0 ^a	1.1910	1.418	-0.601	0.14	0.473	0.28
UI	4.722	4.750	4.500	1.0397	1.081	-0.476	0.14	0.928	0.28

Note: ^a Multiple modes exist. The smallest value is shown.

Table 2. Reliability analysis with Cronbach’s Alpha

Constructs	No. of Items	Cronbach’s Alpha
OB	5	0.802
MP	6	0.913
RA	7	0.876
CB	7	0.918
UI	8	0.859
All Items	37	0.958

Confirmatory Factor Analysis

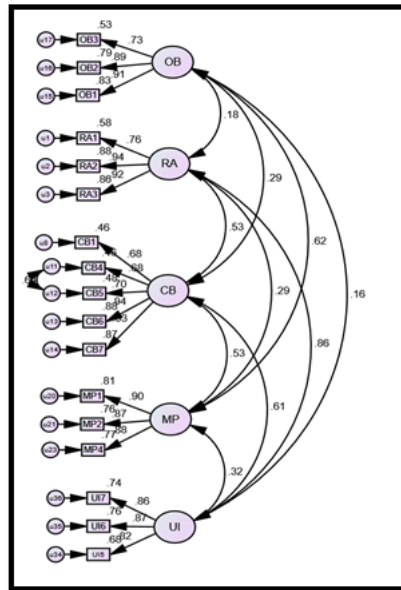
Thereafter, CFA was performed and model fit indices for the initial model were tested. The initial model was not found to be fit and so procedure recommended by Awang (2012) and Hair et al. (2010) and demonstrated by Dastane (2020) were followed. Firstly, items with factor loading less than 0.5 were deleted in iterative process with one deletion and one time followed by re-running of the CFA. Secondly, Modification Indices (MI) were assessed and item pair with MI more than 15 were either removed or connected to eliminate redundancy.

Figure 2 displays modified measurement model. Table 3 shows that all modified model fit statistics were above the acceptable levels, indicating an adequate level fit for the modified model. A scoring of 2.925 for Chi-square value over degree-of-freedom (CMIN/DF), Goodness-of-fit Index (GFI) = 0.905 Tucker-Lewis Index (TLI) = 0.958, Comparative Fit Index (CFI) = 0.966, and Root Mean Square of Error of Estimation (RMSEA) = .066, indicating an adequate level of model fit. All factor loadings or path estimates ranging from 0.607 to 0.944, were greater than 0.50, indicating a reasonably good measurement and providing evidence of convergent validity.

Table 3. Fit measures – modified CFA model

Fit Indices	Estimates	Acceptable Level	Decision
Chi-square (χ^2)	397.432		
Degree of Freedom (df)	136		
Normed Chi-square (CMIN/DF)	2.295	< 3.0	Acceptable
Goodness-of-fit Index (GFI)	0.905	> 0.9	Acceptable
Tucker-Lewis Index (TLI)	0.958	> 0.9	Acceptable
Comparative Fit Index (CFI)	0.966	> 0.9	Acceptable
Root Mean Square of Error of Estimation (RMSEA)	0.066	< 0.08	Acceptable

Figure 2. Modified model – CFA model fit



Validity Assessment

Table 4 below summarised the Composite Reliability (CR), Average Variance Extracted (AVE) and Correlations generated from the modified model. This will be used to evaluate the convergent validity and discriminant validity test. All results of CR values range from 0.882 to 0.914 and AVE values from 0.631 to 0.780, meet the recommended threshold of 0.7 and 0.5 respectively (Awang, 2012). The bolded number in the diagonal of Table 4 reports the square root of the AVE. It is generally greater than the correlation values. This suggests the acceptable discriminant validity in the measurement model.

Table 4. Validity assessment of measurement model

	CR	AVE	MSV	MaxR(H)	RA	CB	MP	OB	UI
RA	0.909	0.771	0.739	0.936	0.878				
CB	0.893	0.631	0.376	0.945	0.535***	0.795			
MP	0.914	0.780	0.382	0.915	0.287***	0.526***	0.883		
OB	0.882	0.715	0.382	0.905	0.176**	0.295***	0.618***	0.845	
UI	0.888	0.725	0.739	0.890	0.859***	0.613***	0.325***	0.159*	0.852

Structural Equation Modelling

The development of the measurement model from the preceding section has reduced data and obtained a manageable number of valid and reliable items, which can be used in the final step for evaluating

Advanced Technological Factors Affecting Digital Banking Usage Intention

structural models and hypotheses testing. The objective is to examine the causal relationship between various innovation and technology with the UI as depicted in Figure 3.

Figure3: Model structure path diagram

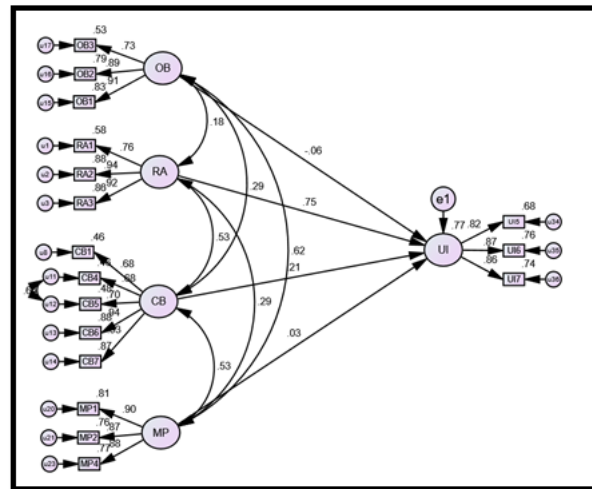


Table 4 shows that all modified model fit statistics were above the acceptable levels, indicating an adequate level fit for the modified model. A scoring of 2.925 for Chi-square value over degree-of-freedom (CMIN/DF), Goodness-of-fit Index (GFI) = 0.905, Tucker-Lewis Index (TLI) = 0.958, Comparative Fit Index (CFI) = 0.966, and Root Mean Square of Error of Estimation (RMSEA) = .066, indicating an adequate level of model fit.

Table 5. Model fit measures

Fit Indices	Estimates	Acceptable Level	Decision
Chi-square (χ^2)	247.895		
Degree of Freedom (df)	108		
Normed Chi-square (CMIN/DF)	2.295	< 3.0	Acceptable
Goodness-of-fit Index (GFI)	0.905	> 0.9	Acceptable
Tucker-Lewis Index (TLI)	0.958	> 0.9	Acceptable
Comparative Fit Index (CFI)	0.966	> 0.9	Acceptable
Root Mean Square of Error of Estimation (RMSEA)	0.066	< 0.08	Acceptable

Hypotheses Testing and Discussion

The results of hypotheses testing with structural paths and its regression estimates, standard errors, covariances and P-values is summarised in Table 6. Based on the findings, the effect between OB and UI

was found insignificant. The p-value of 0.277 (>0.05) indicated the direct effect between OB and UI was not supported. Similar observation between MP and UI. On the other shore, RA and CB have significant effect on UI, of which the RA had the highest dominance on UI as compared to CB (CR = 11.586). In other words, intention to use RA could be one of the important aspects to examine in future research.

Table 6. Hypotheses testing results

Dependent Variables		Independent Variables	S.E.	P-value	Hypothesis Decision
UI	↯	OB	-.064	.277	Reject
UI	↯	MP	.036	.572	Reject
UI	↯	RA	.750	***	Accept
UI	↯	CB	.210	***	Accept

Note: * p<.05, **p<.01, ***p<.001

The findings shows that significant positive relationship exists among relationships between advanced technology factors of RA and CB with UI. On the other hand, insignificant relationship was observed between OB and Ui as well as MP and UI. Therefore, Hypotheses H1 and H2 are rejected while H3 and H4 are accepted.

Referring to literature review section, several influencing factors were incorporated to examine the UI across various technologies such as perceived usefulness, attitude and self-efficacy. Studies related to the effects of these constructs in the field of technologies adoption produced different findings. Some studies support the significant and positive impact (Fathima & Muthumani, 2015; Susanto et al., 2016; Upadhyay & Jahanyan, 2016), while others concluded with no significant results for this relationship (Belanche et al., 2019). This could be explained through the digital age across the four technology dimensions that we studied. As presented in the descriptive analysis, almost all respondents are the OB and MP users, 98.3% and 84.8% respectively. Over the years, the usage of online banking and MP is no longer a sophisticated trend but has emerged into a norm to conduct the financial transactions in the country. This indicated that the customers' intention to use may differ from one stage to another within the lifecycle of technology usage (Leong et al., 2013).

The findings related to impact of RA on UI is in agreement with several researchers in the context of e-commerce and banking services (Riza & Hafizi, 2020; Wu & Gao, 2021). On the other this particular finding is in contrast with mixed views are expressed on the influence of RA on UI (Cocca, 2016, Jung, Glaser, & Köpplin, 2019; Leong, & Sung, 2018).

CB is statistically significant in explaining the customers' use intention. Although respondents may not fully aware of the scope, usage and performance of CB or applications from an end-user point of view, at the time of this study, the subject of cloud computing applications is novel and at the early adoption stage in Malaysian banking industry and was still a newer technology that had not been massively adopted in the country (Digital News Asia, 2019). Through the assessment of technologies at different level of adoption stage, this study clarifies the variations in customers' adoption behaviour across the technology life cycle.

CONCLUSION

This study develops and examines a theoretical model depicting advanced technological variables affecting the customers' UI of banking services in Malaysia. The contributions of this study are twofold. First, it goes beyond traditional adoption variables tested by several researchers in time to time by considering advanced technological factors which are less investigated by other researchers. Second, it positions itself in the e-banking literature, offering a new combination of variables to include both variables associated with UI and customers. In addition, it investigates the factors influencing internet banking UI in South East Asian regions. Indeed, there is lack of country-level studies investigating the factors that make a difference in the diffusion of internet banking across different countries. To fill this gap in the internet banking literature, this study examines internet banking usage at the country level (Takieddine and Sun, 2015).

Recommendations

Firstly, the results of this study indicated the drivers affecting the customers' intention to use may differ from one stage to another within the lifecycle of technology usage. This can be evidenced by comparing the statistical findings between the more matured banking technology such as OB and MP as opposed to RA, which is still at the novel implementation stage. The results also crucial to provide an indication on the reaction of users with regards to the change or development of a technology. Secondly, the purification process during confirmatory factor analysis have identified some preferable constructs amongst users in explaining the technology adoption behaviour, namely perceived usefulness, attitude and self-efficacy, as previous studies found. These drivers need to be considered by businesses to formulate a better strategy in encouraging the users' intention. In addition, the study has suggested definite managerial implications such as use of factors which positively impacts UI. RA and CB are such factors and banking players are advised to inculcate use of such aspects in their banking websites. RA based loan calculators, repayment plans, comparative analysis would be of greater utility to enhance use of RA which intern can reflect in greater UI. Similarly, inclusion of cloud-based platforms and other cloud computing factor can result in greater CB implying better UI.

Limitations and Future Research Avenues

Firstly, the research is restricted by conducting the investigation with a small user group, hence there must be caution while generalizing the findings. Random sampling is always preferred over non-probability sampling and therefore, future studies can employ more accurate sampling technique. It is suggested to differentiate the data gathering process into foreign owned and local owned financial institution considering significant nature in their businesses. The relevant segmented data can be collected from customer who actively conducting their financial transaction with foreign and local owned institutions. As different banking providers may have the different enforcement levels as well as the different technology life cycles. This may allow for further insights how the level of enforcements could impact the use intention. Lastly, privacy, security and trust are important considerations while analysing advanced technology factors affecting UI. Such parameters can be analysed for their role as mediators or moderators in future studies.

REFERENCES

- Agag, G. M., & El-Masry, A. A. (2017). Why do consumers trust online travel websites? Drivers and outcomes of consumer trust toward online travel websites. *Journal of Travel Research*, 56(3), 347–369. doi:10.1177/0047287516643185
- Aizstrauta, D., Ginters, E., & Eroles, M. A. P. (2015). Applying theory of diffusion of innovations to evaluate technology acceptance and sustainability. *Procedia Computer Science*, 43(1), 69–77. doi:10.1016/j.procs.2014.12.010
- Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. doi:10.1016/0749-5978(91)90020-T
- Al-Jabri, I. M., & Sohail, M. S. (2012). Mobile banking adoption: Application of diffusion of innovation theory. *Journal of Electronic Commerce Research*, 13(4), 379–391.
- Al-Sharafi, A., Arshah, R.A., Herzallah, A.T., & Abu-Shanab, E.A. (2018). *The Impact of Customer Trust and Perception of Security and Privacy on The Acceptance of Online Banking Services: Structural Equation Modelling Approach*. Academic Press.
- Al-Somali, S. A., Gholami, R., & Clegg, B. (2009). An investigation into the acceptance of online banking in Saudi Arabia. *Technovation*, 29(2), 130–141. doi:10.1016/j.technovation.2008.07.004
- Albashrawi, M., & Yu, J. (2020). *Usage Behavior of M-Banking: An Analytical Perspective*. Academic Press.
- Alwan, H. A., & Al-Zubi, A. I. (2016). Determinants of internet banking adoption among customers of commercial banks: An empirical study in the Jordanian banking sector. *International Journal of Business and Management*, 11(3), 95. doi:10.5539/ijbm.v11n3p95
- Amin, H., Hamid, M. R. A., Lada, S., & Anis, Z. (2008). The adoption of mobile banking in Malaysia: The case of Bank Islam Malaysia Berhad (BIMB). *International Journal of Business and Society*, 9(2), 43.
- Ariff, M. S. M., Yeow, S. M., Zakuan, N., Jusoh, A., & Bahari, A. Z. (2012). The effects of computer self-efficacy and technology acceptance model on behavioural intention in internet banking systems. *Procedia: Social and Behavioral Sciences*, 57, 448–452. doi:10.1016/j.sbspro.2012.09.1210
- Arpaci, I. (2016). Understanding and predicting students' intention to use mobile cloud storage services. *Computers in Human Behavior*, 58, 150–157. doi:10.1016/j.chb.2015.12.067
- Asadi, S., Nilashi, M., Husin, A. R. C., & Yadegaridehkordi, E. (2017). Customers perspectives on adoption of cloud computing in banking sector. *Information Technology Management*, 18(4), 305–330. doi:10.1007/10799-016-0270-8
- Asian Banking & Finance. (2016). *APAC banks' IT spending to hit US\$19.1b in 2017*. Available from: <https://asianbankingandfinance.net/banking-technology/in-focus/apac-banks-it-spending-hit-us191b-in-2017>

Advanced Technological Factors Affecting Digital Banking Usage Intention

Awang, Z. (2012). *Structural equation modeling using AMOS graphic*. Penerbit Universiti Teknologi MARA.

Bach, M. P., Čeljo, A., & Zoroja, J. (2016). Technology acceptance model for business intelligence systems: Preliminary research. *Procedia Computer Science*, *100*, 995–1001. doi:10.1016/j.procs.2016.09.270

Belanche, D., Casaló, L. V., & Flavián, C. (2019). Artificial Intelligence in FinTech: Understanding robo-advisors adoption among customers. *Industrial Management & Data Systems*, *119*(7), 1411–1430. doi:10.1108/IMDS-08-2018-0368

Bergström Stacey, I., Svenningsson, P. & Thoresson, A. (2018). *The Era of Artificial Intelligence in Swedish Banking: Exploring Customer Attitudes Towards AI as a Substitute to Brick-and-Mortar Offices*. Academic Press.

Bertino, E. (2015, June). Big data-security and privacy. In *Big Data (BigData Congress), 2015 IEEE International Congress on* (pp. 757-761). IEEE. 10.1109/BigDataCongress.2015.126

BNM. (2018). *Financial stability and payment systems report 2017*. Bank Negara Malaysia.

Bongju, C. (2019). *Study on Factors Affecting Financial Investors' Acceptance Intention to Robo-Advisor based on UTAUT*. Academic Press.

Caron, X., Bosua, R., Maynard, S. B., & Ahmad, A. (2016). The Internet of Things (IoT) and its impact on individual privacy: An Australian perspective. *Computer Law & Security Review*, *32*(1), 4–15. doi:10.1016/j.clsr.2015.12.001

Cheng, E. W. (2019). Choosing between the theory of planned behaviour (TPB) and the technology acceptance model (TAM). *Educational Technology Research and Development*, *67*(1), 21–37. doi:10.1007/11423-018-9598-6

Chong, A. Y. L. (2013). Predicting m-commerce adoption determinants: A neural network approach. *Expert Systems with Applications*, *40*(2), 523–530. doi:10.1016/j.eswa.2012.07.068

Cocca, T. (2016). Potential and limitations of virtual advice in wealth management. *Journal of Financial Transformation*, *44*(1), 45–57.

Dastane, O. (2020). Impact of Digital Marketing on Online Purchase Intention: Mediation Effect of Customer Relationship Management. *Journal of Asian Business Strategy*, *10*(1), 142–158. doi:10.18488/journal.1006.2020.101.142.158

Dastane, O. (2020). Impact of Leadership Styles on Employee Performance: A Moderating Role of Gender. *Australian Journal of Business and Management Research*, *5*(12), 27–52. doi:10.52283/NSWRCA.AJBMR.20200512A03

Dastane, O., & Fazlin, I. (2017). Re-investigating key factors of customer satisfaction affecting customer retention for fast food industry. *International Journal of Management, Accounting and Economics*, *4*(4), 379–400.

- Dastane, O., Goi, C. L., & Rabbanee, F. (2020). A synthesis of constructs for modelling consumers' perception of value from mobile-commerce (M-VAL). *Journal of Retailing and Consumer Services*, 55, 102074. doi:10.1016/j.jretconser.2020.102074
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Management Information Systems Quarterly*, 13(3), 319–340. doi:10.2307/249008
- de Sena Abrahão, R., Moriguchi, S. N., & Andrade, D. F. (2016). Intention of adoption of mobile payment: An analysis in the light of the Unified Theory of Acceptance and Use of Technology (UTAUT). *RAI Revista de Administração e Inovação*, 13(3), 221–230. doi:10.1016/j.rai.2016.06.003
- Digital News Asia. (2019). *Get your business on cloud*. Available from: <https://www.digitalnewsasia.com/business/get-your-business-cloud>
- Doig, J. M. (2016). *Impact of online privacy concerns and brand reputation on consumer willingness to provide personal information* (Doctoral dissertation). Queensland University of Technology.
- Donni, R., Dastane, O., Haba, H. F., & Selvaraj, K. (2018). Consumer perception factors for fashion M-commerce and its impact on loyalty among working adults. *Business and Economic Review*, 8(2), 168–192. doi:10.5296/ber.v8i2.13044
- DOSM. (2017). *Report of Household Income and Basic Amenities Survey 2016*. Department of Statistics Malaysia.
- Fathima, Y. A., & Muthumani, S. (2015). User acceptance of banking technology with special reference to internet banking. *Journal of Theoretical and Applied Information Technology*, 73(1).
- Foroughi, B., Iranmanesh, M., & Hyun, S. S. (2019). Understanding the determinants of mobile banking continuance usage intention. *Journal of Enterprise Information Management*, 32(6), 1015–1033. doi:10.1108/JEIM-10-2018-0237
- Gareth, L., Stephen, G., Hua, Z., & Juan, M. (2018). *Global tech spending forecast: Banking edition. Technical Report*. Celent.
- Garson, G. D. (2012). *Testing statistical assumptions*. Statistical Associates Publishing.
- Hair, J.F., Anderson, R.E., Babin, B.J., & Black, W.C. (2010). *Multivariate data analysis: A global perspective* (Vol. 7). Academic Press.
- Hui, S. C. S., Dastane, O., Johari, Z., & Roslee, M. (2021). Enhancing Online Repurchase Intention via Application of Big Data Analytics in E-Commerce. In *Handbook of Research on Innovation and Development of E-Commerce and E-Business in ASEAN* (pp. 395–434). IGI Global.
- Jabnoun, N., & Al-Tamimi, H. A. H. (2003). Measuring perceived service quality at UAE commercial banks. *International Journal of Quality & Reliability Management*, 20(4), 458–472. doi:10.1108/02656710310468614

Advanced Technological Factors Affecting Digital Banking Usage Intention

Jagannathan, V., Balasubramanian, S., & Natarajan, T. (2018). An extension to the Delone and Mclean information systems success model and validation in the internet banking context. In *Encyclopedia of Information Science and Technology* (4th ed., pp. 49–60). IGI Global.

Jayawardhena, C., & Foley, P. (2000). Changes in the banking sector—the case of Internet banking in the UK. *Internet Research*, *10*(1), 19–31. doi:10.1108/10662240010312048

Johnson, V. L., Kiser, A., Washington, R., & Torres, R. (2018). Limitations to the rapid adoption of M-payment services: Understanding the impact of privacy risk on M-Payment services. *Computers in Human Behavior*, *79*, 111–122. doi:10.1016/j.chb.2017.10.035

Jung, D., Glaser, F., & Köpplin, W. (2019). Robo-advisory: opportunities and risks for the future of financial advisory. In *Advances in consulting research* (pp. 405–427). Springer. doi:10.1007/978-3-319-95999-3_20

Jünger, M., & Mietzner, M. (2020). Banking goes digital: The adoption of FinTech services by German households. *Finance Research Letters*, *34*, 101260. doi:10.1016/j.frl.2019.08.008

Khatun, F., Palas, M. J. U., & Ray, P. K. (2017). Using the unified theory of acceptance and use of technology model to analyze cloud-based mHealth service for primary care. *Digital Medicine*, *3*(2), 69. doi:10.4103/digm.digm_21_17

Khidzir, N. Z., Ghani, W. S. D. W. A., & Guan, T. T. (2017, March). Cloud-Based Mobile-Retail Application for Textile Cyberpreneurs: Task-Technology Fit Perspective Analysis. In *Proceedings of the International Conference on High Performance Compilation, Computing and Communications* (pp. 65-70). 10.1145/3069593.3069609

Kolodinsky, J. M., Hogarth, J. M., & Hilgert, M. A. (2004). The adoption of electronic banking technologies by US consumers. *International Journal of Bank Marketing*, *22*(4), 238–259. doi:10.1108/02652320410542536

Leong, K., & Sung, A. (2018). FinTech (Financial Technology): What is it and how to use technologies to create business value in fintech way? *International Journal of Innovation, Management and Technology*, *9*(2), 74–78. doi:10.18178/ijimt.2018.9.2.791

Lin, X., Wu, R., Lim, Y. T., Han, J., & Chen, S. C. (2019). Understanding the sustainable usage intention of mobile payment technology in Korea: Cross-countries comparison of Chinese and Korean users. *Sustainability*, *11*(19), 5532. doi:10.3390/u11195532

Lule, I., Omwansa, T. K., & Waema, T. M. (2012). Application of technology acceptance model (TAM) in m-banking adoption in Kenya. *International Journal of Computing & ICT Research*, *6*(1).

Lwoga, E. T., & Lwoga, N. B. (2017). User Acceptance of Mobile Payment: The Effects of User-Centric Security, System Characteristics and Gender. *The Electronic Journal on Information Systems in Developing Countries*, *81*(1), 1–24. doi:10.1002/j.1681-4835.2017.tb00595.x

- Mahon, P. Y. (2013). Internet research and ethics: Transformative issues in nursing education research. *Journal of Professional Nursing, 30*(2), 124–129. doi:10.1016/j.profnurs.2013.06.007 PMID:24720940
- Manser Payne, E., Peltier, J. W., & Barger, V. A. (2018). Mobile banking and AI-enabled mobile banking: The differential effects of technological and non-technological factors on digital natives' perceptions and behaviour. *Journal of Research in Interactive Marketing, 12*(3), 328–346. doi:10.1108/JRIM-07-2018-0087
- Mei, Y. C., & Aun, N. B. (2019). Factors influencing consumers' perceived usefulness of m-wallet in Klang Valley, Malaysia. Academic Press.
- Nasri, W., & Charfeddine, L. (2012). Factors affecting the adoption of Internet banking in Tunisia: An integration theory of acceptance model and theory of planned behaviour. *The Journal of High Technology Management Research, 23*(1), 1–14. doi:10.1016/j.hitech.2012.03.001
- Ogedengbe, F. A., & Abdul-Talib, Y. Y. (2020). Factors influencing electronic banking continuance usage intention in developing economies: A study of Nigeria. *International Journal of Business Information Systems, 35*(1), 63–87. doi:10.1504/IJBIS.2020.109541
- Oliveira, T., Thomas, M., Baptista, G., & Campos, F. (2016). Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology. *Computers in Human Behavior, 61*, 404–414. doi:10.1016/j.chb.2016.03.030
- Onaolapo, S. and Oyewole, O. (2018). Performance Expectancy, Effort Expectancy, and Facilitating Conditions as Factors Influencing Smart Phones Use for Mobile Learning by Postgraduate Students of the University of Ibadan, Nigeria. *Interdisciplinary Journal of e-Skills and Lifelong Learning, 14*(1), 95-115.
- Pei, T. J., & Dastane, O. (2021). Digital Technology in Retail: Impact on Shopper Satisfaction. In *Handbook of Research on Disruptive Innovation and Digital Transformation in Asia* (pp. 187-213). IGI Global.
- Putritama, A. (2019). The mobile payment fintech continuance usage intention in Indonesia. *Journal of Economics, 15*(2), 243–258.
- Raviadaran, N. S. H., Dastane, O., & Ma'arif, M.Y., & Satar, M. (2019). Impact of Service Quality Dimensions on Internet Banking Adoption, Satisfaction and Patronage. *International Journal of Management, Accounting and Economics, 6*(10), 709–730.
- Riza, A. F., & Hafizi, M. R. (2020). Customers attitude toward Islamic mobile banking in Indonesia: Implementation of TAM. *Asian Journal of Islamic Management, 1*(2), 75–84.
- Rogers, E. M. (2003). *Diffusion of Innovations* (5th ed.). Free Press.
- Saunders, M., Lewis, P. & Thornhill, A. (2015). *Research Methods for Business Students*. Academic Press.
- Schoeman, F. D. (Ed.). (1984). *Philosophical dimensions of privacy: An anthology*. Cambridge University Press. doi:10.1017/CBO9780511625138
- Shankar, A., & Rishi, B. (2020). Convenience matter in mobile banking adoption intention? *Australasian Marketing Journal, 28*(4), 273–285. doi:10.1016/j.ausmj.2020.06.008

Advanced Technological Factors Affecting Digital Banking Usage Intention

- Shiau, W. L., & Chau, P. Y. (2016). Understanding behavioural intention to use a cloud computing classroom: A multiple model comparison approach. *Information & Management*, *53*(3), 355–365. doi:10.1016/j.im.2015.10.004
- Singh, S., & Srivastava, R. K. (2020). Understanding the intention to use mobile banking by existing online banking customers: An empirical study. *Journal of Financial Services Marketing*, *25*(3), 86–96. doi:10.1057/41264-020-00074-w
- Suh, B., & Han, I. (2002). Effect of trust on customer acceptance of Internet banking. *Electronic Commerce Research and Applications*, *1*(3-4), 247–263. doi:10.1016/S1567-4223(02)00017-0
- Susanto, A., Chang, Y., & Ha, Y. (2016). Determinants of continuance intention to use the smartphone banking services: An extension to the expectation-confirmation model. *Industrial Management & Data Systems*, *116*(3), 508–525. doi:10.1108/IMDS-05-2015-0195
- Takieddine, S., & Sun, J. (2015). Internet banking diffusion: A country-level analysis. *Electronic Commerce Research and Applications*, *14*(5), 361–371. doi:10.1016/j.elerap.2015.06.001
- Tung, F. C., Yu, T. W., & Yu, J. L. (2014). An extension of financial cost, information quality and IDT for exploring consumer behavioural intentions to use the internet banking. *International Review of Management and Business Research*, *3*(2), 1229.
- Upadhyay, P., & Jahanyan, S. (2016). Analysing user perspective on the factors affecting use intention of mobile based transfer payment. *Internet Research*, *26*(1), 38–56. doi:10.1108/IntR-05-2014-0143
- Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273–315. doi:10.1111/j.1540-5915.2008.00192.x
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186–204. doi:10.1287/mnsc.46.2.186.11926
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *Management Information Systems Quarterly*, *3*(2), 425–478. doi:10.2307/30036540
- Wu, M., & Gao, Q. (2021, July). Understanding the Acceptance of Robo-Advisors: Towards a Hierarchical Model Integrated Product Features and User Perceptions. In *International Conference on Human-Computer Interaction* (pp. 262-277). Springer. 10.1007/978-3-030-78108-8_20
- Yeh, H. (2020). Factors in the ecosystem of mobile payment affecting its use: From the customers' perspective in Taiwan. *Journal of Theoretical and Applied Electronic Commerce Research*, *15*(1), 13–29. doi:10.4067/S0718-18762020000100103
- Yildirim, C., & Correia, A. P. (2015). Exploring the dimensions of nomophobia: Development and validation of a self-reported questionnaire. *Computers in Human Behavior*, *49*, 130–137. doi:10.1016/j.chb.2015.02.059

Yiu, C. S., Grant, K., & Edgar, D. (2007). Factors affecting the adoption of Internet Banking in Hong Kong—Implications for the banking sector. *International Journal of Information Management*, 27(5), 336–351. doi:10.1016/j.ijinfomgt.2007.03.002

Yousafzai, S. Y., Foxall, G. R., & Pallister, J. G. (2010). Explaining internet banking behaviour: Theory of reasoned action, theory of planned behaviour, or technology acceptance model? *Journal of Applied Social Psychology*, 40(5), 1172–1202. doi:10.1111/j.1559-1816.2010.00615.x

Yuan, Y., Lai, F., & Chu, Z. (2019). Continuous usage intention of Internet banking: A commitment-trust model. *Information Systems and e-Business Management*, 17(1), 1–25. doi:10.1007/10257-018-0372-4

ADDITIONAL READING

Abdou, D., & Jasimuddin, S. M. (2020). The Use of the UTAUT Model in the Adoption of E-Learning Technologies: An Empirical Study in France Based Banks. *Journal of Global Information Management*, 28(4), 38–51. doi:10.4018/JGIM.2020100103

Albashrawi, M. A. (2021). Mobile Banking Continuance Intention: The Moderating Role of Security and Customization. *Journal of Information Technology Research*, 14(1), 55–69. doi:10.4018/JITR.2021010104

Dimitrova, I., & Öhman, P. (2021). Digital Banking and the Impersonalisation Barrier. In *Impact of Globalization and Advanced Technologies on Online Business Models* (pp. 120–133). IGI Global. doi:10.4018/978-1-7998-7603-8.ch008

Ho, R. C., Hou Hong Ng, A., & Nourallah, M. (Eds.). (2021). *Impact of Globalization and Advanced Technologies on Online Business Models*. IGI Global. doi:10.4018/978-1-7998-7603-8

Rasiwala, F. S., & Kohli, B. (2021). Artificial Intelligence in FinTech: Understanding Stakeholders Perception on Innovation, Disruption, and Transformation in Finance. *International Journal of Business Intelligence Research*, 12(1), 48–65. doi:10.4018/IJBIR.2021010101.0a3

KEY TERMS AND DEFINITIONS

Cloud-Based Services: Services based on cloud computing are termed as cloud-based services. According to the NIST definition, cloud computing enables ubiquitous, convenient, on-demand network access to a common pool of configurable computing resources under a minimal service provider interaction and management effort. It offers secure deployment platform where the bank can leverage on to enhance new customer experiences, expand rapidly to market and increasing IT efficiency.

Innovation and Technology: Innovation refers to the new mind set or idea generation beyond the present experiences and into the future. Through the innovation, it enhances and creates the new product, process, concept, strategy, service and organisation. Technology is derived from two Greek words, ‘techne’ and ‘logos’ and can be interpreted as the principle of how something is produced based on the skill.

Advanced Technological Factors Affecting Digital Banking Usage Intention

Mobile Payment: Mobile devices have transformed from just a means of communication to a multi-function device that enables users to engage in various financial transactions such as bill payment, account transfers, person to person transfers, proximity payments at the point of sale and remote payments channel, without the need for a physical card or wallet.

Online Banking: Online banking, specifically internet and mobile banking refer to the customer interaction with bank facilities and services using a computer or smartphone with an internet connection to perform financial and non-financial transactions without the direct interacts with bank employees.

Robo-Advisor: Robo-Advisor combines the word “Robo”, originating from robot, and “Advisor”. It refers to the automated process without interference of a human being, utilising mathematical computations algorithms to support investment and financial decisions. Putting these terms together, it can be defined as “automated financial advisory interactive personalised customer services that minimise human interaction”. As opposed to traditional human advisory services, robo-advisor can reduce the costs of human labour while still offering personalised advices and can be accessed as long as one has an internet connectivity.

Chapter 4

Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period

Mahadi Hasan Miraz

Sunway University, Malaysia

Ferdoush Saleheen

Universiti Utara Malaysia, Malaysia

Mohammad Nabil Almunawar

 <https://orcid.org/0000-0001-5296-2576>

Universiti Brunei Darussalam, Brunei

Farhana Rahman Sumi

University of Information Technology and Sciences, Bangladesh

Shumi Sarkar

University of Information Technology and Sciences, Bangladesh

Mohammad Tariq Hasan

 <https://orcid.org/0000-0003-0810-5395>

United International University, Bangladesh

ABSTRACT

This research examines the relationship between facilitating condition, digital literacy, pandemic adoption, social influence, application use intention, and IoT-based business. Also, the research used systematic random sampling in this study to achieve the most rigorous analysis of the possible research objectives even though 277 legitimate replies were received in response to the survey questions asked at the online-based companies in Bangladesh. The scope of this study is the urban SME industry in Bangladesh. Besides that, the data was being analyzed with the help of partial least squares structural equation modeling (PLS-SEM). These research findings showed that facilitating condition (FC), digital literacy (DL), pandemic adoption (PA), social influence (SI), application use intention (AUI), and IoT-based business (dependent variable) effect in SME business industries in Bangladesh.

INTRODUCTION

Devices and systems can communicate more quickly through the Internet of Things (IoT). Smart gadgets have been used in many new ways by businesses to improve their operations, and day after day its become

DOI: 10.4018/978-1-7998-9664-7.ch004

Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period

more effective tools for our lives. Besides, it impacts our daily works. In addition, many variables are influenced by the new pandemic business environment. Also, Pandemic forces the entire civilization to work from home. To work from home need IoT services. Also, IoT creates a new sensation towards service. Many studies have shown that ZOOM, Webex, Google meet, and Microsoft teams have used the most application to manage their meeting and daily works. As a result, small and medium-sized enterprises (SMEs) must make use of facilitating their operations. Online business management, on the other hand, is an essential concern for developing countries. Because of the fantastic improvement in technology, small and medium-sized enterprises (SMEs) are rapidly embracing digital facilities. To put it another way, it is a more advanced version of the standard online-based digital learning environment.

Therefore, the SME business has to use a similar facility to facilitate their business, through online business management is critical for developing countries. Because of the incredible advancement in technology, the SME is increasingly opting for digital facilities. In other words, it is a more sophisticated version of the traditional online-based digital classroom.

IOT AND ITS USE IN BUSINESS

The Internet of Things (IoT) is a network of internet-connected gadgets that can collect and transfer data over a network (Aslam, Aimin, Li, & Ur Rehman, 2020). According to industry experts, introducing sensors, communication devices, and identity chips, which are constantly interacting with cloud and analytics engines, has resulted in a new era of automation in enterprises (Bisht, Jain, & Tewari, 2021). Data from the Internet of Things devices is recorded and sent to monitor critical operations, provide us with fresh insights, increase efficiency, and enable businesses to make more informed decisions (2021 #2703). IoT software businesses develop IoT systems and integrate software and hardware into business operations (Hossain, Rahman, & Roy, 2019). It also assists its clients in identifying and implementing cost-effective solutions to their business challenges (Javaid & Khan, 2021). Internet of Things (IoT) firms also offer full-stack IoT services, enabling them to develop technologies for various industries (Khan & Tariq, 2021). The Internet of Things (IoT) aims to connect all possible things to interact with one another over the internet to give humans a secure and comfortable living (Khan, Ahmad, & Jamshed, 2021). The Internet of Things (IoT) connects everything in our environment, making it as possible (Li *et al.*, 2021). Therefore, it reduces human effort since the Internet of Things gadgets interact and communicate with one another and performs a wide range of tasks for us (Lin, Shen, Zhang, & Chai, 2018; Mason, Conrey, & Smith, 2007). It reduces human effort and saves time, decreasing the amount of human work required. It undoubtedly saves our time for business management (Paiola, Schiavone, Grandinetti, & Chen, 2021; Podder *et al.*, 2021). The most significant aspect that can be saved using the Internet of Things platform is time for business facilitation (Pranto, Noman, Mahmud, & Haque, 2021; Reyna *et al.*, 2018). Therefore, IoT implementation contributed to increased levels of employee engagement, which resulted in increased productivity and ease of managing the business in daily life.

IOT AS A SERVICE

Internet-of-Things-as-a-Service makes it viable and cost-efficient for companies to develop even simple IoT applications and services, which modifies the cost model for adoption and implementation (Li et

al., 2021). IoT, along with other high-tech trends like artificial intelligence, machine learning, and cloud computing, has emerged as one of the most significant trends in high-tech during the last few years (Altaf *et al.*, 2021; da Silva *et al.*, 2021). It has developed frequently, changed course and manifested itself entirely. Wearable intelligent automobiles (such as Tesla) and smart appliances (iRobot) are just a few examples of IoT applications in the real world (Wang *et al.*, 2021). With the increasing deployment of the Internet of Things, coming into contact with several IoT devices every day will become unavoidable shortly.

LITERATURE REVIEW

IoT revitalization is a novel way to accommodate business management activity. IoT develops wholly new technological goods while making no significant changes to the technical features of existing products (Paola *et al.*, 2021). IoT revitalization is a cutting-edge method frequently employed in older technology-based companies (Al-Amin, Sharkar, Kaiser, & Biswas, 2021; Parvez, Chowdhury, Urmi, & Taher, 2021). IoT is a market-driven technological strategy in which the clients serve as the beginning point for forming the strategic plan (Podder *et al.*, 2021). Several factors include facilitating condition, digital literacy, pandemic effect, social influence, application use intention, and IoT-based business (Haque *et al.*, 2021). It is essential to have all of these aspects in place to undertake IoT rejuvenation successfully.

In recent times, corporate organizations have faced significant challenges resulting from widespread pandemic outbreaks (Chakraborty & Maity, 2020). The intensity of epidemics in question has a considerable impact on the scope of the issues faced by organizations. Businesses and supply chains suffer negative consequences in the event of a widespread SME business (Mahadi, Ferdoush, & Rahman, 2016; Miraz, 2020a, 2020b; Miraz & Habib, 2016; Miraz, Hasan, & Sharif, 2018; Miraz, Hasan, & Sharif, 2019b) such as an epidemic or pandemic, including decreased facilitating condition, digital literacy and social influence (Guan *et al.*, 2020), and the propagation of disruptions throughout supply chains (known as ripple effects). It has long-term consequences for their resilience and sustainability (Ivanov & Dolgui, 2020, 2021). Multiple significant virus outbreaks have negatively influenced Bangladesh's supply chains and SME business management (Khan, Ahmad, & Majava, 2021). On the other hand, the current COVID-19 outbreak is unprecedented.

Fortune magazine story published on February 21, 2020, stated that 94 percent of Fortune 1000 firms were experiencing supply chain interruption because of the COVID-19 pandemic (Dohale, Ambilkar, Gunasekaran, & Verma, 2021). As a result, the flow of commodities throughout the supply chain has been severely reduced or completely stopped (Miraz, Hasan, & Sharif, 2019a; Miraz, Hasan, Sumi, *et al.*, 2020; Miraz, Hye, Alkurtehe, *et al.*, 2020; Miraz, Hye, Wahab, *et al.*, 2020a; Miraz, Kabir, Habib, & Ahmed, 2019). The demand for social influence, application use intention, facilitating conditions, and digital literacy has increased significantly. Likewise, pandemic adoption is a challenge to SME business management (Das *et al.*, 2021). Among these are a supply-market lockdown, a halt to vehicle movements, and SME trade (Miraz, Kabir, Habib, & Alam, 2019; Miraz, Majumder, Chowdhury, & Habib, 2018; Miraz, Saleheen, & Habib, 2017). A few studies identified that digital literacy and facilitating conditions correlate to the IoT-based business (Gruszczynski, 2020; Ivanov & Dolgui, 2021; Koonin, 2020). Moreover, there is a significant relationship between facility and applicant use intent on the IoT-based business in the SME industry.

Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period

Furthermore, pandemic adoption is a highly influential and significant factor that impacts IoT-based business. In a pandemic, the situation needs to adapt to the problem and is far from physical interaction (Das *et al.*, 2021; El-Ebiary *et al.*, 2021). So the IoT creates a new sensation and position to use it further for the business initiative. Moreover, the application use intention is the primary and significant factor influencing IoT-based business (Report, 2020; Sen, Antara, Sen, & Chowdhury, 2020). As a result of the many repercussions of the pandemic on supply chains and other economic and financial difficulties, it is projected to have a considerable impact on IoT-based business (Taşel, 2020; Yaprak, Kılıç, & Okumuş, 2021). As a result, the study team develops the following hypothesis.

Facilitating Condition and IoT-Based Business

The facilitating condition (FC) is the grade an individual believes in, and technical infrastructure supports the system's use (Duca, Rule, & Loebel, 2012; Hart & Henriques, 2006). In addition, facilitation is a defined person who believes in an organizational and technological framework to support new technology (Venkatesh, Morris, Davis, & Davis, 2003). The growth of a facilitating condition encourages and enables establishing a deeper understanding and personal connection with their business (Ghalandari, 2012). An empirical study demonstrates a positive effect, facilitating conditions as well IoT adoption (Onalapo & Oyewole, 2018). Besides, the researcher discovered a substantial impact on facilitating IoT-based business in the SME industry in Bangladesh (Hye, Miraz, & Habib, 2020a). The study will point out the employee's understanding of the resources available in institutions to support IoT business (Miraz, Hye, Wahab, *et al.*, 2020b). According to previous literature, facilitating condition affects the facilitating condition in the SME industry in Bangladesh. Hence, facilitating conditions influence IoT business management (Mofijul Hoq Masum & *et al.*, 2020; Mohajan, 2015; Rahman, Mona, Al Noman, & Avi, 2020). It represents a significant dependency without a barrier in terms of the SME business. Therefore, the researcher suggests the following hypotheses:

H1: *Facilitating condition has a significant positive effect on the IoT-based business in the SME industry in Bangladesh.*

Digital Literacy And IoT-Based Business

An empirical investigation reveals that it has digital literacy and the acceptance of IoT (Oh *et al.*, 2021). The investigator has also found that digital literacy significantly impacted the ease of IoT-based business in Bangladesh's SME industry (Akther, 2018). The study will show the employee's comprehension of the resources available to IoT companies in business management (Shadat, Islam, Zahan, & Matin, 2020). Similarly, another study shows that digital literacy influences the IoT-based business management SME industry in Bangladesh (Hossain, 2015). This makes it easier for IoT business management to impact digital literacy (Reddy, Sharma, & Chaudhary, 2021). It reflects a significant reliance on the SME sector without a barrier.

H2: *Digital literacy has a significant positive effect on the IoT-based business in the SME industry in Bangladesh.*

Pandemic Adoption and IoT-Based Business

Pandemic adoption is a term related to new technology adoption (Javaid & Khan, 2021). IoT business management is a new technology that needs adaptation (Gruszczynski, 2020; Gunessee & Subramanian, 2020; Ivanov & Dolgui, 2021). It has been chiefly and repeatedly reported that pandemic adoption plays an essential role in configuring actual use and introducing IoT-based business management. Consequently, the present study assumes the vital acceptance of IoT in pandemic adoption (Koonin, 2020; Lalon, 2020; Raza, Qazi, Khan, & Salam, 2021; Shammi, Bodrud-Doza, Islam, & Rahman, 2021). The researcher also adapted the scale to measure pandemic adoption in SME business in Bangladesh (Sen *et al.*, 2020; Shammi *et al.*, 2021).

H3: *Pandemic adoption has a significant positive effect on the IoT-based business in the SME industry in Bangladesh.*

Social Influence and IoT-Based Business

Social influence (SI) is the degree to which the person perceives that other influential people think that the new system should be applied (Venkatesh & Bala, 2008; Venkatesh *et al.*, 2003; Venkatesh, Sykes, & Zhang, 2011). The degree to which one feels that significant others find the new way to be adopted acceptable is defined (Venkatesh & Bala, 2008; Venkatesh & Brown, 2001). SI is expected to have a favorable impact on the IoT-based business. To determine whether or not an employee should use IoT-based business in the SME industry (da Silva *et al.*, 2021; Hossain *et al.*, 2019). SI will reflect how much the employee understands how vital it is to believe that they should use IoT-based in the market (Javaid & Khan, 2021). Previous research has demonstrated that, at the individual level of social influence. For this reason, the social influence in Bangladesh is influenced significantly by the strength of the SI ties. Therefore, the researcher suggests the following hypothesis:

H4: *Social influence has a significant positive effect on the IoT-based business in the SME industry in Bangladesh.*

Application Use Intention And IoT-Based Business

Application use intention is an intention towards using the application (software or tools) for work purposes. It expresses the application used towards the IT-based business. Application use intention is the degree to which a person plans to engage or not in future conduct (Miraz, Hasan, Masum, *et al.*, 2020). Most IoT upgraded their operations to appeal to potential users in the subsequent SME industry in Bangladesh (Roussou & Stiakakis, 2016; Tun, 2020). So, when people want to use applications of IoT, it enhances the IoT-based business (Dinev & Hu, 2005). Additionally, IoT business is to strengthen the use of IoT and boost to intention to use.

Thus, the researcher observed that application use intention is influenced by its goal to be used (Guych, Anastasia, Simon, & Jennet, 2018; Husin, Haron, & Aziz, 2019; Maruping, Bala, Venkatesh, & Brown, 2017; Mendoza-Tello, Mora, Pujol-López, & Lytras, 2018). In addition, IoT business management produces benefits and improves the economy, encouraging SME business-enhancement (Mendoza-Tello *et al.*, 2018; Miraz, Hasan, Masum, *et al.*, 2020). Hence, it comprehends the new IoT-based business and

Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period

makes it more widely used its use intention (Sair & Danish, 2018). Therefore, the researcher suggests the following hypotheses:

H5: *Application use intention has a significant positive effect on the IoT-based business in the SME industry in Bangladesh.*

PROBLEMS OF IOT BASE BUSINESS MANAGEMENT

IoT-related issues have attracted academics and practitioners' attention, and the results from a few existing studies have shown some inconsistencies (Soni *et al.*, 2021). A study justifies that technology use and IoT-based business management are positively correlated. Also, IoT is a new phenomenon and needs more research to determine the factors to run in the SME industries (Alnoukari, 2021). Nonetheless, very little work has been performed on the role of facilitating conditions (Khan, Ahmad, & Jamshed, 2021). **IoT is directly related to the application use intentions' intimacy and interest (Sarfraz, Sarfraz, Iftikar, & Akhund, 2021).** It remains relevant as new ideas and understanding make it imperative to explore IoT in business management further. The current IoT policy is also vulnerable and seems to play a critical role in SMEs. Also, IoT is not well stated in the SME industry in Bangladesh.

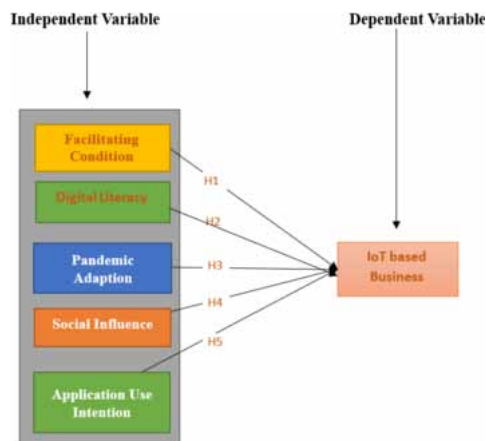
On top of that, the IoT is affected by the application use intention. There is no further initiative to disclose IoT business management in SMEs and no action to make it usable to the business sector (Bisht *et al.*, 2021). IoT faces problems because of digital literacy and stability (Hye *et al.*, 2020a; Hye, Miraz, & Habib, 2020b; Jones *et al.*, 2021; Mahadi *et al.*, 2016). Also, there is insufficient research on the impact of IoT in business management in Bangladesh (Hossain *et al.*, 2019). This has motivated the study to explore the area mainly from the SME in Bangladesh perspective. Another study discusses several shortcomings of IoT business management that need further investigation.

The researcher explores an in-depth study and analysis to explain the problems and provide solutions. The researcher found some variables that need to focus on further improving IoT-based SME business in Bangladesh (Pranto *et al.*, 2021). Facilitating condition (FC), digital literacy (DL), pandemic adoption (PA), social influence (SI), Application use intention (AUI), and IoT-based business have become significant issues in the Bangladesh SME industry (Shabur, Hridoy, & Rahman, 2021). Lack of facilitating conditions has been the primary issue to use the IoT in the SME industry. Besides that, the absence of digital literacy technology understanding is another issue in the IoT-based business (Khan & Tariq, 2021). Apart from that, the limited capabilities of the pandemic adoption issue need to be solved to ensure the study's objectives (Javaid & Khan, 2021). Also, the lack of social influence in the IoT is another distinguished issue been identified. Besides, application use intention is not studied yet. There are not many studies that show the effect of application use intention. These issues pose an obstacle to IoT-based business in the SME industry.

RESEARCH FRAMEWORK

The independent variables are facilitating condition (FC), digital literacy (DL), pandemic adoption (PA), social influence (SI), Application use intention (AUI). On the other hand, IoT base business (George *et al.*) represents the dependent variable.

Figure 1. Research framework



ANALYSIS

Each researcher's reliability will be different. Hence it is vital to examine the reliability of each predictor separately (Afthanorhan, Awang, & Mamat, 2016; Akter, Fosso Wamba, & Dewan, 2017; Becker, Klein, & Wetzels, 2012). It is common to refer to the indicator's dependability as "outer loading," which implies that the latent design is responsible for most of the variance in the indicator (Cheah *et al.*, 2018; Chin, 2001, 2010). Depending on the situation, the overall load can have a magnitude range between 0 and 1 (Goodhue, Lewis, & Thompson, 2012; Hair, Ringle, & Sarstedt, 2011; Hair Jr, Matthews, Matthews, & Sarstedt, 2017). Most researchers agree that a researcher should eliminate any objects with loading values less than 0.4 and values greater than 0.7 retain in their datasets.

Valid discrimination between two unique concepts is defined as the presence of significant disparities between them in Figure 3. According to others, it is also necessary to tell the difference between the different structures (Hair Jr *et al.*, 2017; Hair Jr, Sarstedt, Hopkins, & Kuppelwieser, 2014a, 2014b). The Fornell-Larcker Criterion and Cross Loading are two measurements that are frequently employed. According to Fornell Larcker, the condition that a latent variable explains more variation than other latent variables is an appropriate criterion (Fornell *et al.*, 1996; Fornell & Larcker, 1981a, 1981b). In this case, the difference between the significance of its indicators is the difference between the relevance of its indicators (Cheah *et al.*, 2018; Chin, 2001). Cross-loadings are an additional criterion for discriminative validity that should be taken into consideration as well (Goodhue *et al.*, 2012; Hair Jr *et al.*, 2014a). For another way of saying it, each indicator loading must be bigger than the sum of all of the cross-loadings on the indicator (Chin, 1998; Kimmerl, 2020). It was decided whether or not this study had discriminant validity based on the Fornell-Larcker ratio in this study (Hair Jr *et al.*, 2017; Hair Jr *et al.*, 2014b). Figure 3 indicates that the value on the diagonal is bigger than the value on the horizontal. In this investigation, the greatest value is slanted and higher than the rest, indicating that no discriminant exists.

The reliability of the study is depicted in Figure 4. Figure 4: As an alternative to external quality measures, the researchers proposed two internal quality metrics, including Cronbach's alpha and composite reliability (Hulland, 1999; Jin & Wang, 2019). Cronbach's alpha and composite reliability metrics are the most typically employed measures (Hair *et al.*, 2017; Hair, Ringle, & Sarstedt, 2013). Using composite reliability to evaluate internal correctness rather than individual dependability for calculating

Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period

Figure 2. Measurement model



Figure 3. Discriminant validity

	Application Use Inten...	Digital Literacy	Facilitating Condition	IoT Based Business	Pandemic Adoption	Social Influen...
Application Use Inten...	0.867					
Digital Literacy	0.327	0.815				
Facilitating Condition	0.447	0.091	0.871			
IoT Based Business	0.304	-0.065	0.371	0.860		
Pandemic Adoption	0.232	0.059	0.455	0.303	0.882	
Social Influence	0.425	0.045	0.501	0.432	0.425	0.820

internal precision is also more equitable than using particular trustworthiness (Hair Jr *et al.*, 2017; Hair Jr *et al.*, 2014b). When the composite reliability is between 0.6 and 0.7, it is acceptable; it is satisfactory in both circumstances when it is between 0.7 and 0.9 (Hair Jr *et al.*, 2017; Hair Jr *et al.*, 2014b). Another researcher came up with a solution. Throughout this experiment, the dependability values for all composites were acceptable; in other words, they were greater than the 0.7 norms established by the researchers, which was considered acceptable (Figure 4).

Figure 4. Reliability

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Applicati...	0.890	0.891	0.924	0.751
Digital Lit...	0.856	0.959	0.887	0.664
Facilitat...	0.840	0.843	0.904	0.758
IoT Based...	0.882	0.884	0.919	0.739
Pandemic...	0.905	0.921	0.933	0.777
Social Infl...	0.838	0.843	0.891	0.673

The structure model is seen in Figure 5. As part of this stage, the structural model and latent build-ings are calculated to reflect the assumed relationship between latent structures and the structural model, expressed as a relationship between the structural (Chin, 2010; Goodhue *et al.*, 2012; Hair Jr *et al.*, 2017; Hulland, 1999; Ramayah *et al.*, 2017). For any given association (Figure 6), T and p values are utilized to determine the importance of the link, regardless of whether it is necessary to do so in the first place (Hair Jr *et al.*, 2017; Hair Jr *et al.*, 2014a, 2014b). The PLS-SEM strategy uses an observational t and p-value bootstrapping process in conjunction with a statistical model (Bryant & Satorra, 2012; Chin,

1998) (Hair Jr *et al.*, 2014a; Hulland, 1999; Jin & Wang, 2019). Although t-values more than 1.645 are statistically significant, p-values of less than 0.05 are considered acceptable or justifiable (Kock, 2016). The value of the direction coefficients was determined through normal bootstrapping in this study, with a range of 500 bootstraps—a total of 277 cases in the study’s data (Ramayah *et al.*, 2018; Ramayah *et al.*, 2017). According to the conceptual model for this study, latent internal processes are included in addition to latent external mechanisms and a latent endogenous component, as depicted in Figure 5.

Figure 5. Structure model



Figure 6. Path coefficient

	Original Sam...	Sample ...	Standard ...	T Statistic...	P Values
Application Use Intention -> IoT Based Business	0.157	0.151	0.052	3.003	0.003
Digital Literacy -> IoT Based Business	-0.147	-0.139	0.077	1.914	0.056
Facilitating Condition -> IoT Based Business	0.137	0.138	0.062	2.207	0.028
Pandemic Adoption -> IoT Based Business	0.103	0.093	0.067	1.545	0.123
Social Influence -> IoT Based Business	0.260	0.269	0.065	3.981	0.000

DISCUSSION

This research reveals the factors that influence the IoT-based business in the SME industry in Bangladesh. Figure 6 and Table 1 illustrate the research output of the study. It shows that the relationship between facilitating condition predicts and IoT-based business management was insignificant. Since the hypothesis, H1 showed that facilitating condition predicts and IoT based business since their relationship was significant ($\beta= 0.137$, $t= 2.207$, and $p=0.028$). However, the relationship between digital literacy and IoT-based business management was insignificant ($\beta= -0.147$, $t= 1.914$, and $p<0.056$), and hypothesis H2 was not supported. Similarly, hypothesis H3 demonstrated that pandemic adoption was insignificant toward IoT-based business ($\beta= 0.103$, $t=1.545$, and $p=0.123$). However, H4 shows that social influence and IoT-based business are supported in this study, and the effects are ($\beta= 0.116$, $t= 1.844$, and $p<0.000$) significant. Lastly, hypothesis H5 executed that application use intention in predicting IoT-based business, and the relationship was significant. It is seen that the and application use intention directly indicates

Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period

IoT BB ($\beta = 0.157$, $t = 3.003$, and $p < 0.003$). Therefore, this study supported four hypotheses (H1, H4, H5), though H2 & H3 have negative relation and H2 & H3 is not supported.

Table 1. Assessment of path model

Hypothesis	Relationships	Beta Values	SD	T Values	P Values	Findings
H1	FC -> IoT BB	0.137	0.062	2.207	0.028	Supported
H2	DL -> IoT BB	-0.147	0.077	1.914	0.056	Not Supported
H3	PA -> IoT BB	0.103	0.067	1.545	0.123	Not Supported
H4	SI -> IoT BB	0.116	0.063	1.844	0.000	Supported
H5	ATU-> IoT BB	0.157	0.052	3.003	0.003	Supported

CONCLUSION

According to the objectives of this study, variables that influence relationships between facilitating condition, digital literacy, pandemic adoption, social influence, application use intention, and IoT-based business SME industry in Bangladesh were examined in depth. Bangladesh's SME industry must enhance its supply chain to manage its company better. Facilitating conditions, digital literacy, pandemic adoption, social influence, application use intention, and IoT-based business have played a vital role in managing the pandemic business in Bangladesh's SME industry. However, digital literacy needs to improve towards IoT-based business in the SME industry. Likewise, pandemic adoption is a new phenomenon, and it needs more attention towards IoT and the business industry. The following conclusion can be drawn from the results of this study:

1. FC, SI, and ATU have played a significant role in factors that influence the IoT-based business in the SME industry in Bangladesh. TR in Malaysia can not directly affect consumer ties with cryptocurrency adoption digital market Malaysia.
2. The study also revealed that DL and PA are not impacted in the IoT-based business in the SME industry in Bangladesh. It means that this DL and PA need more focus towards making the affected.

REFERENCES

- Afthanorhan, A., Awang, Z., & Mamat, M. (2016). A comparative study between GSCA-SEM and PLS-SEM. *MJ Journal on Statistics and Probability*, 1(1), 63–72.
- Akter, S., Fosso Wamba, S., & Dewan, S. (2017). Why PLS-SEM is suitable for complex modelling? An empirical illustration in big data analytics quality. *Production Planning and Control*, 28(11-12), 1011–1021. doi:10.1080/09537287.2016.1267411
- Akther, F. (2018). Intermediaries and intermediating tools as instruments for digital literacy in Bangladesh. In *Designing for Learning in a Networked World* (pp. 251–272). Routledge. doi:10.4324/9781351232357-14

- Al-Amin, S., Sharkar, S. R., Kaiser, M. S., & Biswas, M. (2021). Towards a blockchain-based supply chain management for e-agro business system. *Proceedings of International Conference on Trends in Computational and Cognitive Engineering*. 10.1007/978-981-33-4673-4_26
- Alnoukari, M. (2021). From Business Intelligence to Big Data: The Power of Analytics. In *Integration Challenges for Analytics, Business Intelligence, and Data Mining* (pp. 44-62). IGI Global.
- Altaf, A., Abbas, H., Iqbal, F., Khan, M. M. Z. M., Rauf, A., & Kanwal, T. (2021). Mitigating service-oriented attacks using context-based trust for smart cities in IoT networks. *Journal of Systems Architecture*, 115, 102028. doi:10.1016/j.sysarc.2021.102028
- Aslam, F., Aimin, W., Li, M., & Ur Rehman, K. (2020). Innovation in the Era of IoT and Industry 5.0: Absolute Innovation Management (AIM) Framework. *Information (Basel)*, 11(2), 124. doi:10.3390/info11020124
- Becker, J.-M., Klein, K., & Wetzels, M. (2012). Hierarchical latent variable models in PLS-SEM: Guidelines for using reflective-formative type models. *Long Range Planning*, 45(5-6), 359–394. doi:10.1016/j.lrp.2012.10.001
- Bisht, R. S., Jain, S., & Tewari, N. (2021). *Study of Wearable IoT devices in 2021: Analysis & Future Prospects*. Paper presented at the 2021 2nd International Conference on Intelligent Engineering and Management (ICIEM). 10.1109/ICIEM51511.2021.9445334
- Chakraborty, I., & Maity, P. (2020). COVID-19 outbreak: Migration, effects on society, global environment and prevention. *The Science of the Total Environment*, 728, 138882. doi:10.1016/j.scitotenv.2020.138882 PMID:32335410
- Cheah, J.-H., Memon, M. A., Chuah, F., Ting, H., & Ramayah, T. (2018). Assessing reflective models in marketing research: A comparison between pls and plsc estimates. *International Journal of Business and Society*, 19(1), 139–160.
- Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern Methods for Business Research*, 295(2), 295-336.
- Chin, W. W. (2001). PLS-Graph user's guide. CT Bauer College of Business, University of Houston.
- Chin, W. W. (2010). How to write up and report PLS analyses. In *Handbook of partial least squares* (pp. 655–690). Springer. doi:10.1007/978-3-540-32827-8_29
- da Silva, D. A., de Sousa Jr, R. T., de Oliveira Albuquerque, R., Orozco, A. L. S., & Villalba, L. J. G. (2021). IoT-based security service for the documentary chain of custody. *Sustainable Cities and Society*, 71, 102940. doi:10.1016/j.scs.2021.102940
- Das, G., Jain, S. P., Maheswaran, D., Slotegraaf, R. J., & Srinivasan, R. (2021). Pandemics and marketing: Insights, impacts, and research opportunities. *Journal of the Academy of Marketing Science*, 49(5), 1–20. doi:10.1007/11747-021-00786-y PMID:33994600
- Dinev, T., & Hu, Q. (2005). The centrality of awareness in the formation of user behavioral intention toward preventive technologies in the context of voluntary use. *SIGHCI 2005 Proceedings*, 10.

Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period

Dohale, V., Ambilkar, P., Gunasekaran, A., & Verma, P. (2021). Supply chain risk mitigation strategies during COVID-19: Exploratory cases of “make-to-order” handloom saree apparel industries. *International Journal of Physical Distribution & Logistics Management*.

Duca, L. D., Rule, C., & Loeb, Z. (2012). Facilitating expansion of cross-border e-commerce-developing a global online dispute resolution system (Lessons derived from existing ODR systems-work of the United Nations Commission on International trade law). *Penn St. JL & Int'l Aff.*, 1, iv.

El-Ebiary, Y. A. B., ThaherAmayreh, K., Yusoff, M. H., Hatamleh, A., Karim, R., & Mohamed, R. R. (2021). Impacts of COVID-19 Pandemic in the Food and Beverage Industry and the Food Quality. *Annals of the Romanian Society for Cell Biology*, 7754–7760.

Fornell, C., Johnson, M. D., Anderson, E. W., Cha, J., & Bryant, B. E. (1996). The American customer satisfaction index: Nature, purpose, and findings. *Journal of Marketing*, 60(4), 7–18. doi:10.1177/002224299606000403

Fornell, C., & Larcker, D. F. (1981a). *Structural equation models with unobservable variables and measurement error: Algebra and statistics*. Sage Publications Sage CA.

Fornell, C., & Larcker, D. F. (1981b). *Structural equation models with unobservable variables and measurement error: Algebra and statistics*. Sage Publications.

George, R. P., Peterson, B. L., Yaros, O., Beam, D. L., Dibbell, J. M., & Moore, R. C. (2019). Blockchain for business. *Journal of Investment Compliance*, 20(1), 17–21. doi:10.1108/JOIC-01-2019-0001

Ghalandari, K. (2012). The effect of performance expectancy, effort expectancy, social influence and facilitating conditions on acceptance of e-banking services in Iran: The moderating role of age and gender. *Middle East Journal of Scientific Research*, 12(6), 801–807.

Goodhue, D. L., Lewis, W., & Thompson, R. (2012). Does PLS have advantages for small sample size or non-normal data? *Management Information Systems Quarterly*, 36(3), 981–1001. doi:10.2307/41703490

Gruszczynski, L. (2020). The COVID-19 pandemic and international trade: Temporary turbulence or paradigm shift? *European Journal of Risk Regulation*, 11(2), 337–342. doi:10.1017/err.2020.29

Guan, D., Wang, D., Hallegatte, S., Davis, S. J., Huo, J., Li, S., ... Coffman, D. M. (2020). Global supply-chain effects of COVID-19 control measures. *Nature Human Behaviour*, 4(6), 577–587. doi:10.1038/41562-020-0896-8 PMID:32493967

Gunessee, S., & Subramanian, N. (2020). Ambiguity and its coping mechanisms in supply chains lessons from the Covid-19 pandemic and natural disasters. *International Journal of Operations & Production Management*, 40(7/8), 1201–1223. doi:10.1108/IJOPM-07-2019-0530

Guych, N., Anastasia, S., Simon, Y., & Jennet, A. (2018). Factors influencing the intention to use cryptocurrency payments: An examination of blockchain economy. *Munich Personal RePEc Archive*, 1-11.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Thiele, K. O. (2017). Mirror, mirror on the wall: A comparative evaluation of composite-based structural equation modeling methods. *Journal of the Academy of Marketing Science*, 45(5), 616–632. doi:10.1007/11747-017-0517-x

- Hair, J. F. Jr, Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: Updated guidelines on which method to use. *International Journal of Multivariate Data Analysis*, 1(2), 107–123. doi:10.1504/IJMDSA.2017.10008574
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, 19(2), 139–152. doi:10.2753/MTP1069-6679190202
- Hair, J. F. Jr, Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results and higher acceptance. *Long Range Planning*, 46(1-2), 1–12. doi:10.1016/j.lrp.2013.01.001
- Hair, J. F. Jr, Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM). *European Business Review*, 26(2), 106–121. doi:10.1108/EBR-10-2013-0128
- Haque, A., Islam, N., Samrat, N. H., Dey, S., & Ray, B. (2021). Smart Farming through Responsible Leadership in Bangladesh: Possibilities, Opportunities, and Beyond. *Sustainability*, 13(8), 4511. doi:10.3390/s13084511
- Hart, M., & Henriques, V. (2006). On the influence of facilitating conditions on DSS usage. *Preface of the Editors*, 135.
- Hossain, K., Rahman, M., & Roy, S. (2019). Iot data compression and optimization techniques in cloud storage: Current prospects and future directions. *International Journal of Cloud Applications and Computing*, 9(2), 43–59. doi:10.4018/IJCAC.2019040103
- Hossain, T. (2015). *Digital literacy skills of university students of Bangladesh: A comparative study between a public and a private university*. University of Dhaka.
- Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal*, 20(2), 195–204.
- Husin, M. M., Haron, R., & Aziz, S. (2019). The role of perceived benefits in formation of intention to use islamic crowdfunding platform among small and medium enterprises in Malaysia. *International Journal of Entrepreneurship*, 2(7), 39–47. doi:10.35631/ijemp.27005
- Hye, A. K. M., Miraz, M. H., & Habib, M. M. (2020a). Factors Affecting Change Management through Technology Adoption in Public Organizations in Bangladesh. *Int. J Sup. Chain. Mgt*, 9(4), 122–131.
- Hye, A. K. M., Miraz, M. H., & Habib, M. M. (2020b). Wave Retail Banking Effect on Customer Satisfaction in Retail Supply Chain in Bangladesh. *Int. J Sup. Chain. Mgt*, 9(3), 232–238.
- Ivanov, D., & Dolgui, A. (2020). Viability of intertwined supply networks: Extending the supply chain resilience angles towards survivability. A position paper motivated by COVID-19 outbreak. *International Journal of Production Research*, 58(10), 2904–2915. doi:10.1080/00207543.2020.1750727
- Ivanov, D., & Dolgui, A. (2021). OR-methods for coping with the ripple effect in supply chains during COVID-19 pandemic: Managerial insights and research implications. *International Journal of Production Economics*, 232, 107921. doi:10.1016/j.ijpe.2020.107921 PMID:32952301

Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period

- Javaid, M., & Khan, I. H. (2021). Internet of Things (IoT) enabled healthcare helps to take the challenges of COVID-19 Pandemic. *Journal of Oral Biology and Craniofacial Research*, 11(2), 209–214. doi:10.1016/j.jobcr.2021.01.015 PMID:33665069
- Jin, J., & Wang, Q. (2019). Evaluation of informative bands used in different PLS regressions for estimating leaf biochemical contents from hyperspectral reflectance. *Remote Sensing*, 11(2), 197. doi:10.3390/rs11020197
- Jones, E., Miraz, M., Hye, A., Mahbub, A., Wahab, K., & Habib, M. (2021). Blockchain Securities to Construct Inclusive, Digital Economy Globally. *International Supply Chain Technology Journal*, 7(1).
- Khan, I. S., Ahmad, M. O., & Majava, J. (2021). Industry 4.0 and sustainable development: A systematic mapping of triple bottom line, Circular Economy and Sustainable Business Models perspectives. *Journal of Cleaner Production*, 297, 126655. doi:10.1016/j.jclepro.2021.126655
- Khan, S., & Tariq, M. U. (2021). Harnessing IoT advantages in the disruptive era: UAE retail industry. *Academy of Entrepreneurship Journal*, 27, 1–13.
- Khan, S. A., Ahmad, S., & Jamshed, M. (2021). IoT-enabled services in online food retailing. *Journal of Public Affairs*, 21(1), e2150. doi:10.1002/pa.2150
- Kimmerl, J. (2020). *Understanding Users' Perception on the Adoption of Stablecoins-The Libra Case*. Paper presented at the PACIS.
- Kock, N. (2016). Non-normality propagation among latent variables and indicators in PLS-SEM simulations. *Journal of Modern Applied Statistical Methods*, 15(1), 16. doi:10.22237/jmasm/1462076100
- Koonin, L. M. (2020). Novel coronavirus disease (COVID-19) outbreak: Now is the time to refresh pandemic plans. *Journal of Business Continuity & Emergency Planning*, 13(4), 298–312. PMID:32438951
- Lalon, R. M. (2020). COVID-19 vs Bangladesh: Is it Possible to Recover the Impending Economic Distress Amid this Pandemic? *Journal of Economics and Business*, 3(2). Advance online publication. doi:10.31014/aior.1992.03.02.240
- Li, C. Z., Chen, Z., Xue, F., Kong, X. T., Xiao, B., Lai, X., & Zhao, Y. (2021). A blockchain-and IoT-based smart product-service system for the sustainability of prefabricated housing construction. *Journal of Cleaner Production*, 286, 125391. doi:10.1016/j.jclepro.2020.125391
- Lin, J., Shen, Z., Zhang, A., & Chai, Y. (2018). Blockchain and IoT based food traceability for smart agriculture. *Proceedings of the 3rd International Conference on Crowd Science and Engineering*. 10.1145/3265689.3265692
- Mahadi, H. M., Ferdoush, S., & Rahman, M. (2016). *Supply Chain Management in Service Quality*. Paper presented at the International Conference on Industrial Engineering and Operations Management.
- Maruping, L. M., Bala, H., Venkatesh, V., & Brown, S. A. (2017). Going beyond intention: Integrating behavioral expectation into the unified theory of acceptance and use of technology. *Journal of the Association for Information Science and Technology*, 68(3), 623–637. doi:10.1002/asi.23699

- Mason, W. A., Conrey, F. R., & Smith, E. R. (2007). Situating social influence processes: Dynamic, multidirectional flows of influence within social networks. *Personality and Social Psychology Review*, *11*(3), 279–300. doi:10.1177/1088868307301032 PMID:18453465
- Mendoza-Tello, J. C., Mora, H., Pujol-López, F. A., & Lytras, M. D. (2018). Social commerce as a driver to enhance trust and intention to use cryptocurrencies for electronic payments. *IEEE Access: Practical Innovations, Open Solutions*, *6*, 50737–50751. doi:10.1109/ACCESS.2018.2869359
- Miraz, M. H. (2020a). Factors Affecting e-logistics in Malaysia: The Mediating Role of Trust. *Journal of Advanced Research in Dynamical and Control Systems*, *12*(3), 111–120. doi:10.5373/JARDCS/V12SP3/20201244
- Miraz, M. H. (2020b). Trust Impact on Blockchain & Bitcoin Monetary Transaction. *Journal of Advanced Research in Dynamical and Control Systems*, *12*(3), 155–162. doi:10.5373/JARDCS/V12SP3/20201249
- Miraz, M. H., & Habib, M. M. (2016). ICT Adoption in Small and Medium Enterprises: An Empirical Evidence of Service Sectors in Bangladesh *Journal of Economics, Business and Management*, *4*(8), 481–487. doi:10.18178/joebm.2016.4.8.439
- Miraz, M. H., Hasan, M. G., & Sharif, K. I. (2018). Supply Chain Management for Garments Industries Using Blockchain in Bangladesh. *Journal of Business Management and Economic Research*, *2*(8), 13–20. doi:10.29226/TR1001.2018.54
- Miraz, M. H., Hasan, M. G., & Sharif, K. I. (2019a). Blockchain Technology Implementation in Malaysian Retail Market. *Jour of Adv Research in Dynamical & Control Systems*, *11*(5), 991–994.
- Miraz, M. H., Hasan, M. G., & Sharif, K. I. (2019b). The Numerous Tactical Plans Affect Customer and Postal Service Relationship: The Mediating Role of Blockchain, An Empirical Study in Bangladesh. *Jour of Adv Research in Dynamical & Control Systems*, *11*(5), 985–990.
- Miraz, M. H., Hasan, M. T., Masum, M. H., Alam, M. M., & Sarkar, S. (2020). Factors Affecting Consumers Intention to Use Blockchain-Based Services (BBS) in the Hotel Industry. *International Journal of Mechanical and Production Engineering Research and Development*, *10*(3), 8891–8902. doi:10.24247/ijmperdjun2020846
- Miraz, M. H., Hasan, M. T., Sumi, F. R., Sarkar, S., & Majumder, M. I. (2020). Understanding, Supervision, Strategy and Acceptance Effect into the Blockchain Employment in Malaysia. *International Journal of Mechanical and Production Engineering Research and Development*, *10*(3), 8339–8360. doi:10.24247/ijmperdjun2020793
- Miraz, M. H., Hye, A. K. M., Alkurtehe, K. A. M., Habib, M. M., Ahmed, M. S., Molla, M. S., & Hasan, M. T. (2020). The Effect of Blockchain in Transportation Malaysia. *International Supply Chain Technology Journal*, *6*(1), 1–10. doi:10.20545/isc tj.v06.i01.02
- Miraz, M. H., Hye, A. K. M., Wahab, M. K., Alkurtehe, K. A. M., Majumder, M. I., Habib, M. M., & Alsabahi, M. A. (2020a). Blockchain Securities to Construct Inclusive, Digital Economy Globally. *International Supply Chain Technology Journal*, *6*(1), 1–11. doi:10.20545/isc tj.v06.i01.03

Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period

- Miraz, M. H., Hye, A. K. M., Wahab, M. K., Alkurtehe, K. A. M., Majumder, M. I., Habib, M. M., & Alsabahi, M. A. (2020b). Electronics Product Promotion and SCM. *Contemporary Research on Bangladesh*, 6(1), 1–9. doi:10.20545/isc tj.v06.i01.01
- Miraz, M. H., Kabir, A., Habib, M. M., & Ahmed, M. S. (2019). *Securities on Blockchain in Order to Engage with Blockchain Technologies to Build a Comprehensive, Apparent and Liable Digital Economy World Wide*. Paper presented at the 2nd International Conference on Business and Management (ICBM).
- Miraz, M. H., Kabir, A., Habib, M. M., & Alam, M. M. (2019). *Blockchain Technology in Transport Industries in Malaysia*. Paper presented at the 2nd International Conference on Business and Management.
- Miraz, M. H., Majumder, M. I., Chowdhury, A. H. M. Y., & Habib, M. M. (2018). A Study on Sustainable Supply Chain Governance for Successful Investment. *International Supply Chain Technology Journal*, 4(6), 2–10. doi:10.20545/isc tj.v4i06.167
- Miraz, M. H., Saleheen, F., & Habib, M. M. (2017). *Assessing SCM: A Procedure Based on a Theoretical Model*. Paper presented at the 1st International Conference on Business & Management.
- Mofijul Hoq Masum, M. H. M. (2020). Factors Affecting the Sustainability Reporting, Evidence from Bangladesh. *International Journal of Mechanical and Production Engineering Research and Development*, 10(3), 8323–8338. doi:10.24247/ijmperdjun2020792
- Mohajan, H. (2015). *Present and Future of Nestlé Bangladesh Limited*. Academic Press.
- Oh, S. S., Kim, K.-A., Kim, M., Oh, J., Chu, S. H., & Choi, J. (2021). Measurement of Digital Literacy Among Older Adults: Systematic Review. *Journal of Medical Internet Research*, 23(2), e26145. doi:10.2196/26145 PMID:33533727
- Onaolapo, S., & Oyewole, O. (2018). Performance expectancy, effort expectancy, and facilitating conditions as factors influencing smart phones use for mobile learning by postgraduate students of the University of Ibadan, Nigeria. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 14(1), 95-115.
- Paiola, M., Schiavone, F., Grandinetti, R., & Chen, J. (2021). Digital servitization and sustainability through networking: Some evidences from IoT-based business models. *Journal of Business Research*, 132, 507–516. doi:10.1016/j.jbusres.2021.04.047
- Parvez, N., Chowdhury, T. H., Urmi, S. S., & Taher, K. A. (2021). *Prospects of Internet of Things for Bangladesh*. Paper presented at the 2021 International Conference on Information and Communication Technology for Sustainable Development (ICICT4SD). 10.1109/ICICT4SD50815.2021.9396818
- Podder, A. K., Al Bukhari, A., Islam, S., Mia, S., Mohammed, M. A., Kumar, N. M., ... Abdulkareem, K. H. (2021). IoT based smart agrotech system for verification of Urban farming parameters. *Microprocessors and Microsystems*, 82, 104025. doi:10.1016/j.micpro.2021.104025
- Pranto, T. H., Noman, A. A., Mahmud, A., & Haque, A. B. (2021). Blockchain and smart contract for IoT enabled smart agriculture. *PeerJ. Computer Science*, 7, e407. doi:10.7717/peerj-cs.407 PMID:33834098
- Rahman, M. N., Mona, S. S., Al Noman, S. A., & Avi, A. D. (2020). COVID-19, Consumer Behavior and Inventory Management: A Study on the Retail Pharmaceutical Industry of Bangladesh. *Supply Chain Insider*, 4(1), 8-25.

- Ramayah, T., Cheah, J., Chuah, F., Ting, H., & Memon, M. (2018). Partial least squares structural equation modeling (PLS-SEM) using smartPLS 3.0. In *An Updated Guide and Practical Guide to Statistical Analysis*. Pearson.
- Ramayah, T., Yeap, J. A., Ahmad, N. H., Halim, H. A., & Rahman, S. A. (2017). Testing a confirmatory model of facebook usage in smartPLS using consistent PLS. *International Journal of Business and Innovation*, 3(2), 1–14.
- Raza, S. A., Qazi, W., Khan, K. A., & Salam, J. (2021). Social Isolation and Acceptance of the Learning Management System (LMS) in the time of COVID-19 Pandemic: An Expansion of the UTAUT Model. *Journal of Educational Computing Research*, 59(2), 183–208. doi:10.1177/0735633120960421
- Reddy, P., Sharma, B., & Chaudhary, K. (2021). Digital literacy: A review in the South Pacific. *Journal of Computing in Higher Education*, 1–26. doi:10.100712528-021-09280-4
- Report, D. (2020). On Int'l day of awareness of food loss and waste, experts want end to wastage. *The Daily Star*.
- Reyna, A., Martín, C., Chen, J., Soler, E., & Díaz, M. (2018). On blockchain and its integration with IoT. Challenges and opportunities. *Future Generation Computer Systems*, 88, 173–190. doi:10.1016/j.future.2018.05.046
- Roussou, I., & Stiakakis, E. (2016). *Adoption of Digital Currencies by Companies in the European Union: A Research Model combining DOI and TAM*. Paper presented at the 4 th International Conference on Contemporary Marketing Issues ICCMI, Heraklion, Greece.
- Sair, S. A., & Danish, R. Q. (2018). Effect of performance expectancy and effort expectancy on the mobile commerce adoption intention through personal innovativeness among Pakistani consumers. *Pakistan Journal of Commerce and Social Sciences*, 12(2), 501–520.
- Sarfraz, Z., Sarfraz, A., Iftikar, H. M., & Akhund, R. (2021). Is covid-19 pushing us to the fifth industrial revolution (Society 5.0)? *Pakistan Journal of Medical Sciences*, 37(2), 591. doi:10.12669/pjms.37.2.3387 PMID:33679956
- Sen, S., Antara, N., Sen, S., & Chowdhury, S. (2020). The Unprecedented Pandemic 'COVID-19' Effect on the Bangladesh Apparel Workers by Shivering the Apparel Supply Chain. *Journal of Textile and Apparel, Technology and Management*, 11(3), 1–20.
- Shabur, A., Hridoy, M. W., & Rahman, K. A. (2021). The investigation of challenges of implementing Industry 4.0 in Bangladesh. *Academia Letters*, 2.
- Shadat, M. W. B., Islam, M. S., Zahan, I., & Matin, M. (2020). *Digital Literacy of Rural Households in Bangladesh*. Academic Press.
- Shammi, M., Bodrud-Doza, M., Islam, A. R. M. T., & Rahman, M. M. (2021). Strategic assessment of COVID-19 pandemic in Bangladesh: Comparative lockdown scenario analysis, public perception, and management for sustainability. *Environment, Development and Sustainability*, 23(4), 6148–6191. doi:10.100710668-020-00867-y PMID:32837281


Factors Affecting on IoT-Based Business Management in the Post-Pandemic Period

- Soni, G., Mangla, S. K., Singh, P., Dey, B. L., & Dora, M. (2021). Technological interventions in social business: Mapping current research and establishing future research agenda. *Technological Forecasting and Social Change*, 169, 120818. doi:10.1016/j.techfore.2021.120818
- Taşel, F. (2020). Evaluation of Covid19 Pandemic From an Economic Perspective. *Journal of International Trade. Logistics and Law*, 6(2), 176–181.
- Tun, P. M. (2020). An Investigation of Factors Influencing Intention to Use Mobile Wallets of Mobile Financial Services Providers in Myanmar. *The Asian Journal of Technology Management*, 13(2), 129–144. doi:10.12695/ajtm.2020.13.2.3
- Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, 39(2), 273–315. doi:10.1111/j.1540-5915.2008.00192.x
- Venkatesh, V., & Brown, S. A. (2001). A longitudinal investigation of personal computers in homes: Adoption determinants and emerging challenges. *Management Information Systems Quarterly*, 25(1), 71–102. doi:10.2307/3250959
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *Management Information Systems Quarterly*, 27(3), 425–478. doi:10.2307/30036540
- Venkatesh, V., Sykes, T. A., & Zhang, X. (2011). *Just what the doctor ordered: a revised UTAUT for EMR system adoption and use by doctors*. Paper presented at the 2011 44th Hawaii International Conference on System Sciences. 10.1109/HICSS.2011.1
- Wang, T., Lu, Y., Wang, J., Dai, H.-N., Zheng, X., & Jia, W. (2021). Eihdp: Edge-intelligent hierarchical dynamic pricing based on cloud-edge-client collaboration for iot systems. *IEEE Transactions on Computers*, 70(8), 1285–1298. doi:10.1109/TC.2021.3060484
- Yaprak, Ü., Kılıç, F., & Okumuş, A. (2021). Is the Covid-19 Pandemic Strong Enough to Change the Online Order Delivery Methods? Changes in the Relationship Between Attitude and Behavior Towards Order Delivery by Drone. *Technological Forecasting and Social Change*, 169, 120829. doi:10.1016/j.techfore.2021.120829

Chapter 5

Framework for Assessing Online Shopping Use Under the Digital Transformation of the Economy in a Post–Pandemic Era

Abubakar Mukhtar Yakasai

 <https://orcid.org/0000-0002-4642-2853>

Universiti Brunei Darussalam, Brunei

Mohammad Nabil Almunawar

 <https://orcid.org/0000-0001-5296-2576>

Universiti Brunei Darussalam, Brunei

Muhammad Anshari

 <https://orcid.org/0000-0002-8160-6682>

Universiti Brunei Darussalam, Brunei

ABSTRACT

The sudden appearance of COVID-19 has positively ameliorated digital presence generally as well as B2C e-shopping transactions. This situation attracts researchers' interest to unravel the effect of COVID-19 vis-à-vis various e-commerce activities. Recent studies have already shown a direct impact of the pandemic on many businesses, especially B2C transactions. However, its moderation effect and its effect as a control variable were scarcely traced in the literature. Hence, the chapter explains and proposes a framework for assessing online shopping use under the digital transformation in a post-pandemic era, including both a moderating and a control effect of the COVID-19 pandemic. Building on the TAM theoretical model, the proposed framework added risk factors and channel credibility as additional independent variables and the COVID-19 pandemic as both a moderating and a control variable, respectively. Using existing literature, the authors establish relationships among variables and conceptualise both the moderating and control effects of the COVID-19 pandemic, respectively.

DOI: 10.4018/978-1-7998-9664-7.ch005

INTRODUCTION

Under the digital economy, traditional business models have entirely changed so that the digital transformation sharply impacted the transition in products and services (Pilik, Juříčková, & Kwarteng, 2017). Earlier, the Organisation for Economic Co-operation and Development (OECD) (2014) clarifies that the Internet has entered every aspect of human life and society, particularly in driving innovation vis-à-vis business models and new products, as well as easing transactions. As a result, the global retail industry witnesses significant transformation through electronic commerce (e-commerce), whereby customers have substantially migrated from brick-and-mortar to online shopping activities. Also, the current Covid-19 pandemic, which affects every aspect of businesses positively and otherwise, has greatly ameliorated Business-to-Consumer (B2C) transactions (Zhao & Bacao, 2020).

With the continued impact of the Covid-19 pandemic on businesses coupled with digital information, it becomes necessary for B2C e-retailers to keep assessing online shopping use among consumers, especially in a post-pandemic era, to shape their business sustainability and continuity planning. The retail industry is one of the most affected industries by the digital transformation, specifically in e-commerce B2C transactions. According to Chaffey (2016, p.27), B2C e-commerce is a commercial transaction between sellers and direct consumers. To achieve successful B2C transactions, e-tailers need proactive customer knowledge to effectively convert potential customers into actual buyers, especially in crises such as the Covid-19 Pandemic. Once they adequately achieve this situation, they might likely cushion the adverse effect and aftermath of the pandemic on the B2C dealings (Zhao & Bacao, 2021).

For instance, in a continued digitally transformed Asian economy, e-shopping has increasingly been adopted to the extent that most consumers continuously express interest in using it (Singh, & Srivastava, 2019) due to the rapid digital transformation in Asia and across the globe. As of March 2021, the global Internet users reached over 5.17 billion, having a 65.6% penetration rate (Internet World Stats, 2021). The total internet users stood at 2.76 billion in the Asia Pacific, indicating about a 63.8% penetration rate. This means an annual digital change of almost +9.2% (+204 million users). Similarly, global e-commerce spending has been projected to increase from \$3.354 trillion in 2019 to \$4.819 trillion in the first quarter of 2021 due to the Covid-19 pandemic (e-marketer, 2020). This shows that B2C e-commerce is significantly affected by the present pandemic coupled with widespread digital transformation among various economies. Consequently, e-retailers may be interested in keeping informed about whether customers will maintain this trend beyond the present pandemic and how the pandemic can play a contingent role in the B2C transaction. Hence, addressing the preceding issues motivates the current proposition to conceptualise a framework for assessing B2C online shopping use under the digital transformation of the economy in a post-pandemic era.

Problem Statement

In late 2020, the dramatic increase in B2C online shopping amid movement restriction induced by Covid-19 raises e-retail sales' share of total retail value from 16% to 19% (UNTAD Report, 2021), and the trend shows evidence of continuity. It becomes essential to devise a framework to investigate and assess online shopping use in a digitally transformed economy, particularly in a post-pandemic era. However, Information System (IS) researchers' interest focuses more on investigating the impact of the pandemic on e-commerce in general (Hasanat et al., 2020; Roggeveen & Sethuraman, 2020; Zhao & Bacao, 2020), neglecting its specific effect on B2C online shopping. Such oversight might likely produce insufficient

knowledge regarding the continuous effect of Covid-19 in dealing with consumer behaviour vis-à-vis actual online use in a post-pandemic era.

Furthermore, despite the high rate of online shopping acceptance, research shows that many consumers, particularly in developing nations, did not fully patronise online shopping (Izogo & Jayawardhena, 2018). Some reasons responsible for such situation include consumer scepticism vis-à-vis the online shopping channel's credibility (Gabriel, Ogbuigwe, & Ahlazu 2016) and intense customer complaints concerning the risks related to online shopping transactions. For example, many customers lament frequent fraud, money lost in, wrong product delivery, and poor performance during online transactions, among others. Similarly, B2C e-shopping literature stressed more on consumer demographics, socio-cultural factors, e-shopping platforms, or product types as moderators of the effect of intention on e-shopping use. However, with the present Covid-19 pandemic, it is imperative to explore how the Covid-19 pandemic could moderate intention – actual online shopping use relationship and find out whether the pandemic could be a control variable in a typical B2C e-shopping use among consumers. Accordingly, this chapter aims to propose a framework for assessing online shopping use while exploring the moderating role of the Covid-19 pandemic and its control effects, respectively. If empirically tested, the proposed framework will keep retailers abreast on the consumer online shopping amid the digital transformation of the economy.

To achieve the stated purpose, the authors address the following research questions: Does an extended Technology Acceptance Model help develop a befitting model for online shopping use in a post-pandemic era? What combination of factors determines actual online shopping use in a post-pandemic era? Can Covid-19 Pandemic serve a dual role of a moderator and a control variable vis-à-vis online shopping use? Accordingly, this chapter explains and proposes a framework for assessing online shopping use under the digital transformation of the economy in a post-pandemic era through an extended TAM model. The remaining part of the chapter is organised as follows. The next section presents the theoretical background, followed by an empirical conceptualisation of the framework's proposition. Subsequently, the author describes the proposed relationships in the framework. It followed by a discussion of the research implications, limitations, and directions of future investigation, and finally, a conclusion was drawn.

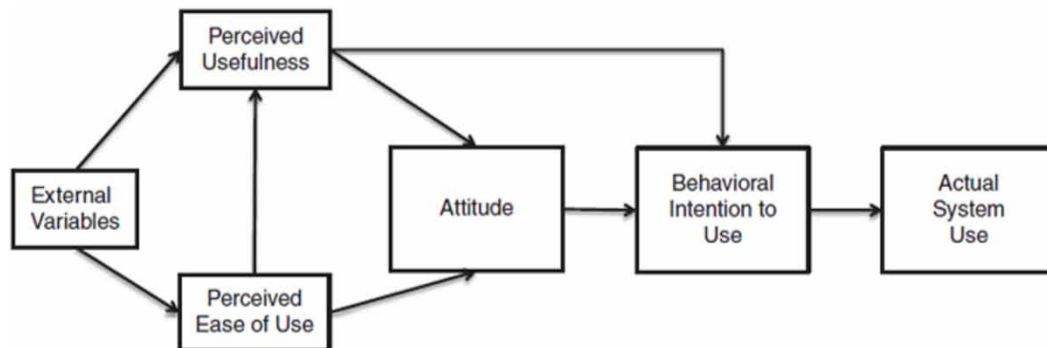
Theoretical Background:

Technology Acceptance Model (TAM)

Assessing Information Technology (IT) use and predicting user behaviour became easy with the development of the Technology Acceptance Model (Davis, 1989), which is an adaptation of the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) following the latter's limitation in predicting user behaviour. TAM (figure 1) conceptualises that a person's decision to use IT depends on a likely result's evaluation of how useful or easy the technology might be. Thus, the duo beliefs factors are termed Perceived-ease-of-use (PEU) and Perceived usefulness (PU). According to Davis (1989, p320), PEOU is "the degree to which a person believes using a system is free of effort," while PU defines "the extent of believability that using a system would enhance job performance." Consequently, IT researchers validated the efficacy of the TAM in investigating the usage, acceptance, and rejection of many ITs (Aref & Okasha, 2020).

According to previous researchers (e.g. (Turner, Kitchenham, Brereton, Charters, & Budgen, 2010; Davis & Venkatesh, 2000), the original TAM may not necessarily explain user behaviour in all contexts

Figure 1. Technology acceptance model (Davis, 1989)



leading to the history of the model’s extensions. As a result, several variables like normative beliefs, system quality, online experience, personal characteristics, and psychological perceptions were incorporated during many research investigations. Nevertheless, none of those extensions universally explain IT acceptance and usage in all contexts, particularly in a B2C purchase context (Singh & Srivastava, 2019; Wu, 2020). Consequently, in proposing its framework, the present paper extends the TAM by incorporating additional variables, namely, risk factors and channel credibility as independent variables, and Covid-19 pandemic as moderating and control variables. Considering the situational context of current B2C online shopping characterised by the Pandemic crisis and global digital transformation of various economies, the author uses Stimulus-Organism-Response (S-O-R) theory to support conceptualising its propositions covid-19 pandemic as moderating variable.

Online Shopping and Consumer e-Shopping Use Behaviour

Online shopping consists of buying and selling activities conducted through the Internet. The concept has been defined by many in several contexts. One comprehensive definition views it as “ all forms of activities consisting product or services buying carried out on the Internet, (Al-Maghrabi et al., 2011). Consequently, this study uses electronic shopping (e-shopping), internet shopping, digital shopping, and virtual shopping interchangeably. It is simply a digital version of traditional brick-and-mortar shopping whereby transactions and other related functions happen over the Internet. Thus, to engage in these activities, the customer undergoes through series of actions from conceiving the needs of the product or service to ultimate purchase. When a customer patronises any digital shopping platform and makes a purchase, it is considered that the customer is using internet shopping as alternate means of transaction. Hence, how customer endures and relates to shopping processes and makes transactions are regarded as online shopping use behaviour.

Meanwhile, scholars have defined general shopping behaviour as seen by consumers in their product searching, buying, alternative evaluation, and ultimate use of the products and services expected to address intended needs and requirements (Schiffman & Kanuku, 2007; Solomon, 2010). Also, according to many viewpoints, customer buying behavior follows five primary successive stages construed on an interdisciplinary approach. For example, Blackwell et al. (2012) views it as “those activities individual’s acts directly involve in obtaining, using, and disposing of economic goods and services, including the decision that precedes these acts.” Putting this into an online shopping scenario, an online customer

recognises a product's need, searches for the product information online, and compares competitive products to decide on a specific choice. Ultimately, the customer purchases from a particular online vendor that meets prescribed shopping requirements. Such activities are regarded as online shopping use behaviour. Nevertheless, the possible question remains what motivates consumers towards these purchase activities, particularly digital economy transformation, in a post-pandemic period? To address this fundamental question, the current paper proposes a conceptual framework, with relevant factors, for assessing online shopping use.

Digital Transformation and Internet as Shopping Channel

Digital Transformation emerged as a phenomenon in strategic information system research (Piccinini, Gregory, & Kolbe, 2015), encompassing the significant changes happening in industries and society through digital technologies (Vial, 2021). In this regard, technology remains the primary tool that will keep businesses competitive in customer targeting and acquisition, particularly during a pandemic time such as Covid-19. Information and Communication Technologies (ICTs) reinforced customer behavioural changes in all transaction activities, leading to a significant move into the service economy from the industrial economy (Pilik et al., 2017). Thus, digital transformation has radically altered the means through which products and services are designed, developed, produced, transacted, distributed, exchanged, and consumed. For this purpose, customers across the globe have since embraced the Internet as alternative means of transaction over traditional brick-and-mortar business channels, mainly due to its information provision capacity and simplifying product purchase. Notwithstanding, internet transaction was initially viewed as a risky but convenient and straightforward alternative (Bhatnagar et al. 2000). However, such a trade-off between internet shopping convenience and risk is realised as the bedrock of alternative shopping channel choice.

Internet existence has positively impacted the contemporary forms of business, claiming the information revolution period (Svatošová, 2015). Pilik et al. (2017) and Kotler and Pfoertsch (2007) characterized the digital revolution as benefits consumers. Such benefits include a tremendous increase in customer purchasing power; higher product assortments and availability; reach information; improved opportunities with different sellers during a transaction; convenient communication; and exchange of positive customer experience. Thus, the digital revolution has helped business leaders have a strategic vision towards digitalization due to its imminent advantages. One element of the digital revolution is support for disintermediation, which facilitates quick linkage of a business to clients and customers to businesses anywhere and comparative cheaper cost of digital transformation implementation in the future (Hemachandra & Sharkasi, 2021). This will drastically reduce the cost of doing business, resulting in continuous downward pressure on prices and higher customer patronage.

Presently, most economies are being transformed digitally to catch up with the new normal brought by the Covid-19 pandemic. This situation keeps businesses changing ways and strategies, particularly as the new Covid-19 variants keep emanating, warning both businesses and customers that it could stay for a longer time than expected (Parlakkiliç, Üzmez, & Mertoğlu, 2020). Therefore, to remain competitive in the current digital marketplace, businesses should maintain an up-to-date digital presence, meeting the demand and high customer expectations while sustaining the new normal brought about by the pandemic. To achieve the stated objective, businesses need prompt and up-to-date information regarding customers vis-à-vis what attracts them to online shopping channels amid the Covid-19 Pandemic, ongoing digital

Figure 2. Opportunities and threats for the circular economy arising from e-commerce (Romagnoli, et al (2020, p10)

<i>Cluster:</i>	<i>Opportunities:</i>	<i>Threats:</i>
Accessibility of Information	Availability of information; Big data/meta data Innovation; Market access to online aftermarket; and product portfolio.	International market access and Ubiquity.
Consumer needs and behaviour	Nudging and Sharing models and services.	Cross-selling and up-selling; Ease of shopping; Personalised design; and Shopping frenzy.
Digitalisation	Digital goods; Reduction of retail space; and Substitution of printed marketing material	Operation of network infrastructure
End of Life	Extended product selling cycle; Product take-back; ReCommerce: Second-hand E-commerce /online auctioning; and Food waste.	Food waste and End-of-Life challenges.
Legal Framework		Difficulty to monitor; Enforcement; EPR free-rider effect; and lack of compliance with common market regulation.
Logistics and transport	In-House Fulfilment; Collaboration between companies and partnering with waste management suppliers; Optimisation of supply chain; and Substitution of individual shopping trips.	Damage on delivery; Individual product delivery; Induced freight traffic to remote locations; Induced parcel transport; Inefficient transport; Inferior types of transportation; Parcel return; and Waste from returns.
Packaging	Development of dedicated optimised packaging solutions.	Excessive protective packaging and Secondary Packaging.

transformation, and a quest for a circular economy. Consequently, proposing a framework for assessing B2C online shopping in the current scenario is worth the effort.

Lacy, Long, and Spindler (2020) examine the role that ten different industries could play in the circular economy and how they can realize significant value through the large-scale adoption of circular principles. Their assessment showed the considerable role of e-commerce’s cross-cutting industry in generating circular value in three ways: value addition via cost reduction, revenue generation, and revenue migration facilitated by ICTs. Also, Romagnoli et al. (2020) made an in-depth assessment of the opportunity and threats for circular economy arising from e-commerce (see figure2), clearly indicating the positive effects of e-commerce vis-à-vis actualising circular economy. Recently, Peng et al. (2021) analysed the circular economy of the e-commerce market to precisely predict the e-commerce market dynamics and raise the total value of the circular e-commerce industry. Their analysis concluded that it is essential to assess the circular economy of the e-commerce market to attain the holistic global circular economy objectives.

Covid-19 Pandemic and B2C Online Shopping

Corona Virus Disease, also known as Covid-19, first surfaced in Wuhan, China’s Hubei province, in December 2019. Since its appearance in 2019, it has infected almost all countries worldwide and seriously devastated the global economy (Bhatti, Akram, & Khan, 2020). According to World Health Organization (WHO, 2021), there have been over 209 million confirmed cases of Covid-19, including over 4 million deaths. Sadly, despite vaccination efforts, the virus keeps mutating into new variants such as Delta, which are more devastating than the original variant. Initially, to curve the menace of this virus, public areas like

schools, offices, beaches, officers, and universities were closed for people to stay at home and prevent the virus spread. These measures led to an increase in B2C online shopping patronage (Parlakkiliç et al., 2020). This argument corroborates Sheth (2020), who asserts that among the immediate impact of Covid-19 on consumption behaviour was embracing digital technology by consumers.

In the wake of the Covid-19 pandemic, consumers embraced digital technology out of necessity by adopting new technologies and applications that have hitherto not been used, especially online stores, to satisfy day-to-day groceries and food demands. This corroborates the significance of virtual market-space vis-à-vis B2C e-commerce. Consumers use virtual marketplaces to react to, cope with and adapt to periods of environmentally imposed restraint (Guthrie, Fosso-Wamba, & Arnaud, 2021) without which the situation would have been devastating. Similarly, Dumanska, Hrytsyna, Kharun, & Matviets (2021) post-pandemic forecast affirmed a perpetual increase in world sales in e-commerce courtesy of virtual marketplaces. Other benefits include the development of e-commerce and m-commerce around big data, personalization, e-mail marketing, transition of commerce to e-commerce, ordering services online and transition of retail to online, electronic public procurement, omnichannel and multichannel, and socially oriented commerce, among others.

For example, online food delivery apps and payment systems received skyrocketed traffic immediately after the sudden appearance of the pandemic (Zhao & Bacao, 2021), making stores come home (Sheth, 2020). With the currently renewed lockdown, social distancing, and other preventive measures taken by various governments due to the second wave of the present pandemic, retailers have strengthened their efforts of customer acquisitions and targeting by showcasing their willingness and abilities to bring forth their valuable offerings at the customer's doorstep with the help of digitalisation and Internet of things technologies ranging from enhanced online product searching, order placing, improved delivery services, as well as product return policies. From customers' point of view, despite the restrictive consequences of the pandemic, many have expressed satisfaction with the new and improved B2C shopping improvement, particularly in meeting their unending and dynamic expectations (Parlakkiliç et al and a significant rise of Consumer-to-Consumer (C2C e-commerce. Hence, e-vendors need proactive and continuous strategies amid the ongoing pandemic or even after the pandemic for effective business and service delivery.

CONCEPTUAL FRAMEWORK PROPOSITION

Following the above discussion, the proposed model leverages the TAM and incorporates other variables: financial risk, security risk, channel credibility, and covid-19 pandemic. These constructs are selected for their immense relevance in the current B2C online shopping context. These variables merit inclusion into the current research framework because of their significance and relevance in comprehending online shopping use behaviour in the current situation. Previously, researchers successfully extended the TAM model to improve its predictive power (Aref & Okasha, 2020; Turner et al., 2010). Hence, the current author believes that the proposed conceptual framework will simplify the assessment of B2C online shopping use in the current digital transformation of the economy amid crises of the Covid-19 pandemic. The constructs used in this study are briefly defined in table 1.

Table 1. Constructs definition

Construct	Definition
Actual Online Shopping Use Behaviour	The consumer decision/action to buy a particular product or service online.
Intention to use Online Shopping	An expression of the individual’s determination and willingness to buy products or services online is considered the immediate cause of user behaviour.
Perceived ease of use	The degree to which a consumer believes that using an online shopping system would be free of effort.
Perceived usefulness	The degree to which a consumer believes that using an online shopping system would enhance their shopping performance.
Perceived channel credibility	It refers to customer perception of trustworthiness, reliability, and dependability towards online shopping channels.
Financial Risk	It refers to some expected consequences arising from online products or services purchases.
Security Risk	It refers to some threats or vulnerabilities expected while transacting business online such as unauthorised third-party access into personal data for dubious gains.
Covid-19 Pandemic	The ongoing global pandemic of Coronavirus disease 2019 (Covid-19) result from “Severe Acute Respiratory Syndrome Coronavirus 2” (SARS-CoV-2)

Source: (Author, 2021)

Actual Online Shopping Use Behaviour

Purchase behaviour connotes “total consumer behaviour intended towards satisfying needs and desires through searching products’ information, generating purchase intention, comparing products for decision-making, and ultimately buying the products” (Moslehpour et al., 2018). From an online shopping viewpoint, it comprises all types of activity carried out by a consumer to satisfy needs and wants via internet technology. It involves using the Internet to search for products and information that results in favourable intention, product comparison from various vendors’ sites, checking prices, and ultimately deciding to buy from certain e-vendor. This chapter conceptualises such activity, as actual online shopping use behaviour, as the study’s dependent variable. Previously, studies have measured actual online shopping use via many factors. However, none has been proved to apply to all contexts, particularly under the present Covid-19 pandemic. Hence, the need for further conceptualisation to meet the current scenario.

A study among Taiwanese university students examines online shopping behaviour using extended TAM, where the author incorporates five factors of shopping use. They indicate that trust and intention have a significant effect on actual use behaviour. Later, Jamil (2012) integrated TPB and TAM to examine essential factors of actual online buying among Malaysian consumers. The author added Risk factors and basic TAM and Theory of Planned Behaviour (TPB) constructs in the model as a significant determinant of actual use behaviour.

Furthermore, Celik (2016) employed the Unified Theory of Acceptance and Use of Technology (UTAUT) to explore actual online shopping use among Turkish consumers. His framework shows a significant effect of intention and facilitating conditions as direct determinants of actual use. In Driediger and Bhatiasevi’s (2019) study among Thailand online grocery shoppers, perceived risk, subjective norm, and visibility were antecedents of ease-of-use, whereas perceived enjoyment predicts usefulness. Recently, a survey among Egyptians (Aref & Okasha, 2020) shows that a modified TAM model

incorporating enjoyment, subjective norm, and online subjective norm could strongly predict actual use behaviour among Egyptian e-shoppers.

The studies discussed above show a diverse use of factors predicting online shopping use in a different context. Generally, the studies recommend continuous investigation regarding dynamic consumer nature to fit the situation, particularly in the unending digital transformation of various economies amid the Covid-19 pandemic. Hence, this chapter acted on those recommendations to conceptualise a framework for assessing online shopping use incorporating moderating and controlling effects of the Covid-19 pandemic. This is to enable the e-tailers' business continuity plan and sustainability in a post-pandemic era.

Intention to Use and Actual Online Shopping Use

Venkatesh et al. (2003) have earlier established intention as the most significant and direct determinant of use behaviour. Intention deals with motivation, which shows how a person is willing and determined to carry out a given task or behaviour (Lai, 2017). In this study, intention deals with the determination to use the Internet and associated technologies solely to buy products or services. The possibility of using online shopping as an alternative purchase channel could be explained better by consumer intention. For Celik (2016), modeling actual online shopping use without consumer intention online shopping use may result in a model fit with less predictive relevance.

As the technology diffused among consumers, actual use should be the focal point rather than mere intention (Driediger & Bhatiasevi, 2019). With the current pandemic amid vast digitalization, e-vendors need to know the extent to which consumers patronise digital shopping platforms rather than expressing a mere intention. Previously, studies have established a positive association between intention actual use (Celik, 2016), while other scholars like Saade et al. (2008) found a negative association earlier. For instance, A strong argument was made by Celik (2016) that without positive intention, there may not be a positive outcome of actual use. To buttress this assertion, an empirical study in Thailand argued that customers are pulled into actual online shopping use when they have a favourable predetermined intention, nurtured from previous experience (Driediger & Bhatiasevi, 2019). A prior meta-analysis by Turner et al. (2010) reveals 90% success of actual e-shopping use determined by positive intention. Hence, we postulate a significant positive association between intention and actual online shopping use.

Perceived Ease-of-Use, Perceived Usefulness, and Intention

Perceived ease-of-use (PEOU) measures “the degree to which one believes that using a system will be free for effort” while Perceived usefulness (PU) is “the extent to which one believes that using a system improves one’s job performance” (Davis, 1989, p.320). Specifically, these two belief constructs estimate a person’s view that using a particular technology might be practical and straightforward. Empirical studies have invariably established a positive association between the two belief constructs and intention towards many several technologies, namely among others, multichannel retailing (Singh & Srivastava, 2019), online booking (Kucukusta et al., 2015), and online food delivery apps (Zhao & Bacao, 2019). The current study views PEOU as an online shopper’s belief that it will be effortless, hitch-free, and less difficult to use online channels for shopping transactions. It could happen when online shopping channels are designed with less complexity and easier for product search, comparison, making payment, quick delivery, and effect product return policy. Similarly, PU is viewed as the online shoppers’ belief about the efficiency of product and service purchases. E-shopping efficiency might be expressed in terms of

overall cost incurred, comprising monetary (actual price paid) and non-monetary costs (time, psyche cost, energy, and opportunity cost of online product purchase).

Based on extant literature, PEOU and PU are the most cited determinants of intention to use online shopping (Singh & Srivastava, 2019; Sohn & Groß, 2020). Mostly, they reveal that PEOU and PU have a positive association with intention toward online shopping. As technology continues to evolve amid continuous market digitalisation, the effect of the duo variable will continue to make an impact in the B2C e-shopping context. Although Khalilurrahman et al. (2014) maintain that such a scenario may appear possible among experienced users than new ones, Kim (2016) observes that as consumers experience using online shopping online continuously, the effect of PEOU toward intention will likely decline. Thus, one should not expect the two constructs to play a similar impact in all scenarios. For example, during Covid-19, consumers expect quick product delivery since ease of use and usefulness might be controlled by the effect of the pandemic. In such a situation, the intention may play a significant role in predicting actual use. Such a situation was revealed by Gunadi et al. (2019), whose study shows the insignificant effect of PEOU and PU on intention. Therefore, the current paper argues that PEOU and PU might not be a strong determinant of actual online shopping during or in a post-pandemic era.

Financial Risk, Security Risk, and Intention

There is a general assumption in perceived risk theory that “humans prefer less-risky decisions to larger ones, provided other externalities like expected values remain constant, and the successive negative outcome is independent of all others” (Mitchell, 1999, p.167). This assumption underlays the inverse risk-human behaviour relationship. Hence, to continuously explain how specific risk factors affect customer behaviour, particularly in dynamic digitally transformed economies, scholars suggested investigating the effect of specific risk factors rather than the broad concept of risk (Patro, 2019). Consequently, we sought to incorporate in our framework the dual effects of financial and security risk vis-à-vis intention to use online shopping, which ultimately leads to actual use during and in a post-pandemic era.

In this context, financial risk involves the loss of money while making a transaction online. In theory, it is postulated that finance-related risks occur at the early stage of online shopping, where a consumer makes an order. Similarly, empirical results prove that most consumers are sceptical about shopping online because of expected monetary loss during the transaction (Ariffin et al., 2018). Thus, a higher expected financial risk tends to reduce customers’ decision capacity to buy online. Forsythe and Shi (2003) observe that financial risk is the most salient determinant of electronic shopping use. We then argue that the frequent rise in scamming activities amid the digital transformations of various economies, particularly during the Covid-19 pandemic, will raise consumer scepticism towards online shopping use. Hence, financial risk will be strongly and negatively associated with online shopping intention during and in a post-pandemic era.

Equally, online consumers must worry about safety and protection concerning personal data disclosure and credit card use, otherwise referred to as security risk (Patro, 2019). In the same vein, the premise of the perceived risk theory cited above (Mitchell, 1999, p.167) connotes the security risk-behaviour relationship. Several empirical studies (for example, Masoud, 2013; Patro, 2019) established that, apart from the loss of money, fraud related to credit card theft might drastically reduce online purchases, especially with rising scamming activities. Such condition was found prevalent during the covid-19 pandemic (Zhao & Bacao, 2021) in markets characterised by weak and volatile financial systems, mostly found in economies that are undergoing digital transformation in developing nations (Khan & Uwemi, 2018;

Tham *et al.*, 2019). Therefore, the current study argued that with improved online security amid the Covid-19 pandemic, we may expect a positive association between security risk and intention towards online shopping.

Online Channel Credibility and Intention

The construct credibility was initiated originally from the source credibility theory in communication literature to evaluate the acceptance of information from media outlets. According to Hu and Sunder (2010), it describes “the extent to which people trust media such as television, newspapers, magazines, radio, and later the Internet. The concept was subsequently incorporated and applied in a practical business-related discipline (Straus & Frost, 2014) to evaluate advertisement effectiveness concerning sales. Its application in a business context is due to advertisement’s peculiarity to general media communication. Powel (1965) opined that the credibility of a message source could stimulate the message acceptance and decode with less interference. Conversely, the proponent of source credibility theory in a business context opined that source of advertisement could improve the campaign effectiveness, thereby leading to fruitful response (Jäger & Weber, 2020).

Moreover, prior literature explicates credibility as a multidimensional construct, constituting variables like trustworthiness, expertise, and dependability (Teo & You, 2005). However, Kim (2016) treated the concept as a single dimension construct, referring to it as ‘credibility’ in its natural form yet relates to privacy and security. This has been an additional contribution made regarding the concept’s conceptualisation. Notwithstanding, privacy and security could be treated as a separate construct since empirical evidence shows that while privacy and security relate more to users’ financial or personal data loss during a transaction, credibility is more of trustworthiness. Like Teo and You (2005), in the current proposition, we explicate credibility from the customers’ viewpoint of how honest, dependable, or reliable an e-vendor might be, in addition to the technical aspect of the system. Rafalak, Abramczuk, and Wierzbicki (2014) observed that risk-taking ability and trustworthiness play an essential role in evaluating a website’s credibility because the intuitive visitor may likely be more honest than high-risk-takers in such scenario.

An earlier assertion by Yoon *et al.* (1998) argues for the relevance of online channel credibility in customer acquisition, maintenance, and retention. The entire digital marketing success depends significantly on how credible customers perceive a channel before a transaction occurs. For Jäger and Weber (2020), the impersonal nature of online-based transactions necessitates and pushes e-vendor towards credibility building, which has become one of the essential pillars in e-commerce success. Consequently, for business to thrive, e-vendors should understand that customers expect a credible shopping platform that nurtures positive intention as a precursor of transactional relationships (Straus & Frost, 2014). Recently, Jäger and Weber (2020) reiterated the influence of source credibility defined by vendor’s channel in building positive intention, particularly about new shopping channels. Consequently, the present study’s conceptualisation of online channel credibility means the possibility to make e-shopping channels trustworthy, dependable, and reliable as perceived by existing and potential customers, respectively. Therefore, we posit a positive association between online channel credibility and intention towards online shopping.

Covid-19 Pandemic as a Moderating Variable between Intention to Use and Actual Online Shopping Use?

As mentioned earlier, Covid-19 is a disease that suddenly surfaced in Wuhan, China. Its impact afflicted every sphere of human activities in the globe, particularly business transactions. This situation pushed consumers to embrace digital technology to continue with day-to-day activities immediately. Hence, we consider this pandemic as a situational variable capable of strengthening B2C online shopping use. Previous research has empirically proved that specific situational factors are among the contingent variables that moderate consumer responses online. According to Yazdanparast and Spears' (2013) investigation, situational-specific factors could moderate the relationship between consumer haptic motivation and consumer responses in an online context. Specifically, they show that positive mood, price promotions, and level of situation-specific product expertise results in higher purchase intentions.

While conceptualising the moderating effect of Covid-19, this study employs the Stimulus-Organism-Response (S-O-R) theory. Prior research has established its predictive relevance regarding how retail consumers respond to novel environmental or situational stimuli (Gao & Bai, 2014; Laato, Islam, Farooq, & Dhir, 2020). Researchers in marketing have long used this theory to unravel the effects of environmental situation factors (Xu et al., 2014). Based on the work of Mehrabian and Russel (1974), the theory conceptualised behaviour as cyclical in an environment that comprises *stimuli*. The *stimuli* influence the *organism*, particularly consumers' cognitive and affected processes, leading to certain behavioral responses. These links help in understanding how certain stimulus factors can indirectly affect the outcome. In this situation, the author referred to Covid-19 as the environment and situational stimulus which triggers consumer organismic intention. Then the contingent effect of the pandemic on consumer willingness to use online shopping will strengthen the final response (actual online shopping patronage). Therefore, based on the S-O-R theory, this study regards the covid-19 pandemic as a specific situation that vehemently impacted all business activities (Roggeveen & Sethuraman, 2020). The pandemic is seemingly a stimulus that triggers a positive response on general internet use and associated technologies, mainly e-commerce. For example, B2C witnesses positive responses in the retail industry due to lockdown, social distancing, and increased use of digital marketplace. The result has been increased e-shopping patronage among consumers.

In retrospect, Zwanka and Buff (2021) profound a conceptual framework for consumer behavioural shift caused by the Covid-19 pandemic among the USA generational cohorts. The authors suggest to marketers the possible long-term behavioural shifts from the Covid-10 pandemic of 2020 and the resulting shift in consumer behaviour. It indicates that amid the covid-19 pandemic, intention towards behaviour may positively change, especially when the behaviour in question concerns necessities for survival. Similarly, Alhaimer's (2021) study in Kuwait empirically shows that consumer attitude and behaviour towards online shopping fluctuate in times of emergency, particularly referring to the ongoing Covid-19 pandemic. Specifically, the author reveals that risk factors towards online shopping such as risk susceptibility, risk severity, risk of formal penalties, product, financial, and non-delivery risks affect the attitude and behaviour of consumers toward online shopping in typical non-emergency situations, differ from those during an emergency. It hinted that a pandemic such as Covid-19 could moderate the consumer intention-behaviour relationship.

An earlier study in the context of online grocery shopping (Hand, Riley, Harris, Singh, & Rettie, 2009) investigates the influence of situational factors in the process of adopting online grocery shopping. The authors' analysis reveals the importance of situational factors such as having a baby or developing

health problems as triggers for starting online grocery shopping. However, shoppers tend to stop online grocery shopping once the trigger has disappeared or had a problem with the service. The current author likened such a situation with the current Covid-19 pandemic as a situational trigger that has made non-shoppers start or existing ones continue. Nevertheless, the Covid-19 pandemic is not showing signs of disappearance anytime soon. Thus, the author argues that the covid-19 pandemic as a situational factor might likely continue to strengthen online shopping use among consumers.

As well, covid-19 is a situational factor that appeared capable of changing the effects of human-related behaviour. Concerning B2C e-commerce, the situation has positively affected consumer behaviour towards the Internet and many digital technologies. Therefore, the current study argues that with the covid-19 pandemic, the relationship between intention to use and actual online shopping use would be stronger and vice-versa, particularly when economies continue towards digital transformation. The author further argues that such a moderating effect will continue to strengthen the relationship and shape consumer behaviour in general, vis-à-vis B2C online shopping use even after discontinuing the pandemic courtesy of adapting to the new normal brought by the pandemic. In Addition, in the proposed framework, we added the Covid-19 pandemic as a control variable to reduce the interference to the study according to the current study on B2C online shopping during pandemic situations and e-commerce in general. Donthu and Gustafsson's (2020) contribution regarding the effects of Covid-19 on business and research showed that Covid-19 and its associated aftermaths could control consumer behaviour and market. It will further make businesses related to e-entertainment, food delivery, e-shopping, e-education, and solutions for remote work could grow exponentially.

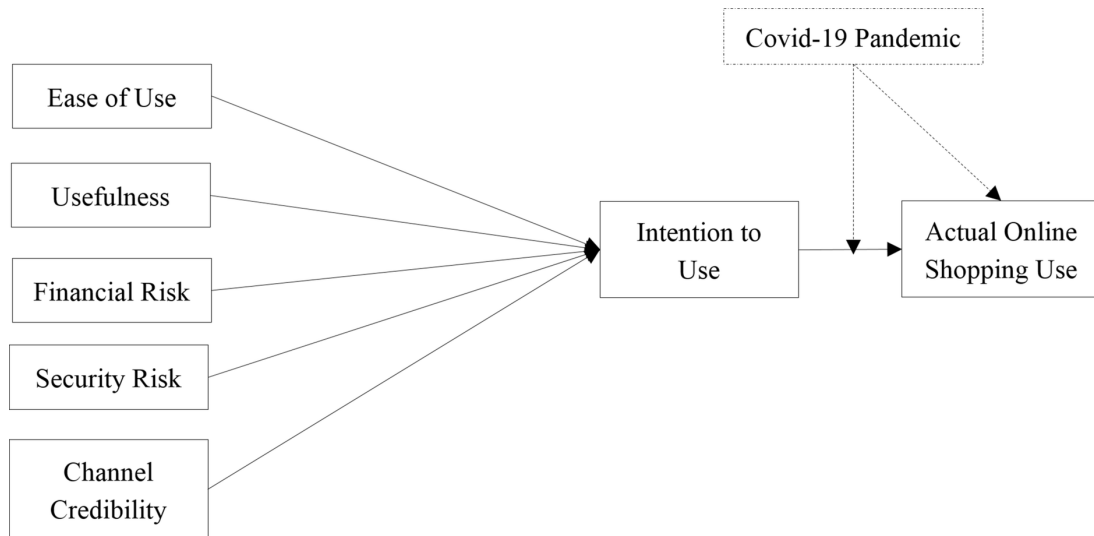
PROPOSED CONCEPTUAL FRAMEWORK

Based on the above discussion, B2C online shopping literature shows that prior studies used diverse factors in assessing online shopping use. The current conceptualisation extends the TAM's theoretical framework to propose a framework for assessing online shopping use amid digital economy transformation in a post-pandemic era (figure 2). The proposed framework consists of five exogenous variables (PEOU, PU, financial risk, security risk, and Online Channel Credibility). Additionally, considering the present pandemic situation and its significant impact, particularly on e-commerce, the framework proposes a moderating effect of the Covid-19 pandemic. It uses the pandemic as a control variable that has hitherto not been used in previous B2C online shopping models.

THEORETICAL AND PRACTICAL IMPLICATION

This study proposed a framework for assessing online shopping use under the digital transformation of the economy by connecting predictors of actual online shopping use with a moderating effect of the Covid-19 pandemic. Subsequently, the study has improved technology acceptance literature in a B2C online shopping context amid the Covid-19 pandemic. Also, the integration of the TAM basic framework with risk factors, channel credibility, and Covid-19 help present a model of actual online shopping use in the current pandemic situation intended to elucidate B2C actual online shopping use concurrently. Specifically, extending TAM's boundary with Online Channel Credibility indicates significant importance in developing a positive intention which invariably will result in actual online shopping use. Additionally,

Figure 3. Conceptual framework for assessing online shopping use



a fusion of the Covid-19 pandemic guided by Stimulus-Organism-Response theory, as a situational variable in the model, is shown to have a contingent effect between intention – actual use relationship, as well as controlling online shopping use among e-shoppers. Meanwhile, composing channel credibility, online risk factors, and the Covid-19 pandemic may be an efficient setup to explain users’ actual online shopping use in this digital information age.

Furthermore, the chapter has important managerial implications. Firstly, e-vendors need to understand the extent to which consumers accept their transaction channel’s credibility, especially in times of pandemic such as Covid-19. Such knowledge will help enhance their trustworthiness in the values offered to consumers. Achieving such a strategic move will simplify the vendor’s customer acquisition, maintenance, and retention capabilities. For instance, besides providing easy-to-use and useful online shopping channels, e-retailers should also maintain honesty in product quality, prompt delivery, ensure safety in the delivery process, and efficient and easy return policies. Secondly, e-vendors should know that despite the Covid-19 pandemic or a rapid digital transformation of various economies, an easy-to-use, useful, or credible channel are not enough to entice customers to patronise online vendors in various transactions fully. However, the safety of the money and personal data also matters. Thus, online retailers must provide secure channels for the transaction to ensure customers’ finance and unauthorised access to personal data are strictly protected. It could be achieved by finetuning policies that may curtail risks related to fraud, unauthorised customers’ data sharing, and other security-related issues to enhance the e-vendors-customers relationships. Finally, e-vendors should learn from the present pandemic by strengthening online presence, equipping online stores with product varieties with diverse and qualitative product assortments for effective B2C transactions.

CONCLUSION

Investigating B2C online shopping use in this critical pandemic time is essential for e-vendors in customer acquisition, maintaining, and retention, and developing a clear-cut strategy to facilitate smooth B2C transactions during the present Covid-19 pandemic amid rapid digital economies transformation. Although extensive research was carried out in the B2C context, investigating the contingent effect of the Covid-19 pandemic and its control effects are scarcely investigated in the literature. Moreover, previous studies focus on examining the impact of the pandemic on businesses in general or e-commerce, but few attempt to see its contingent effect. In contrast, digital transformation coupled with continuous crises of Covid-19 on various markets and economies indicates that the situation is not ending anytime soon. This scenario mandates constant investigation into technology acceptance and how the pandemic shapes the nature of the acceptance and usage of B2C technologies amid the digital economy transformation. Particularly in Asia, the effect of the current pandemic could be seen, which increases consumers' belief in the digital channels for various activities, particularly business transactions (Hasanat et al., 2020; Zhao & Bacao, 2020). Consequently, the current chapter has proposed a framework for assessing B2C online shopping use under the digital transformation of the economy in a post-pandemic era while leveraging the TAM's model and Stimulus-Organism-Response theory to articulate its propositions.

The study incorporates other relevant factors, namely, security risk, financial risks, online channel credibility, and Covid-19 pandemic, into the TAM's model. It argued that such a combination of factors might explain variance in online shopping use under the digital transformation of the economy in a post-pandemic era. For the current context, the author believes that an extended TAM framework that combines these factors becomes an invaluable knowledge contribution to B2C online shopping literature. Notably, the fusion of online channel credibility, risk factors, and examining the potential contingent role of the Covid-19 pandemic, which is scarcely examined, is another knowledge contribution the chapter provides.

Moreover, the chapter adequately addressed the research questions raised. Firstly, it addressed the research question regarding whether an extended Technology Acceptance Model could help develop a befitting model for online shopping use in a post-pandemic era? From empirical and theoretical evidence discussed, it was clear that an extended TAM, incorporating financial and security risks, online channel credibility, and Covid-19 pandemic as a situational contingent factor, could meet the expectation for a framework for assessing B2C online shopping use. Also, it will potentially explicate online shopping use under a digital economy transformation during and in a post-pandemic era.

Secondly, the study also raised a question concerning what combination of factors determines actual online shopping use in a post-pandemic era? The chapter discussed that customers worry about online shopping channel credibility during crises such as the ongoing Covid-19 pandemic. Suppose online shopping channels are not trustworthy enough. In that case, it will give rise to high security and financial risks concerns even though online shopping is made so easy or useful by e-business practitioners. Thus, a combination of these well-identified factors could develop positive intention, invariably leading to actual usage amid rapid digital economy transformation during and in a post-pandemic period.

Finally, the last question raised whether the Covid-19 Pandemic can moderate the association between intention and actual online shopping use and control the effect of online shopping use in the current context. The chapter buttressed that the Covid-19 pandemic could be a significant contingent variable, especially in strengthening the association between consumer intention and actual online shopping use in times of crises such as the covid-19 pandemic. Research has shown that since the appearance of the current pandemic, economies worldwide, especially in Asia, witnessed rapid digitisation to adhere to the

new normal brought by the pandemic. E-businesses, especially e-food delivery and other grocery shopping e-tailers, received significant boosters due to the pandemic (Zhao & Bacao, 2020). It indicates that covid-19 might likely strengthen consumers' intention vis-à-vis e-shopping use. In any case, controlling the effect of the Covid-19 pandemic should not be overlooked while investigating B2C online shopping use to isolate any noise caused by the pandemic in the proposed model.

LIMITATION AND DIRECTION OF FUTURE RESEARCH

This section summarises three major limitations related to the present study and provides relevant suggestions for further investigation. Firstly, this study's primary limitation is its conceptual nature, which is purely based on previous studies and industry statistics, limiting the authors' ability to validate the proposed conceptual framework empirically. Data were not collected for any quantitative or qualitative analysis; thus, hypotheses were not tested. Future research is suggested to employ an appropriate methodology with good instruments to validate the proposed model. Also, given the nature of the current pandemic situation and the digital transformation of various economies, especially in the Asian region, the author suggested future studies to conduct a comparative analysis across countries to see the contingent impact of the pandemic on B2C online shopping use across nations. In the same vein, longitudinal research could be conducted since the pandemic shows a continuous trend at different periods to assess the impact at various times. Secondly, the study restricts its scope to conceptualising actual online shopping use but does not look at post-adoption use and behaviour. Future studies can evaluate such setup vis-à-vis post-adoption behaviour, such as satisfaction, continuous intention, loyalty, or customer lifetime value. Finally, due to the study's exploratory nature and limited space in the chapter, a detailed assessment of individual variables could not be provided. Hence, the author encourages a meta-analysis to harness literature on online shopping use and the Covid-19 pandemic, especially concerning the digital transformation of the economy. Doing so will improve understanding of the B2C online shopping trend vis-à-vis the Covid-19 pandemic under the digitally transformed economy, which will undoubtedly be a significant knowledge contribution in the field of Information systems.

ACKNOWLEDGMENT

This chapter is a part of the researcher's Ph.D. research work. Universiti Brunei Darussalam supports the research through the University Graduate Scholarship (UGS) award scheme, 2019/2020.

REFERENCES

- Al-Maghrabi, T., Dennis, C., & Halliday, S. V. (2011). Antecedents of continuance intentions towards e-shopping: The case of Saudi Arabia. *Journal of Enterprise Information Management*, 24(1), 85–111. doi:10.1108/17410391111097447
- Alfonso, V., Boar, C., Frost, J., Gambacorta, L., & Liu, J. (2021). E-commerce in the pandemic and beyond. *BIS Bulletin*, 36.

Framework for Assessing Online Shopping Use Under the Digital Transformation of the Economy

Alhaimer, R. (2021). Fluctuating Attitudes and Behaviors of Customers toward Online Shopping in Times of Emergency: The Case of Kuwait during the COVID-19 Pandemic. *Journal of Internet Commerce*, 1–26. doi:10.1080/15332861.2021.1882758

Ammar Haider, N. N. (2016). Factors Affecting Online Shopping Behavior of Consumers in Lahore, Pakistan. *Journal of Management Engineering and Information Technology*, 3(6), 9–14. www.jmeit.com

Aref, M. M., & Okasha, A. E. (2020). Evaluating the online shopping behavior among Egyptian college-educated community. *Review of Economics and Political Science*, 5(1), 21–37. doi:10.1108/REPS-10-2018-0013

Ariffin, S. K., Mohan, T., & Goh, Y. N. (2018). Influence of consumers' perceived risk on consumers' online purchase intention. *Journal of Research in Interactive Marketing*, 12(3), 309–327. doi:10.1108/JRIM-11-2017-0100

Bhatnagar, A., Misra, S., & Rao, H. R. (2000). On risk, convenience, and Internet shopping behavior. *Communications of the ACM*, 43(11), 98–105. doi:10.1145/353360.353371

Bhatti, A., Akram, H., & Khan, A. U. (2020). E-commerce trends during COVID-19 Pandemic. *International Journal of Future Generation Communication and Networking*, 13(2), 1449–1452.

Blackwell, R. D., Miniard, P. W., Engel, J. F., Pai, D. C., Norjaya, M. Y., & Wan Jooria, H. (2012). *Consumer behaviour*. Cengage Learning Asia Pte Ltd.

Celik, H. (2016). Customer online shopping anxiety within the Unified Theory of Acceptance and Use Technology (UTAUT) framework. *Asia Pacific Journal of Marketing and Logistics*, 28(2), 278–307. doi:10.1108/APJML-05-2015-0077

Chaffey, D., & Ellis-Chadwick, F. (2016). *Digital Marketing Strategy, Implementation and Practice* (6th ed., Vol. 53). Pearson education Limited. doi:10.1017/CBO9781107415324.004

Chu, J., Arce-Urriza, M., Cebollada-Calvo, J. J., & Chintagunta, P. K. (2010). An empirical analysis of shopping behavior across online and offline channels for grocery products: The moderating effects of household and product characteristics. *Journal of Interactive Marketing*, 24(4), 251–268. doi:10.1016/j.intmar.2010.07.004

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *Management Information Systems Quarterly*, 13(3), 319–340. doi:10.2307/249008

Donthu, N., & Gustafsson, A. (2020). Effects of COVID-19 on business and research. *Journal of Business Research*, 117(June), 284–289. doi:10.1016/j.jbusres.2020.06.008 PMID:32536736

Driediger, F., & Bhatiasevi, V. (2019). Online grocery shopping in Thailand: Consumer acceptance and usage behavior. *Journal of Retailing and Consumer Services*, 48(December), 224–237. doi:10.1016/j.jretconser.2019.02.005

Dumanska, I., Hrytsyna, L., Kharun, O., & Matviets, O. (2021). E-commerce and M-commerce as Global Trends of International Trade Caused by the Covid-19 Pandemic. *WSEAS Transactions on Environment and Development*, 17, 386–397. doi:10.37394/232015.2021.17.38

Framework for Assessing Online Shopping Use Under the Digital Transformation of the Economy

E-Marketer. (2020). *Retail Ecommerce Sales Worldwide, 2019-2024*. Retrieved online from <https://www.shopify.com/enterprise/global-ecommerce-statistics>

Fishbein, M., & Ajzen, I. (1975). *Belief Attitude, Intention and Behaviour: An Introduction to Theory and Research*. Addison-Wesley.

Forsythe, S. M., & Shi, B. (2003). Consumer patronage and risk perceptions in Internet shopping. *Journal of Business Research*, 56(11), 867–875. doi:10.1016/S0148-2963(01)00273-9

Gabriel, J. M. O., Ogbuigwe, T. D., & Ahiauzu, L. U. (2016). Online shopping systems in Nigeria: Evolution, Trend and prospects. *Asian Research Journal of Arts & Social Sciences*, 1(4), 1-7. doi:10.9734/ARJASS/2016/29170

Gao, L., & Bai, X. (2014). Online consumer behaviour and its relationship to website atmospheric induced flow: Insights into online travel agencies in China. *Journal of Retailing and Consumer Services*, 21(4), 653–665. doi:10.1016/j.jretconser.2014.01.001

Giuffrida, M., Mangiaracina, R., Perego, A., & Tumino, A. (2017). Cross-border B2C e-commerce to Greater China and the role of logistics: A literature review. *International Journal of Physical Distribution & Logistics Management*, 47(9), 772–795. doi:10.1108/IJPDLM-08-2016-0241

Gunadi, D., Sanjaya, R., & Harnadi, B. (2019). Examining the Acceptance of Virtual Assistant - Vanika for University Students. *ICICOS 2019 - 3rd International Conference on Informatics and Computational Sciences: Accelerating Informatics and Computational Research for Smarter Society in The Era of Industry 4.0, Proceedings*, 1–4.

Guthrie, C., Fosso-Wamba, S., & Arnaud, J. B. (2021). Online consumer resilience during a pandemic: An exploratory study of e-commerce behavior before, during and after a COVID-19 lockdown. *Journal of Retailing and Consumer Services*, 61, 102570. doi:10.1016/j.jretconser.2021.102570

Hand, C., Riley, F. D. O., Harris, P., Singh, J., & Rettie, R. (2009). Online grocery shopping: The influence of situational factors. *European Journal of Marketing*, 43(9), 1205–1219. doi:10.1108/03090560910976447

Hasanat, M. W., Ashikul Hoque, F. A. S., & Mashrekha Anwar, P., Hamid, A. B. A., & Tat, H. H. (2020). The impact of coronavirus on business continuity planning. *Asian Journal of Multidisciplinary Studies*, 3(1), 85–90.

Hemachandra, S., & Sharkasi, N. (2021). Digital Transformation Induced by the Covid-19 Pandemic. In F. J. Martínez-López & D. López López (Eds.), *Advances in Digital Marketing and eCommerce. DMEC 2021. Springer Proceedings in Business and Economics*. Springer. doi:10.1007/978-3-030-76520-0_6

Hu, Y., & Sundar, S. S. (2010). Effects of online health sources on credibility and behavioral intentions. *Communication Research*, 37(1), 105–132. doi:10.1177/0093650209351512

Internet World Stats. (2021). *Internet Usage Statistics, The Internet Big Picture, World Internet Users and 2021 Population Stats*. Retrieved from <https://www.internetworldstats.com/stats.htm>

Izogo, E. E., & Jayawardhena, C. (2018). Online shopping experience in an emerging e-retailing market: Towards a conceptual model. *Journal of Consumer Behaviour*, 17(4), 379–392. doi:10.1002/cb.1715

- Jacoby, J. (2002). Stimulus-Organism-Response Reconsidered: An Evolutionary Step in Modeling (Consumer) Behavior. *Journal of Consumer Psychology, 12*(1), 51–57. doi:10.1207/S15327663JCP1201_05
- Jäger, A. K., & Weber, A. (2020). Can you believe it? The effects of benefit type versus construal level on advertisement credibility and purchase intention for organic food. *Journal of Cleaner Production, 257*, 120543. Advance online publication. doi:10.1016/j.jclepro.2020.120543
- Jamil, N. A. (2012). *The Integration of Theory of Planned Behaviour (TPB) and Technology Acceptance Model (TAM) in Determining Online Purchasing Behaviour in Malaysia* [Unpublished doctoral dissertation]. Universiti Utara, Malaysia.
- Khan, H. U., & Uwemi, S. (2018). What are e-commerce possible challenges in developing countries : A case study of Nigeria. *Int. J. Business and Systems Research, 12*(4), 454–486. doi:10.1504/IJBSR.2018.095077
- Kim, J. S. (2016). An extended technology acceptance model in behavioral intention toward hotel tablet apps with moderating effects of gender and age. *International Journal of Contemporary Hospitality Management, 28*(8), 1535–1553. Advance online publication. doi:10.1108/IJCHM-06-2015-0289
- Kotler, P., & Pfoertsch, W. (2007). Being known or being one of many: The need for brand management for business-to-business (B2B) companies. *Journal of Business and Industrial Marketing, 22*(6), 357–362. doi:10.1108/08858620710780118
- Kucukusta, D., Law, R., Besbes, A., & Legohérel, P. (2015). Re-examining perceived usefulness and ease of use in online booking. *International Journal of Contemporary Hospitality Management, 27*(2), 185–198. doi:10.1108/IJCHM-09-2013-0413
- Laato, S., Islam, A. K. M. N., Farooq, A., & Dhir, A. (2020). Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach. *Journal of Retailing and Consumer Services, 57*, 102224. Advance online publication. doi:10.1016/j.jretconser.2020.102224
- Laato, S., Islam, A. N., Farooq, A., & Dhir, A. (2020). Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach. *Journal of Retailing and Consumer Services, 57*, 102224. doi:10.1016/j.jretconser.2020.102224
- Lacy, P., Long, J., & Spindler, W. (2020). E-Commerce Meets the Circular Economy. In *The Circular Economy Handbook* (pp. 197–201). Palgrave Macmillan. doi:10.1057/978-1-349-95968-6_15
- Lai, P. C. (2017). The literature review of technology adoption models and theories for the novelty technology. *JISTEM-Journal of Information Systems and Technology Management, 14*(1), 21–38. doi:10.4301/S1807-17752017000100002
- Masoud, E. Y. (2013). The effect of perceived risk on online shopping in Jordan. *European Journal of Business and Management, 5*(6), 76–87. https://www.researchgate.net/profile/Emad-Masoud/publication/340438323_The_Effect_of_Perceived_Risk_on_Online_Shopping_in_Jordan/links/5eb44e2c92851cd50da11774/The-Effect-of-Perceived-Risk-on-Online-Shopping-in-Jordan.pdf
- Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology*. The MIT Press.

Framework for Assessing Online Shopping Use Under the Digital Transformation of the Economy

Mitchell, V. (1999). Consumer perceived risk: Conceptualisations and models. *European Journal of Marketing*, 33(1/2), 166–195. doi:10.1108/03090569910249229

Moslehpour, M., Pham, V. K., Wong, W. K., & Bilgiçli, İ. (2018). E-purchase intention of Taiwanese consumers: Sustainable mediation of perceived usefulness and perceived ease of use. *Sustainability*, 10(1), 234. doi:10.3390/s10010234

OECD. (2014). *Measuring the Digital Economy: A New Perspective*. OECD Publishing., doi:10.1787/9789264221796-

Parlakkiliç, A., Üzmez, M., & Mertoğlu, S. (2020). How Does Covid-19 Pandemic Effect Online Shopping in E-Commerce? *Journal of Business in The Digital Age*, 3(2), 117–122. doi:10.46238/jobda.823955

Patro, C. S. (2019). Influence of Perceived Benefits and Risks on Consumers' Perceived Value in Online Shopping. *International Journal of Applied Behavioral Economics*, 8(3), 12–36. doi:10.4018/IJABE.2019070102

Peng, X., Li, X., & Yang, X. (2021). Analysis of circular economy of E-commerce market based on grey model under the background of big data. *Journal of Enterprise Information Management*. Advance online publication. doi:10.1108/JEIM-01-2021-0015

Piccinini, E., Gregory, R. W., & Kolbe, L. M. (2015). Changes in the producer-consumer relationship towards digital transformation. *Changes (Hove, England)*, 3(4), 1634–1648.

Pilik, M., Juříčková, E., & Kwarteng, M. A. (2017). On-line shopping behaviour in the Czech Republic under the digital transformation of economy. *Economic Annals-XXI*, 165(5–6), 119–123. doi:10.21003/ea.V165-24

Powel, F. A. (1965). Source credibility and behavioral compliance as determinants of attitude change. *Journal of Personality and Social Psychology*, 2(5), 669–676. doi:10.1037/h0022724 PMID:5838765

Rafalak, M., Abramczuk, K., & Wierzbicki, A. (2014). Incredible: Is (almost) all web content trustworthy? Analysis of psychological factors related to website credibility evaluation. In *Proceedings of the 23rd International Conference on World Wide Web* (pp. 1117–1122). International World-Wide-Web Conference Committee (IW3C2). 10.1145/2567948.2578997

Rahman & Jalil. (2014). Factors Influencing Malaysian Consumers' Intention Towards E-Shopping. *Journal of Applied Sciences*, 14(18), 2119–2128.

Roggeveen, A. L., & Sethuraman, R. (2020). How the COVID-19 Pandemic May Change the World of Retailing. *Journal of Retailing*, 96(2), 169–171. Advance online publication. doi:10.1016/j.jretai.2020.04.002

Romagnoli, V., Aigner, J. F., Berlinghof, T., Bey, N., Rödger, J. M., Pätz, C., & Saveyn, H. (2020). *Identification and assessment of opportunities and threats for the Circular Economy arising from E-commerce*. Publications Office of the European Union.

Saade, R. G., Tan, W., & Kira, D. (2008). Is Usage Predictable Using Belief-Attitude? Intention Paradigm? *Issues in Informing Science and Information Technology*, 5, 591–599. doi:10.28945/1030

Schiffman, L. G., & Kanuku, L. L. (2007). *Consumer behaviour*. Pearson/Prentice Hall.

- Sheth, J. (2020). Impact of Covid-19 on consumer behavior: Will the old habits return or die? *Journal of Business Research*, 117, 280–283. Advance online publication. doi:10.1016/j.jbusres.2020.05.059 PMID:32536735
- Singh, S., & Srivastava, S. (2019). Engaging consumers in multichannel online retail environment: A moderation study of platform type on interaction of e-commerce and m-commerce. *Journal of Modelling in Management*, 14(1), 49–76. doi:10.1108/JM2-09-2017-0098
- Sohn, S., & Groß, M. (2020). Understanding the inhibitors to consumer mobile purchasing intentions. *Journal of Retailing and Consumer Services*, 55(April), 102–129. doi:10.1016/j.jretconser.2020.102129
- Solomon, M. R. (2010). *Consumer behaviour: A European perspective*. Prentice Hall/Financial Times.
- Strauss, J., & Frost, R. (2014). *E-marketing*. Pearson Education.
- Svatošová, V. (2015). The use of marketing management tools in e-commerce. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 63(1), 303–312. doi:10.11118/actaun201563010303
- Teo, T. S. H., & Yu, Y. (2005). Online buying behavior: A transaction cost economics perspective. *Omega The International Journal of Management Science*, 33(5), 451–465. doi:10.1016/j.omega.2004.06.002
- Tham, K. W., Dastane, O., Johari, Z., & Ismail, N. B. (2019). Perceived Risk Factors Affecting Consumers' Online Shopping Behaviour. *The Journal of Asian Finance. Economics and Business*, 6(4), 246–260. doi:10.13106/jafeb.2019.vol6.no4.249
- Turner, M., Kitchenham, B., Brereton, P., Charters, S., & Budgen, D. (2010). *Does the technology acceptance model predict actual use? A systematic literature review*. doi:10.1016/j.infsof.2009.11.005
- UNCTAD. (2021). *Global E-Commerce Jumps to \$26.7 Trillion, Covid-19 Boosts Online Retail Sales*. Retrieved Online from: <https://unctad.org/press-material/global-e-commerce-jumps-267-trillion-covid-19-boosts-online-retail-sales>
- Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: Toward a unified view. *Management Information Systems Quarterly*, 27(3), 425–478. doi:10.2307/30036540
- Vial, G. (2021). Understanding digital transformation: A review and a research agenda. *Managing Digital Transformation: Understanding the Strategic Process*.
- Viswanath Venkatesh, F. D. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science*, 46(2), 186–204. doi:10.1287/mnsc.46.2.186.11926
- WHO. (2021). *Corona Virus (Covid-19) Global cases*. Retrieved Online from: <https://covid19.who.int/>
- Wu, W. (2020). *Online Shopping Behavior In Electronic Commerce : An Integrative Model From Utilitarian and Hedonic Perspectives*. Academic Press.
- Xu, Z., Shi, L., Wang, Y., Zhang, J., Huang, L., Zhang, C., Liu, S., Zhao, P., Liu, H., Zhu, L., Tai, Y., Bai, C., Gao, T., Song, J., Xia, P., Dong, J., Zhao, J., & Wang, F. S. (2020). Pathological findings of COVID-19 associated with acute respiratory distress syndrome. *The Lancet. Respiratory Medicine*, 8(4), 420–422. doi:10.1016/S2213-2600(20)30076-X PMID:32085846

Framework for Assessing Online Shopping Use Under the Digital Transformation of the Economy

Yazdanparast, A., & Spears, N. (2013). Can Consumers Forgo the Need to Touch Products? An Investigation of Nonhaptic Situational Factors in an Online Context. *Psychology and Marketing*, 30(1), 46–61. doi:10.1002/mar.20588

Yoon, K., Kim, C. H., & Kim, M. S. (1998). A cross-cultural comparison of the effects of source credibility on attitudes and behavioral intentions. *Mass Communication & Society*, 1(3-4), 153–173. doi:10.1080/15205436.1998.9677854

Zhang, J., & Hon, H. W. (2020). Towards responsible digital transformation. *California Management Review*, 62(3).

Zhao, Y., & Bacao, F. (2020). What factors determining customer continuingly using food delivery apps during 2019 novel coronavirus pandemic period? *International Journal of Hospitality Management*, 91(March), 102683. Advance online publication. doi:10.1016/j.ijhm.2020.102683 PMID:32929294

Zhao, Y., & Bacao, F. (2021). How does the pandemic facilitate mobile payment? An investigation on users' perspective under the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 18(3), 1–22. doi:10.3390/ijerph18031016 PMID:33498863

Zwanka, R. J., & Buff, C. (2021). COVID-19 Generation: A Conceptual Framework of the Consumer Behavioral Shifts to Be Caused by the COVID-19 Pandemic. *Journal of International Consumer Marketing*, 33(1), 58–67. doi:10.1080/08961530.2020.1771646

ADDITIONAL READING

Li, J., Hallsworth, A. G., & Coca-Stefaniak, J. A. (2020). Changing Grocery Shopping Behaviours Among Chinese Consumers At The Outset Of The COVID-19 Outbreak. *Tijdschrift voor Economische en Sociale Geografie*, 111(3), 574–583. doi:10.1111/tesg.12420 PMID:32836486

Mehrotra, A. A., Elias, H., Al-Alawi, A. I., & Al-Bassam, S. A. (2020). The Effect of Demographic Factors of Consumers Online Shopping Behavior in a GCC University. In *Ethical Consumerism and Comparative Studies Across Different Cultures: Emerging Research and Opportunities* (pp. 126-151). IGI Global. doi:10.4018/978-1-7998-0272-3.ch008

KEY TERMS AND DEFINITIONS

Business-to-Consumer (B2C): A direct selling of products or services from the seller to the buyer over the Internet without an intermediary.

Circular Economy: A model of production and consumption that comprises reusing, sharing, repairing, refurbishing, and recycling existing products and materials, aiming at solving global challenges like waste, pollution, biodiversity loss, and climate change.

COVID-19: The ongoing global pandemic of Coronavirus disease 2019 (COVID-19) resulting from “Severe Acute Respiratory Syndrome Coronavirus 2” (SARS-CoV-2).

Framework for Assessing Online Shopping Use Under the Digital Transformation of the Economy

Digital Transformation: The adoption of digital technology by a company or a government institution to improve business/service delivery processes, value for customers/clients and innovation.

E-Commerce: All commercial transactions carried out over the internet.

Moderating Variable: A variable that can strengthen, reduces, or otherwise change the association between independent and dependent variables.

Chapter 6

Developing a National Innovation System in Small States:

A Case for Brunei Darussalam's Economic Development – A Catalyst for Digitalization Catch-Up and Economic Growth

Amirul Shahnoel Noeh

Universiti Brunei Darussalam, Brunei

Pg Siti Rozaidah Pg Idris

Universiti Brunei Darussalam, Brunei

Muhammad Anshari

 <https://orcid.org/0000-0002-8160-6682>

Universiti Brunei Darussalam, Brunei

ABSTRACT

This study shares some empirical insights for adopting a national innovation system (NIS) to catalyze capacity building in small states with relatively low technology-based research and development resources. These countries may have to start further back than other nations; however, this chapter maintains that with the right NIS, latecomers can have the advantage of catching up economically. This study explores Brunei Darussalam's journey to catalyze innovation for sustainable economic growth, particularly digitalization and deep tech. The study found that establishing a national innovation ecosystem could be effective with national consensus and acceptance behind the approach. It emphasizes building critical infrastructures, institutions, and governance to promote efficient knowledge flow, talent development, digital literacy, and overall absorptive capacity. Because Brunei is a small state, coordinating and facilitating cohesive linkages among its key stakeholders can strategically mobilize change. As Brunei Darussalam embarks on such a trajectory, it must determine a relevant model.

DOI: 10.4018/978-1-7998-9664-7.ch006

INTRODUCTION

A significant amount of research has dealt with the trajectories of small states in their efforts to innovate (Easterly & Kraay, 2000; Kattel et al., 2013; Peterkova, 2020). Works go back more than a decade with a publication from Edquist and Homeen (2008). The authors acknowledged and supported Kattel et al. (2013)'s views that most innovation systems focused primarily on highly developed countries, such as South Korea and Finland, and glossed over issues of small states. This might have led to obscurity between countries with small state characteristics and developing economies. In this study, the authors established small state refers to the state's determinant of relatively sub-optimal economic deposition in terms of its capacity to innovate and its resilience to global economic shocks. The key question is how small states, such as Brunei Darussalam, can maximise capacity, flow economic growth away from oil and gas, and offer alternative pathways to sustainable development. This study proposes to maximise economic opportunities through innovation by optimising knowledge flow and linkages among stakeholders. This can be done by establishing an appropriate national innovation ecosystem contextualised to Brunei. This paper will then touch upon the opportunities for small states, such as Brunei Darussalam, to undertake economic catch-up by focusing on specific technological domains attributed to two unprecedented disruptive circumstances, the global COVID-19 pandemic and the technologies of the fourth industrial revolution.

BACKGROUND

Small State Nations

The definition of small states has been a point of contention and division, let alone a description that incorporates a perspective of innovation and economic growth. Yet, a significant amount of research has attempted to explain the intricacies of why small nations are unable to innovate or innovative enough. Various literature from Armstrong, Read (2003), Kattel et al. (2011), and J. Peterkova (2020) have pointed out the gaps for a small state to bring about such change. While this chapter will not attempt to critically debate in defining small states, the authors will offer several perspectives and rationale for why small states can harness economic opportunities and growth on par with larger nations. First, to be highly innovative is a key determinant of a country's ability to undertake a vast amount of research and development. Nonetheless, innovation is an important factor only when other critical conditions are met. Consistent with the Schumpeterian perspective that innovation has relatively little to do with research and development (R&D), smallness refers to the source of multiple constraints or limitations in a country's economic ability to gain a competitive advantage to overcome competition to earn profits (Kattel et al., 2013). The literature offers a pragmatic distinction characterisation for small states that possess a small home market to effectively limit economies of scales and aggregation of large market demand. Hence, they are highly dependent on export, leading to overspecialisation, lock-in, and low diversification needs. Small states have fewer financial capabilities or human resources. They will need a higher administrative capacity to invest in advanced science or R&D. This situation suggests that small states need to allocate resources to core developments rather than high technological research initiatives to effectively leverage economies of scale with limited resources. This raises an important point concerning ex-ante norms; in today's new normal, highly collaborative global efforts in fighting the pandemic

Developing a National Innovation System in Small States

have been vital. Sourcing alternative supplies in the disrupted logistic chains is becoming critical. The ubiquitous application of deep technology-based digital solutions to manage these challenges has and will continue to transcend geographical boundaries. Small states need to re-evaluate their economic outlooks to leverage these as new opportunities, adopting a global perspective on strategy for growth; in other words, “think global, start local.”

Furthermore, Armstrong and Read (2003) observed that small state theories were largely underpinned by an orthodox economic development theory based on the Lewis Model of Industrialization (Lewis, 1955). This model suggested that economic growth in the early part of the nineteenth century had been due to the significant mobilisation of the population of low-productivity low-cost labor surplus from an agrarian economy to the emergence of a highly productive manufacturing sector. Seemingly by inference, larger populations correlate with positive economic output (Armstrong & Read, 2003). Global cross-sectional regression analysis by Easterly and Kraay (2000) substantiated this point by analysing 157 countries, including large states and smaller states with populations of less than one million, adjusted with income. They found that smaller states tended to be richer and have higher productivity than larger states while also growing no more slowly than larger states. The findings further emphasised that small states do not have different per capita growth rates.

Another distinction is that small states can suffer from sub-optimal economic inefficiencies and are impervious to exogenous shocks due to their openness to international trade, mainly through the effect of globalisation (Easterly & Kraay, 2000). The key takeaways are that small states’ growth pathways are not determined by their immutable geographic size or population; rather, being small in an economic sense becomes key in designing innovation policies to counterbalance the negative effects.

Therefore, this section will first focus on building a case for Brunei Darussalam’s economic outlook. The second part will introduce the concept of a National Innovation System (NIS) and conceptualisation of such a concept, befitting a small state construct. The third part will highlight the research methodology used in this chapter. The fourth section will discuss Brunei Darussalam’s economic quilt and its current diversification effort trajectory, thus setting the scene toward instituting a NIS ecosystem. It will also highlight identified issues and challenges, comparing perspectives from successful examples abroad. The chapter will then focus on operationalising a NIS ecosystem to successfully integrate innovation efforts collaboratively toward sustainable economic development.

Case for Brunei Darussalam

Brunei Darussalam (henceforth referred to as Brunei) is a small oil-producing country in Southeast Asia, with a Gross Domestic Product (GDP) of USD 12.9 billion and an average estimated 0.5% growth over ten years (WEF, 2021). Brunei is a 2-h flight between ten regional members of the Association of Southeast Asian Nations (ASEAN). It has approximately 459,500 people, 3 universities, and ranks 61st and 51st in the World Economic Forum index in human capital (0.63) and Innovation Capability. For the past three years, Brunei’s Gross Domestic Expenditure on R&D (GERD) index has been relatively low at 0.3% of the total GDP; 95% were government-funded, with 100% of researchers residing in institutions of higher learning (UNESCO, 2018). Approximately 26% is allocated to medical science, 17% for engineering, technology, and natural sciences, 16% for social sciences, and the remainder for humanities and agriculture.

Brunei is in the midst of a perfect storm. From the outset of macroeconomics, the impact of the oil and gas global market’s volatility, the certainty of deep technologies of IR4.0 hitting its shores, and the

effect of the COVID-19 pandemic, Brunei's economic and social development trajectory has inadvertently shifted to a new normal. A survey in the ICT sector shows, that the numbers of unemployed youth and job seekers between 17 and 39 stand at 10,684; 34% are secondary school graduates, and 26% have advanced degrees. The local workforce in this sector stands at 3,280, with over 60% working in the retail sector (MISC ICT, 2020), which inadvertently created a mismatch between skill expectancy from the supply and demand perspective. Data have shown that many job seekers within the ICT sector, holding related education and backgrounds have yet to find employment, and those employed are mainly working in retail (DEPS, 2019). This may suggest that many locals are underemployed and take positions that may be suboptimum to their qualifications and capabilities.

The World Intellectual Properties Organisation Global Innovation Score Index ranks Brunei 71st of 131 economies (Androschuk, 2021). Although the Global Innovation Index (GII) specific pillars ranked Brunei at a relatively average 66th position, representing a medium-high to a medium-low performance, the country ranked 25th on institution while scoring a low 129th in knowledge and technology outputs. Brunei has ratified the Regional Comprehensive Economic Partnership, signaling its commitment to support the region's post-pandemic recovery efforts and new business opportunities for open and inclusive trade.

Technology development in entrepreneurial activities is not uncommon in Brunei. Since 2008, the government has made several efforts to spur local start-ups through a top-down approach by setting up business incubators, such as the i-Centre, K-Hub, and Creative Art Facility (CRAFT) facility in the so-called Anggerek Desa Technology Park (Purwaningrum, 2017). To date, a handful of start-ups continue to exist, representing about 20 companies, with another nine residing in the iCenter.

The WIPO's GII 2020 Report on innovation efficiency analysis highlights Brunei and groups it with high income, oil-rich economies, such as Kuwait, Bahrain, Oman, and Saudi Arabia. Despite being a high-income economy, Brunei has the same innovation output as lower-income economies, such as Ethiopia, Madagascar, and Malawi (Androschuk, 2021). As such, it leads to the question of why there is seemingly no significant traction in start-ups, despite the efforts made by various agencies to indoctrinate entrepreneurship, specifically in Brunei's technology-based sectors. After more than a decade, some senior executives in the technology industry contend that the lackluster progress of technology-based start-ups is not innovative enough in Brunei. However, during the ASEAN Business and Investment Summit (ABIS) 2021, the Prime Minister's Office and Minister of Finance and Economy II (who is also the Chairman of Brunei's largest bank, BIBD), surprisingly announced a target commitment of approximately US\$1.48bn by 2030. The budget is to be allocated for sustainability funding in promoting environmental protection, entrepreneurship, and social inclusion.

Limited literature discusses both aspects of characterisation of small states and Brunei Darussalam, and those few studies found were written decades ago, such as Crosbie, A. J. (1978), Pushpa Tham-bipillai (1998); it is not surprising that both referenced small states with their allocation of resources, geopolitical influence, and power (economic, political, and military). However, one interesting and closer viewpoint from Heeks, R (1998:2) refers to small states like Brunei operating as small enterprises in an oil/mineral-based economy. Heeks describes the effect of technology substitution, import dependency, and barrier to enterprise input access, which will be further discussed in this chapter.

National Innovation System

The National System of Innovation (NIS) has been described as ".the network of institutions in public and private sectors whose activities and interactions initiate, import, modify, and diffuse new technolo-

Developing a National Innovation System in Small States

gies” (Freeman, 1987). A NIS focuses on a dynamic process involving multiple actors, e.g., academia, research institutes, government, and industry, to collectively establish a value-creating system (Carlsson et al., 2002). Since then, innovation research has taken two different perspectives. Lundvall et al. (2009) explained that, based on a linear perspective with a narrower definition, innovation is derivative or equal to science and technology, thus exemplifying their national science-technology-innovation (STI) approach (Lundvall, 1992; Nelson, 1993) aimed at mapping development efforts in science and technology. Second, innovation research focuses on a dynamic process involving multiple actors, e.g., academia, research institutes, government, and industry, to collectively establish a value-creating system (Carlsson et al., 2002). This narrow definition suggests that innovation occurs based on formalising and codifying identified knowledge through research institutions, organisations, and laboratories.

Lundvall (2009) also offers a broader perspective of an innovation system that encompasses learning, competence-building, and generating innovation at different levels of development. Edquist (2004) defined an innovation system through its functional or activity classification. Jensen et al. (2007) identified that significant learning and innovation occur through structure and relationships in the Doing, Using, and Interacting mode. A broader definition of a NIS aggregates learning and capability development from social institutions, macroeconomics regulations, financial systems, education, and market conditions (Gu & Lundvall, 2006a). This closes the interactive loop, linking the input and outcomes as a learning and competence-building system for developing innovation. This study views the definition as an effective tool to understand the country’s competitive advantage (Samara et al., 2012).

The extant literature shows that the narrower definition offers a more structured theoretical clarity, which can be a self-limiting proposition when used in the context of Brunei’s current innovation landscape. First, it can be challenging to identify or formulate a science, technology, research, and development cluster and introduce a national STI policy to fit that definition. Secondly, innovation scales from developed economies with vast, well-structured STI policies and R&D capacities are not applicable. When constructing a NIS in countries with low research capacities and limited resources, the capacity and capabilities of human and institutional resources are considered crucial starting points to be developed (Yongabo & Göransson, 2020). Hence, it would be prudent for Brunei to forego a theoretical standpoint and consider a much broader definition that can recognise the quality of interaction between stakeholders’ functional capacities. Nonetheless, Schoser (1998) highlighted that the narrower definition could be applied to understand the informal relationship with its formal elements, as seen in Table 1.

Table 1. Interaction between formal and informal elements of the innovations system, extracted from (Lundvall et al., 2009, p.10)

	Narrow	Broad*
Formal	(1) Science & Technology organisations, institutions, and formal networks	(2) Organisations supporting innovation in general, institutions, and formal networks
Informal	(1) S&T informal networks and informal networks	(1) Informal networks influencing innovation and informal networks (cultural and historical context)

Source: (Schoser, 1999)

Furthermore, it is helpful to recognise Brunei's aim to develop the capability to absorb and exploit spillover of exogenous technology rather than striving for unique, innovative market creation at the onset. The authors adopt the evolutionary definition proposed by Lundvall, Vang, Joseph, Chaminade (2009) for a NIS in the context of Brunei Darussalam.

The National Innovation System is an open, evolving, and complex system that encompasses relationships within and between organisations, institutions and socio-economic structures, which determine the rate and direction of innovation and competence-building emanating from the process of science-based and experience-based learning. (Lundvall et al., 2009)

METHODOLOGY

This research primarily involves inductive, qualitative, and analytical approaches based on the gathered data. The study was carried in two phases. First, literature reviews were conducted based on subjects relevant to innovation approaches for small nation states. The literature review aimed to identify and understand various adaptations of grounded theories that have been applied. Content and theme were extracted as a baseline research model to establish a suitable conceptual framework to best fit the socio-economic and political standpoints. The second phase was to socialise and carry out stakeholder engagements through a semi-structured interview format. The main objective of these engagements was to gauge the response and seek potential uptake to the proposal to establish a national innovation ecosystem as a working hypothesis. Therefore, an activity flowchart for the innovation ecosystem was developed to visually interpret the research model. At the time of writing, fourteen interview sessions were conducted with senior policymakers, regulators chiefs, vice-chancellors, industry chief executives, including a seminar on innovation development. This feedback allowed the authors to improve the framework development. At the same time, calibration and benchmarking exercises were carried out through observations of other small nation states with similar economic footprints; it was an agile and dynamic process. Subsequently, further work will be required to address policies and regulatory intricacies for bringing the framework to fruition.

Brunei Darussalam's Economic Quilt on Development

This section has established that the definition and characterisation of small states are diverse and well-studied. Here the authors support that there is no empirical evidence to suggest geography, population size, and GDP should be a priori rationale precluding these countries from being innovative and attaining economic growth on par with larger economies. There are certainly challenges with adopting and exploiting technologies identified from economies of scale and capacity; hence, small states tend to be heavily reliant on technology substitution and import knowledge dependency. However, the extant literature highlights the importance of purposefully ensuring that economic efficiencies must be coordinated and optimised, ensuring adequate measures are adopted to soften the exogenous shocks as a basis to exploit efficient use of already scarce resources. In short, small states should increase efficiency and reduce unnecessary barriers to maximise resource usage for the effective rollout of high technology R&D and innovation in market creation. Despite these challenges, there has been a significant push to strengthen

Developing a National Innovation System in Small States

economic development, counterbalancing these negative impacts with diversification efforts toward achieving *Wawasan Brunei 2035*. These efforts have come mainly from two fronts.

In 2019, the Digital Economy Council (DEC) was established, superseding Brunei Darussalam National IT Council's role in stepping up Brunei's vision of becoming a smart nation. Furthermore, a recent announcement from the Brunei Research Council that spearheaded science, technology research, and innovation had been replaced with Council for Research and Advancement in Technology and Science—. The new Council is under the purview of the Ministry of Transport and Info Communication, signaling Brunei's focus on re-mobilising its research development and innovation.

According to the published Brunei Economic Blueprint and the recent Digital Economy Masterplan 2025 (Ministry of Finance, 2020), Brunei aims to build a sustainable economic vibrancy and create a smart nation through digital transformation. The plan calls for the private sector to spearhead the charge with the government to facilitate these developments. Two critical drivers are needed for these changes to take place. Firstly, a balanced economic growth sector leveraging upstream absorptive capacities to its downstream activities must be established (Almudi, Isabel, 2013) by bringing in large-scale foreign direct investments (FDI), mainly through Government Linked Companies or Joint Venture agreements, and creating downstream industries from the oil and gas. Existing examples include the Hengyi Industries project in the petrochemicals, Brunei Fertiliser Industries, Brunei Methanol Company, Advanced Hydrogen Energy Chain Development demonstration projects in the hydrogen supply chain.

An overlooked element in this plan is knowledge diffusion and domiciling these technologies, leveraging existing technological spillovers from multinational companies (MNC) operating in the highly specialised technology industry to accelerate knowledge and technology to local entrepreneurial firms. Due to the nature of firms, MNCs are more adaptive. They possess significant resources to adopt, accumulate, and drive new novel technologies compelled by productivity margins and increase their competitive advantage. Hence, MNCs offer a significant influx of technological stock of knowledge from their respective headquarters, subsidiaries, or global knowledge networks. How can this influx be effectively directed into the local ecosystem to strengthen Brunei SMEs' absorptive and technological capacities?

The key objective is to ensure large FDI's and MNC provide a technological or knowledge transfer framework to ensure that indigenous capacity can be established; this can be done through commercial proposition or an in-country value perspective. Once Brunei's absorptive capacity has been optimised, spillover effects to other industrial sectors can be efficiently attained. This "outside-in and inside-out strategy" as a conceptual approach offers better chances to adopt new technologies and drive economic development. The key is to ensure an efficient capacity to facilitate the inflow of knowledge and that local entities quickly absorb spillover effects.

More than 100 international companies are operating in the oil and gas sector, and at least a third is multinational corporations, such as Schlumberger, Haliburton, and Sumitomo (Noeh, 2021). As the Royal Dutch Shell Chief Executive Officer highlighted earlier this year, Shell Global is accelerating its strategy to drive carbon emissions and energy transition toward 100% net-zero emission by 2050. Shell Global plans to grow the market for cleaner products and has placed approximately USD 23 billion in rebalancing its portfolio toward energy transition. This is significant in adapting and implementing new energy technologies, such as biofuel and hydrogen, as the global demand for these new technologies will affect Brunei's future economic outlook.

The flow of knowledge should not be confined to tacit knowledge through training alone. These technological spillovers can be exploited to generate new knowledge and product functions by domiciling these technological spillovers through a coherent flow of learnings and experiences. Hence, the linkages

between industry and local research faculty and Higher Education Institutions regarding learning, flow, and diffusion of knowledge cannot be underestimated. An explicit industrial policy would inadvertently inject absorbed technologies for innovation directly to the demand side. In contrast, trickle-in development would reinvent the wheel through perhaps erroneous pilot projects and isolated feasibility studies.

Secondly, an emerging front, a much-preferred, seemingly perpetual diversification path, can be achieved by leveraging and investing in the new technologies and aggregated demand from five investment priority clusters: technology and creative, halal, business services, tourism, and downstream oil and gas. These focus on applicable new market creation or productivity undertaken by relatively smaller firms through deep technology, such as artificial intelligence, additive manufacturing, blockchain in supply chains, and the Internet of Things. Such activities inadvertently build local capacities in technological adoption away from oil and gas, and most importantly, they create a concurrent enabling pathway for sustainable innovation. The aim is to strengthen the absorptive capacity (Cohen & Levinthal, 1989; Zahra & George, 2002), not necessarily developing or innovating new technologies but integrating solutions or value-added resolutions based on derivative technologies developed elsewhere. For example, in the “think global, start-local strategy,” the application of blockchain and smart contracts are well-referenced developments in the logistics supply chain industry. Such application can also be applied to the global halal supply chain, where Brunei’s halal brand is highly identifiable for its strict compliance with quality standards. These product solutions should then be able to serve Brunei’s local, regional, and international markets. This requires an initial injection of blockchain technologies that local firms can infuse and absorb, undertaking market-driven product development together with proactive enabling policy support from key regulators and stakeholders. Without appropriate intervention, the market entry barrier for local firms can be considerably high.

Challenges in Technology and Absorption Capacity

Purwaningrum (2017)’s work on Anggerek Desa Technology Park in Brunei Darussalam offers valuable insights into the perspectives on the flow of knowledge in Brunei. It suggests the Brunei government’s top-down approach cultivates and facilitates the knowledge flow between ICT companies in enabling knowledge flow within the ecosystem. The literature highlights that investment in human capital training, capability development, and promoting ICT knowledge flow through social capital, described as Level I and Level II, can be shared among resident companies between stakeholders. However, it also mentions that business entrepreneurs typically rely on knowledge obtained through mutual relationships and informal social networks rather than a formalised approach. Their study lends itself to the importance of knowledge and social capital that fits well with Brunei’s sociological and anthropological construct.

It can be proposed that start-ups need to attain higher levels of knowledge flow that can be used to exploit, generate new knowledge, and commercialise these ideas, i.e.,, innovate, something unattainable if done through informal settings alone. The extant literature highlighted specific cultural antecedents and values for effective knowledge sharing, suggesting a deliberate intervention. These include having a clear and shared leadership vision, aligned organisational structure, and time.

Furthermore, there was a lost opportunity to establish a *laissez-faire* and somewhat limited formalised interface between mature industries, such as oil and gas, to directed research, development, and technology transfer mechanisms to funnel meaningful problem-based solutions back to the innovation stream. As a result, the accumulation and flow of knowledge between supply and demand between universities, research institutions, and industries are much sequestered and sporadic.

However, success ultimately depends on a high level of human capital and strong infrastructure where innovation occurs (Janaina et al., 2021). As indicated earlier, a high concentration of retail IT stores compared to technology-related companies resulted in local ICT professionals being compelled to work in retail shops rather than engaging in deep technology-related activities. As a knock-on effect, there is a supply mismatch for the actual competence and skillsets essential to operate a technology-based industry.

These perhaps suggest a fundamental issue in Brunei's absorptive capacities to efficiently adopt spillover knowledge (Cohen & Levinthal, 1989; Zahra & George, 2002). As per extant literature on the innovation policy and challenges for innovation systems in the developing countries, there is an apparent market failure if there are structural inefficiencies in coordination, capacity development, and communication between key stakeholders and the industry concerned (Lundvall et al., 2009).

Catalysing Innovation for Sustainable Economic Growth

Small and medium-sized enterprises (SMEs) are crucial for the growth and development of the economy. Citing a case study from the Sultanate of Oman, SMEs form a large part of vibrant economic activity and employ approximately 75% of the labor force (Muthuraman et al., 2020). Moreover, when unemployment rises, these smaller firms increasingly act as buffers for economic and labor market policies (Boegenhold, 2004). The government published a series of policies and strategies to spur digital transformation to drive economic growth as early as 2009; however, adoption was predominantly on digitising work processes and procedures within the public sector. DARE was established in 2016 to develop capacity development for small-medium enterprises and local start-ups. To date, there have been a handful of local technology-based start-ups registered and graduated under DARE. In addition, there have been other programs initiated by the private sector, namely LiveWire Brunei, a Brunei Shell Petroleum initiative under the ambit of Shell Social Investment initiative. Notably, other national-level awards in promoting innovation have produced winners, such as the Creation, Innovative Product and Technological Advancement Awards, and the Brunei Darussalam ICT Awards (BICTA). However, few have managed to funnel their innovative and creative ideas to the market.

According to the knowledge spillover theory of entrepreneurship (Acs et al., 2013), one of the critical determinants for entrepreneurship is an opportunity where vast knowledge can be translated into ideas and commercialised from an incumbent organisation via creating a new firm. Thus, Brunei have to determine the best advantage innovation and entrepreneurs to harness new and emerging technologies, propelling SMEs to solve real problems and taking prominent roles in catalysing the country's sustainable economic growth. It can be argued that despite the implemented policies and strategies, there are no straightforward approaches allowing innovation or mechanisms to lower the entry barriers for entrepreneurs to innovate. In Brunei, three components require consideration. 1) Limited industries participate as aggregators of demand with custodians of specific knowledge or technology in the overall ecosystem. 2) Consequently, the relationship between industry and research institutions is limited to a corporate social setting rather than an actual directed application of research to solve the industry's problems. 3) Funding has been a constraint when the public purse typically funds knowledge generation and exploitation dependencies; thus, there is a need to identify alternative revenue sources.

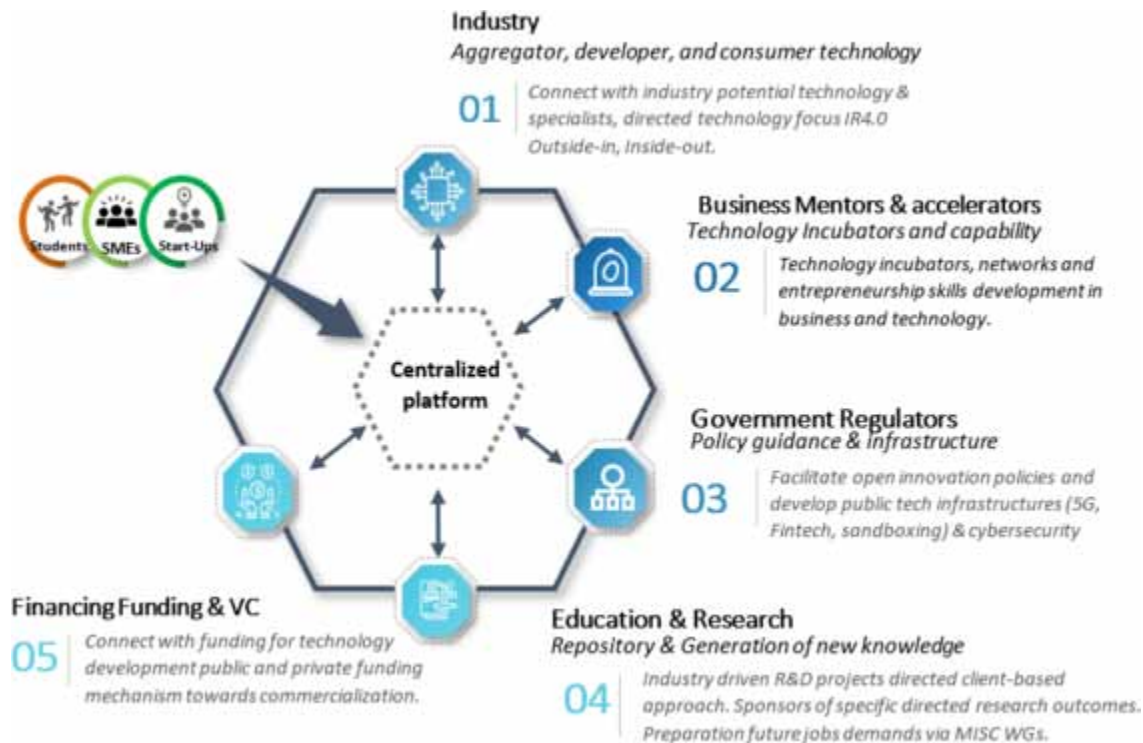
Leveraging existing technologies spillovers from multinational companies operating at the highly specialised technology is another potential approach (Acs Z et al., 2013); however, the industry's role in Brunei has yet to be defined. The fundamentals are based on network theory (Mead, 1962), meaning that Brunei's economic structure and the national knowledge base (universities, laboratories, and

industry R&D) must co-evolve to allow continuity in the experience and learning-based for innovation to occur. Inexplicably, as a nation with a significant portion of its revenue stream from oil and gas, such a demand may not have been necessary until now.

Therefore, there is a need to develop a framework, support structure, and systems to allow for entrepreneurship and knowledge to spur bottom-up, industry-led innovation enabled by the government. This requires a significant shift in organisational behavior that participates with a high degree of trust between firms, universities, and government agencies with strong institutions to build sustained learnings at all economic levels. Furthermore, the system must be open, with mutually collaborative and transparent linkages, to ensure the most efficient flow of knowledge happens. It must close the innovation gaps and optimise the scarcity of limited resources sustainably between contributors, agents, and stakeholders within the ecosystem, thus lowering the entry barrier for SMEs, allowing them to thrive.

Figure 1. below illustrates a possible framework based on the broad innovation definition that centralises these industry-driven efforts, with government facilitation through the DEC. The key stakeholders are identified in the ecosystem’s formal and informal elements. The objective is to catalyse and open innovation activity flow by improving effective and efficient node-to-node and multi-node coordination, communication, and capacity development among stakeholders.

Figure 1. Proposed Brunei Darussalam national system of innovation framework: Industry-driven with cohesive government facilitation (Authors’ Compilation, 2021)



National Innovation System (NIS)-Platform for Growth

The triple helix model of innovation was theorised in 1995 by Herny Etzkowitz and Loet Leydesdorff to foster economic growth and promote entrepreneurship by understanding the dynamics of interactions between three institutional spheres of university, industry, and government (Cai & Etzkowitz, 2020). However, the broadest application to economic performance at a country's level is the concept of National Systems of Innovation (Nelson, 1993; Lundvall, 1992; Lundvall, 2005; Edquist, 1997). Here NSI and NIS are used interchangeably and commonly in literature, which uses the NIS concept. It proposes that a highly collaborative network of key agents, stakeholders, and contributors of innovative development work on a centralised platform to equip and facilitate innovative local firms into advanced technological domains. These networks consist of critical contributors and aggregators of technologies from participating industries, business mentors and accelerators, government agencies and regulators, and key research and learning institutions generating new knowledge and developing a pipeline of local talents and a conduit to potential venture capitalists and private equity firms for commercialisation. This is coordinated through a dedicated team; however, there are a few prerequisites to consider. There must be an open and transparent linkage to ensure the efficient flow of knowledge, capacity development to close the gaps, and limited resources must be optimised between contributing agents within the ecosystem.

Understanding the relationships and roles between universities, industry, and the government is essential to ensure the system runs efficiently within its ecological settings. Traditionally the university's role is predominantly teaching, research, and providing highly skilled employees to the labor market (Dixon, 2012). This aligns well with the narrow and formal definition of innovation. Universities deal with codifying tacit knowledge with science-based learnings. However, growing costs have made universities consider operating to market conditions by offering proprietary knowledge, managing patent controls, and leveraging the vast research services to industries (Lundvall et al., 2009). Markets aggregate supply and demand, and science and technology are vital inputs, codifying experience-based learning, and commercialising knowledge into products for creating wealth. Knowledge and technology may have clear roles in society, but their roles, specifically in the NIS that contributes directly to the national economic growth, are yet to be defined.

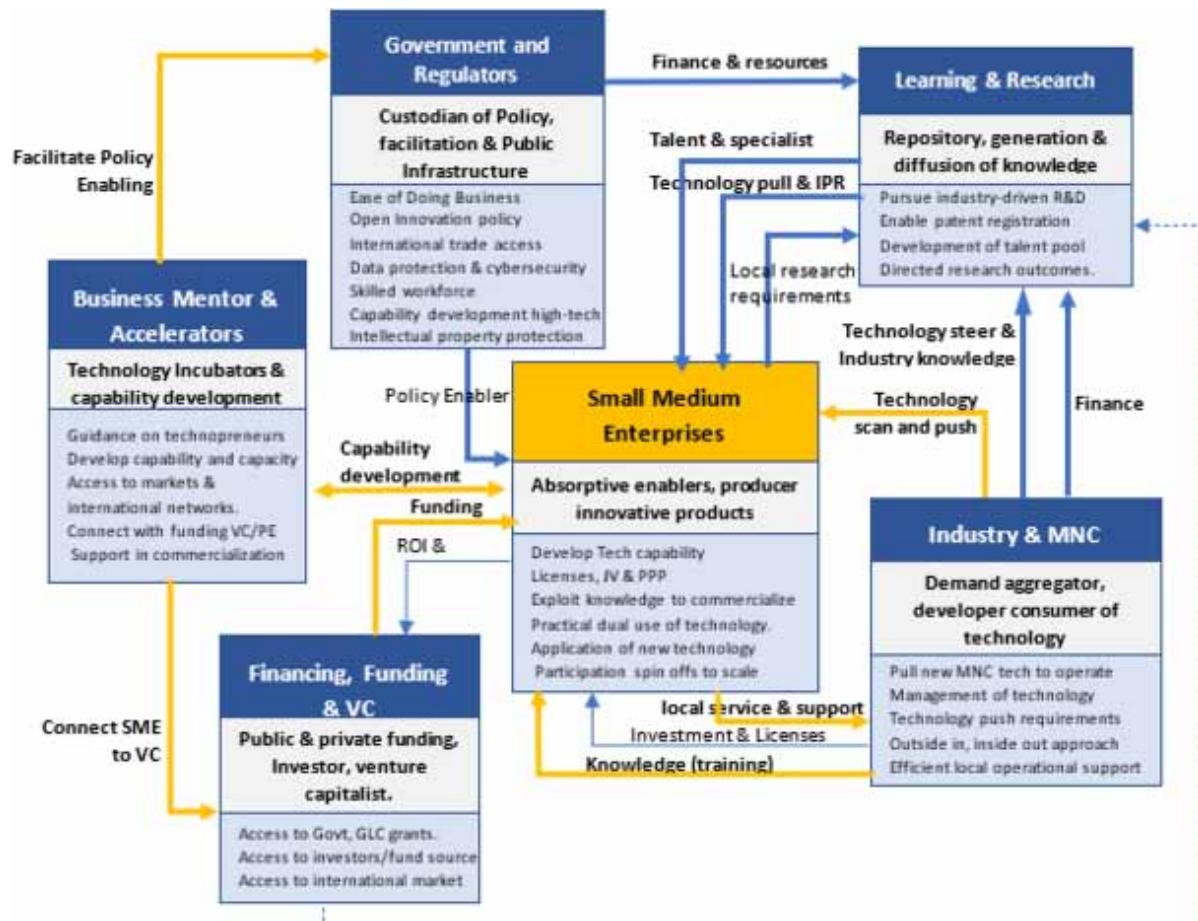
Some economists have argued that academic technology transfer mechanisms follow different systems. This may create unnecessary transaction costs by encapsulating knowledge in patents that might otherwise flow freely to the industry to be commercialised. (Rosenberg, Nelson, 1994, pp. 323-348)

Therefore a linear model market pull or technology push alone was insufficient to induce the transfer of knowledge and technology into the ecosystem (Etzkowitz and Leydesdorff, 2000, pp 4.). Here, in Figure 2. aligning key stakeholders' roles, particularly the roles between universities, research facilities, and the industry, lies with the enabling policies from government and regulators.

Moreover, despite efforts by universities to adopt more open and entrepreneurial outlooks, academic policies and structural norms still prevail. Etzkowitz further proposed that industries and universities establish dedicated research grants or directed venture capital funding to develop new firms from university incubator facilities. Due to Brunei's limited on R&D capacity, sharing a common platform with other research institutions for a specific focus area, joint research, and industry-university collaboration can be valuable. This opens universities directly to economic growth together with a sustainable self-reliance funding mechanism. Curriculums can therefore articulate the industry's needs, and R&D can

focus on providing solutions to real problems in the industry. The research focuses on solving industry problems in the local context; thus, case studies and teaching content are more relevant to students as industry experiences are intrinsically embedded. At the same time, this allows building a stronger relationship between industries. This brings universities closer to the “user of knowledge” and capitalises on experience-based knowledge to strengthen teaching capacities. This is perhaps more attuned to the local industry’s needs, with better prospects for new graduates entering the workforce being industry-ready for meaningful employment. More importantly, quality talent flowing into industries and acting as critical agents for innovation contributes to Brunei’s social and economic development. This requires active facilitation from the government, with support from universities and industries, to ensure adequate governance for an open and effective collaborative partnership.

Figure 2. Illustration of the national innovation ecosystem collaborative activity flowchart (Authors’ Compilation, 2021)



Early indicators from the socialisation and stakeholder engagement on this conceptual framework offer some invaluable insights and perspectives. Notably, there has been unanimous positive support

and interest. However, this must be further refined to consider the socio and cultural ballast relevant to Brunei by socialising to the broader innovation communities within the ecosystem. Therefore, further detailed empirical studies are required to understand the intricacies of challenges and identify opportunities toward bringing the framework to fruition.

CONCLUSION

This study demonstrates potential opportunities for a small nation like Brunei Darussalam to catalyse economic development away from oil and gas. Such a move would break the constraints of its geographical size and population and adopt high-value innovation outcomes through practical, efficient, and effective, coordination that is industry-driven with government facilitation. Although Brunei is amid a perfect storm, there is substantial interest and support with a one-time opportunity to optimise resources, aggregate demand, and focus on improving the resulting absorptive capacities and coordination through establishing a sustainable Brunei's NIS. This study presented vast opportunities to leverage new technologies and new market creation, finding a policy mix not bound by the theoretical framework but with practical application. This endogenous capability inadvertently lowers the entry barrier for SMEs to collaborate, innovate, and thrive through a sustainable ecosystem for Brunei Darussalam's economic development.

REFERENCES

- Acs, Z. J., Audretsch, D. B., & Lehmann, E. E. (2013). The knowledge spillover theory of entrepreneurship. *Small Business Economics*, 41(4), 757–774. doi:10.1007/11187-013-9505-9
- Acs, Z. J., Audretsch, D. B., Lehmann, E. E., & Licht, G. (2017). National systems of innovation. *The Journal of Technology Transfer*, 42(5), 997–1008. doi:10.1007/10961-016-9481-8
- Androschuk, G. (2021). Global innovation index 2020: who will finance innovations. *Law and Innovations*, 1(33).
- Armstrong, H. W., & Read, R. (2003). The determinants of economic growth in small states. *The Round Table*, 92(368), 99–124. doi:10.1080/750456745
- Cai, Y. (2014). Implementing the triple helix model in a non-western context: An institutional logics perspective. *Triple Helix (Heidelberg)*, 1(1), 1–20. doi:10.118640604-014-0001-2
- Cai, Y., & Etzkowitz, H. (2020). Theorising the triple helix model: Past, present, and future. *Triple Helix Journal*, (June), 1–38. doi:10.1163/21971927-bja10003
- Carlsson, B., Jacobsson, S., Holmen, M., & Rickne, A. (2002). Innovation systems: Analytical and methodological issues. *Research Policy*, 31(2), 233–245. doi:10.1016/S0048-7333(01)00138-X
- Chesbrough, H. W. (2003). Open innovation: The new imperative for creating and profiting from technology. Boston, MA: Harvard Business School and Maidenhead: McGraw-Hill
- Crosbie, A. J. (1978). Brunei: The constraints on a small state. *Southeast Asian Affairs*, 67-79.

- Department of Economic Planning and Statistics. (2019). *Report of the Labour Force Survey 2019*. http://www.deps.gov.bn/DEPD Documents Library/DOS/Labour force survey_KTK/2019 /KTK_2019.pdf
- Dixon, R. (2012). The role of universities. *I Am a Linguist*, 6(1), 129-152.
- Easterly, W., & Kraay, A. (2000). Small states, small problems? Income, growth, and volatility in small states. *World Development*, 28(11), 2013–2027. doi:10.1016/S0305-750X(00)00068-1
- Edquist, C. (Ed.). (1997). *Systems of innovation: Technologies, Institutions and Organisations*. London: Printer.
- Edquist, C., & Hommen, L. (2008). *Small Economy Innovation Systems: Comparing Globalisation, Change, and Policy in Asia and Europe*. Edward Elgar. doi:10.4337/9781847209993
- Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From national systems and “Mode 2” to a triple helix of university–industry–government relations. *Research Policy*, 29(2), 109–123. doi:10.1016/S0048-7333(99)00055-4
- Etzkowitz, H., & Loet, L. (1995). The triple helix of university–industry–government relations: A laboratory for knowledge-based economic development. *EASST Review*, 14(1), 11–19.
- Fagerberg, J., & Srholec, M. (2008). National innovation systems, capabilities and economic development. *Research Policy*, 37(9), 1417–1435. doi:10.1016/j.respol.2008.06.003
- Heeks, R. (1998). *Small enterprise development and the ‘dutch disease’ in a small economy: The case of Brunei*. Institute for Development Policy and Management University of Manchester Manchester.
- Janaina, N., Silveira, C., & Paulo, S. (2021). *Determinants of Absorptive Capacity : a systematic literature review*. Academic Press.
- Juma, C. (2016). *Innovation and its Enemies: Why people resist new technologies*. Oxford University Press. doi:10.1093/acprof:oso/9780190467036.001.0001
- Kattel, R., Kalvet, T., & Randma-Liiv, T. (2013). Small states and innovation. *Small States in Europe: Challenges and Opportunities*, 65-86.
- Khordagui, N., & Saleh, G. (2016). Absorptive capacity factors that mediate foreign direct investment spillovers: A sector-level analysis from emerging economies. *International Journal of Business and Globalisation*, 16(2), 188–201. doi:10.1504/IJBG.2016.074486
- Lee, J. & Lee, K. (2021). Catching-up national innovations systems (NIS) in China and post-catching-up NIS in Korea and Taiwan: Verifying the detour hypothesis and policy implications. *Innovation and Development*, 1-25.
- Lee, K., & Lee, J. (2021). *Alternative pathways to growth beyond the middle-income stage and national innovation systems (NIS): Balanced, Imbalanced, Catching-up, and Trapped NIS*. Academic Press.
- Leydesdorff, L. (2012). The triple helix, quadruple helix, and an N-tuple of helices: Explanatory models for analysing the knowledge-based economy? *Journal of the Knowledge Economy*, 3(1), 25–35. doi:10.1007/13132-011-0049-4

Developing a National Innovation System in Small States

Lundvall, B.-Å. (Ed.). (1992). *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London. Pinter Publisher.

Lundvall, B. Å., Joseph, K. J., & Chaminade, C. (2009). Handbook of innovation systems and developing countries: Building domestic capabilities in a global setting. In *Handbook of Innovation Systems and Developing Countries: Building Domestic Capabilities in a Global Setting*. https://play.google.com/books/reader?id=AaRyLGPjkE0C&pg=GBS.PA4.w.1.2.0_190

Lundvall, B. Å., Joseph, K. J., & Chaminade, C. (2009). *Handbook of Innovation Systems and Developing Countries: Building Domestic Capabilities in a Global Setting*. Academic Press.

Manpower Industry Steering Committee for Info Communications. (2020). *Presentation Manpower Survey Results Sides Pack*. AITI.

Mead, G. H. (1962). *The Self as Social Structure. Inside Social Life*. Roxbury Publishing.

Ministry of Finance. (2020). *Towards A Dynamic And Sustainable Economy Economic Blueprint For Brunei Darussalam*. Author.

Muthuraman, S., Haziazi, M., Veerasamy, R., & Yahyaei, N.. (2020). SME for sustainable development in Sultanate of Oman. *October*, 43–48.

Peterkova, J. (2020). Innovation and Industry 4.0 as a part of small state diplomacy. *SHS Web of Conferences*, 74.

Purwaningrum, F. (2017). Knowledge flow in the ICT sector: Case study of Anggerek Desa Technology Park in negara Brunei Darussalam. *South East Asia Research*, 25(2), 157–174. doi:10.1177/0967828X17706568

Razak, A. A., & White, G. R. T. (2015). The triple helix model for innovation: A holistic exploration of barriers and enablers. *International Journal of Business Performance and Supply Chain Modelling*, 7(3), 278–291. doi:10.1504/IJBPSM.2015.071600

Roolaht, T. (2012). *The Characteristics of Small Country National Innovation Systems BT - Innovation Systems in Small Catching-Up Economies: New Perspectives on Practice and Policy*. Springer. doi:10.1007/978-1-4614-1548-0_2

Rosenberg, N., & Richard, R. N. (1994). American Universities and Technical Advance in Industry. *Research Policy*, 23(3), 23. doi:10.1016/0048-7333(94)90042-6

Samara, E., Georgiadis, P., & Bakouros, I. (2012). The impact of innovation policies on the performance of national innovation systems: A system dynamics analysis. *Technovation*, 32(11), 624–638. doi:10.1016/j.technovation.2012.06.002

Shell Source. (2021). *Shell Accelerates Drive foe Net for Zero Emission with Customer First Strategy*. <https://www.shell.com/media/news-and-media-releases/2021/shell-accelerates-drive-for-net-zero-emissions-with-customer-first-strategy.html>

Soylu, D. & Andekina, R. (2021). Evolution and development of the triple helix model in Turkey. *InterConf*, 89-94.

Yongabo, P., & Göransson, B. (2020). *Constructing the national innovation system in Rwanda: Efforts and challenges*. Academic Press.

Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualisation, and extension. *Academy of Management Review*, 27(2), 185–203. doi:10.2307/4134351

KEY TERMS AND DEFINITIONS

Association of Southeast Asian Nations (ASEAN): Association of Southeast Asian Nations, established on 8 August 1967, consisted of ten member states (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Vietnam) aims to accelerate economic growth, social progress and cultural development.

Digital Economy Masterplan: The enablers for Brunei Darussalam’s Digital Economy to propel Brunei Darussalam to the status of a Smart Nation. For Brunei Darussalam, Smart Nation is driven by Digital Government, Digital Economy and Digital Society. The Digital Economy Council (DEC) are the sponsor of Brunei Digital Economy Masterplan 2025.

Global Halal Supply Chain: The supply chain interconnects in the production, sourcing and manufacturing, mainly in the food, pharmaceuticals and cosmetics industry that preserve the halal integrity and compliance from source to consumer. The information networks can spread across regional and international producers, suppliers, manufacturers and services providers.

Level I, II, and III Knowledge Flow: Level I is a basic level of knowledge flow that a community defines, captures, and shares in its informal way. Level II refers to knowledge flow that is managed, defined, captured, and shared conscientiously within a framework. Level III refers to capturing and using knowledge through organised processes and behavioural attributes supported by a technical framework.

NSI (National System of Innovation): The framework in which the relationships and linkages and how each element or node interacts with each other concerning the flow and diffusion of knowledge to enable innovation to take place, this can be termed as the national innovation ecosystem. NSI and NIS (National Innovation System) are interchangeably and commonly used in literature discussing the National Innovation System. This study uses the abbreviation NIS throughout to maintain consistency.

Outside-In and Inside-Out Strategy: A conceptual approach leverages the theory spillover of knowledge from Foreign Direct Investments, multinational corporations, and state-owned enterprises into local companies through spin-offs initiatives Domiciling investing in identified knowledge domains to local firms, including small and medium enterprises and local institutes of research and learnings to facilitate innovation and growth.


Regional Comprehensive Economic Partnership (RCEP): The Regional Comprehensive Economic Partnership (RCEP) is a proposed free trade agreement (FTA) between the ten member states of ASEAN and its six FTA partners (Australia, China, India, Japan, New Zealand, and Republic of Korea).

Think Global, Start-Local: A strategy to adopt and conflate two key determinants, meeting local demand with focused opportunities in the global markets. Product development and refinement are carried out at the local markets to position products are ready to scale up and out into the global markets. These are more related to digitalisation, where a domestic application can be easily scaled up to an international consumer base.


Chapter 7

Business Process Reengineering of Digital Learning Ecosystems: Green Strategy for Recovery and Sustainability

Heru Susanto

 <https://orcid.org/0000-0002-1823-357X>
*Univeristy of Technology Brunei, Brunei &
 National Research and Innovation Agencies,
 Indonesia & Tunghai University, Taiwan*

Fadzliwati Mohiddin

 <https://orcid.org/0000-0002-7332-209X>
University of Technology Brunei, Brunei

Leu Fang-Yie

Tunghai University, Taiwan

Muhammad Syamim Sanip

University of Technology Brunei, Brunei

Alifya Kayla Shafa Susanto

University of Technology Brunei, Brunei


Desi Setiana

*Ministry of Law and Human Right, Indonesia &
 University of Brunei Darussalam, Brunei*

Didi Rosiyadi

*National Research and Innovation Agencies,
 Indonesia*

Fahmi Ibrahim

 <https://orcid.org/0000-0001-5016-7755>
University of Technology Brunei, Brunei

Asep Insani

*National Research and Innovation Agencies,
 Indonesia*

Uus Khusni

*National Research and Innovation Agencies,
 Indonesia*

ABSTRACT

This study was conducted to investigate e-learning acceptance and factors influencing higher institution students in Brunei Darussalam. Among the factors involved in this study were perceived ease of use, perceived usefulness, self-efficacy, technology availability, and usage and intention to use. Technology acceptance models (TAM) were used as a basis for the study and for hypothesizing the effects of such variables on the use of e-learning. The findings of this study found that there is significant influence of self-efficacy to perceived ease of use and perceived usefulness while perceived ease of use has direct

DOI: 10.4018/978-1-7998-9664-7.ch007

impact to perceived usefulness and perceived usefulness has influence on intention to use towards e-learning systems.

INTRODUCTION

In today's advanced technological world, the use of information and communication technology for educational purposes has increased, and the spread of network technologies has caused learning practices to develop and change significantly (Kahiigi et al, 2008). With recent development of information technology, e-learning has become one of the important technology's tools in higher educational institutions today. Electronic learning (E-learning) has become a forefront for Higher education institutions to keep up with the current technology and advanced education. E-learning defines as a learning system or education program that involves the use of information technology such as computers, laptops or smartphones. In order to meet the educational goals and demands of students, the system development of electronic learning has emerged to be a catalyst for today's educational institutions. In the current global competitiveness, the favourable outcome of the country relies heavily on people's knowledge, skills and competencies. E-learning provide significant benefits that include improved access to quality education, electronic communication and collaboration and learning flexibility. In line to Brunei Vision 2035 of well-educated and highly-skilled people, the electronics learning system is an important medium for creation of effective learning and quality education. Even though there are significant benefits in the use of e-learning systems, not all are fully utilized and adopted by students in assisting their study, thus the use of e-learning systems in Brunei is still less than optimal.

E-learning systems enable students to acquire lecture materials, take online quizzes or assessments, submit tutorials or assignments, view results, view course materials, see news and announcements, on-line interaction, anytime and anywhere without any geographical or time barriers. However, the key to effective e-learning is not from its multimedia, design or user-friendliness, but on how the individuals are engaged by the content. Although the use of e-learning provides notable benefits for students as a whole, the effectiveness of the use of the system depends on the level of acceptance and use of students. The goals of e-learning will not be achieved if there is lag and resistance to the use of new technology. The process of implementing e-learning in the institution might face several factors that constraints the effective use of e-learning as a learning medium, such as infrastructure issues, the willingness and readiness of the institutions and students, the power to use technology.

However, the purpose of this study is to investigate the e-learning acceptance and factors influencing higher institutions students in Brunei Darussalam by determining perceived ease of use and perceived usefulness of e-learning along with the intention to use towards e-learning. The basic framework of the study is the Technology Acceptance Model (TAM), which was appropriate for obtaining the research aims. Additionally, the study is carried out to investigate the external factors such as availability and usage of technology, self-efficacy that may have significant influence on the perceptions of students regarding the adoption of the E-learning system. The scope of this study is limited to assess the acceptance behavior of students in higher institutions in Brunei. This paper concentrates on studying the students' perception, intention to use and external factors of TAM towards e-learning approach. In the next section of this paper, we will discuss the literature review followed by further explanation of methodology and analysis. Subsequently in the last section, recommendations to overcome the current findings issue will be addressed.

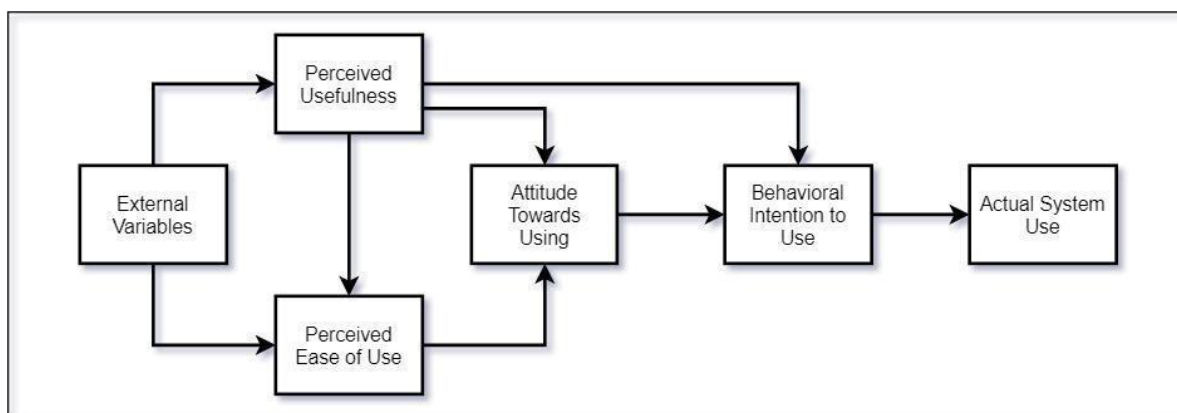
In order to concisely achieve the research study, several research objectives are listed as follow: (1) To investigate whether technology availability and usage and users' self-efficiency have a significant influence on users' perceived usefulness and perceived ease of electronic learning systems; (2) To investigate whether users' perceived usefulness and perceived ease use have a significant influence on the intention to use electronic learning systems; (3) To assess users' perception on ease of use, usefulness, self-efficiency, intention to use and technology availability and usage; (4) To analyse the relationship between perceived ease of use, perceived usefulness, self-efficiency, intention to use and technology availability and usage in the use of electronic learning systems among higher institution stakeholders.

LITERATURE REVIEW

E-learning defines as a learning that occurs when information technology is used to facilitate, convey and enable the learning process over the internet (Bullen & Janes, 2007). As stated to Yahaya & Ning (2011) states the main purpose universities implementing online learning is to provide a centered learning platform for students that promote self-learning. Liu & Wang (2009) stated that electronic learning system processes are characterized by the use of the internet, source of information and flexibility. In addition, electronic learning was created to overcome practical limitations of time and space. Furthermore, the main benefit of e-learning such as Moodle's where the design is based on constructivism approaches that provide opportunities for students to build and gain knowledge through sharing of information and online discussion. Moreover, e-learning overcomes the limitations of time and space an individual faced with the use of technology (Sun et al., 2007). Love and Fry (2006) indicated that e-learning has become crucial in higher institution education. Institutions of higher learning are competing to advance their online system capability in today's technological market.

Technology Acceptance Model (TAM) was first introduced by Fred D. Davis in 1986. TAM is an adaptation of the TRA (Theory of Reasoned Action) which was first developed by Fishbein and Ajzen in 1980 made specifically for modelling the acceptance of the use of information systems. TAM is one of many research models influencing determinants e-learning acceptance. TAM is widely used to predict user acceptance and usage based on perceptions of ease of use of e-learning. To date, TAM has

Figure 1. Technology acceptance model (Davis, 1989)



been considered the most relevant theory in predicting the desire and readiness for adopting technology (Chuttur, 2009).

The Technology Acceptance Model was invented to extend the construction of additional behaviour to increase the understanding of new technology. In the TRA model, it can be concluded that the beliefs and behaviour of each individual is influenced by intentional behaviour. As for behavioural intention, it is caused by two things, first is the attitude towards behavioural intention and the second is the subjective norm of each individual. In contrast to TRA model, Technology Acceptance Model (TAM) is a model built to analyse and understand the factors that influence the acceptance and the use of information technology. TAM aims to explain and estimate user acceptance of an information system. TAM provides a theoretical basis in significance and predicts the factors that influence the acceptance of a technology in an organization. TAM explains the causal relationship between belief and the behaviour, goals and needs, and the actual use of users of an information system. Davis et al. argues that people's acceptance of new technology is determined through two perceptions: perceived usefulness and perceived ease of use.

The TAM models users' in Figure 1 shows the acceptance of e-learning systems in learning explained by the perceived usefulness and ease of use of the system. The perceived usefulness and perceived ease of use components represent users' cognitive responses to the use of technology. These then influence the users' attitude toward using the technology. The users' attitude then subsequently became the significant drivers of the behavioral intention to use toward technology (BurtonJones & Hubona, 2005). Figure 1 shows the main components of the original TAM, that include perceived ease of use, perceived usefulness, attitudes toward using, and behavioral intention to use that predict the users' actual system usage. However, according to the IS Success model, system quality refers to measurement of technical success and information quality measures semantic success (DeLone & McLean, 2003). Both of these factors are expected to promote the use of the system and to influence the acceptance of the system and ultimately to the satisfaction of the user and the organization. The TAM model is a theory in information systems about how system users can accept and use technology. This model shows that when users are introduced to new technology, a number of factors influence their decisions; one of the factor is Perceived Usefulness (PU), to an extent which believes that the use of a system or technology can increase performance. In online learning context, perceived usefulness refers to the learner's belief that the online learning will enhance their performance in the course (Lee, Cheung, & Chen, 2005). For instance, students who have the knowledge, use and motivation in an e-learning system would know the usefulness of the system and have the desire to use the e-learning system properly. Perceived usefulness reflects the user's subjective probability of using specific technology that increases or influences the user's expectation. There are six indicators to measure the construct of usefulness; efficiency, performance, productivity, effectiveness, facilitation and usefulness (Fred D. Davis, 1989). PU encourages the actual use of the system.

Meanwhile, Perception Ease of Use (PEU) refers to the degree where an individual believes how effortless it would be in using a particular system (Fred D Davis, 1985). Individuals tend to use technology or systems which they believe will enhance their performance, efficiency and accuracy. In the application of information systems, TAM has been successfully used by many researchers to predict the behaviour and intentions of users in the use of information technology (Legris, et al, 2003). In an online learning context, it refers to the learner's belief that the online learning system will be easy to use. There are six indicators to measure this construct, namely: the ease of the system to learn, the ease of the system to be controlled, the interaction with the system that is easily understood and clear, flexibility of interaction, ease of ability to be skilled at using the system and easy to use (Davis, 1989).

In TAM, the use of technology is actually equivalent to the term behavior in the Theory of Reasoned Action (TRA) but for use in a technological context. This construct is directly influenced by intensity and usability. As studied by Walker (2002), behavioral intention to use is the extent of an individual readiness to carry out particular actions. The use of e-learning depends on the user's attitude and level of confidence on believing that the e-learning system will increase learning objectives. The user's interest is directed to the use of e-learning which is considered to provide benefits to the learning process and ease of use.

Researchers of TAM have assessed the influence of users' e-learning self-efficacy on technology acceptance (Grandon, Alshare, & Kwan, 2005; Park, 2009). E-learning self-efficacy refers "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). It refers to the personal confidence and skills to perform particular tasks or findings within the e-learning system. In addition, Grandon (2005) analysed that e-learning self-efficacy has an indirect impact on students' intention through perceived ease of use.

Park (2009) argues that access to technology and equipment have influence on the acceptance of an individual to e-learning systems. Learners often have difficulties in perceiving technologies because the equipments to carry out tasks is not readily accessible. He added that external equipments accessibility outside the organization or university such as software and hardware assist in supporting one's belief and enhance outcome expectations. The external equipment added a sense of convenience for an individual that allows access to the system outside the organization or university. Thus, both benefits of convenience and accessibility contribute to the positive attitude to the use of e-learning systems where they are inclined to accept it and learn it. As a result, users will tend to be more engaged in self-motivating mechanisms and contribute to the perception of ease of use of the e-learning system.

Despite the convenience and benefits of using new technology, a vast number of researchers support the fact where people appear to resist against the use of information systems. Siegel (2008) views that resistance to technology illustrates a reluctance to embrace an initiative and perception towards the use of technology. Nonetheless, it is vital for an organisation to overcome resistant behavior by understanding the reason for technological resistance of an individual. Berna-Martinez and Macia-Perez (2012) mentioned that factors such as culture, technology, process and business structure influence the resistance and rejection of new technology. However, they added that the opposition to technology can be overcome through training and assistance. As eloquently stated by Rivard and Lapointe (2012), they added that they view technology resistance as a vital issue in IT implementation that can lead to organisational problems.

In the opinion of Selvaganapathi and Raja (2012), they referred to the feeling of anxiety in using new technology as 'technophobic'. They had suggested that this feeling is the reflection of nervousness and constant feeling of dissatisfaction and uneasiness. These feelings are very common in the present because of the use of technology in every aspect of life.

A study published by Universiti Brunei Darussalam on 'e-Learning and Knowledge Society', January 2016, stated about sixty-four per cent (64%) of the respondents showed interest in online learning. The survey involved 856 respondents of local Bruneians aged 10 to 40 years old. The results showed 67 per cent agreed that online learning makes learning easier, 53 per cent certain that it would improve their academic performance and 87 percent believe online learning enables flexibility. In addition, 67 per cent believe that online learning would improve individual project quality and 53 per cent perceived it as a medium to information sharing and discussion. The authors said that online learning can benefit educational institutions through 'Big Data' that can optimize data collection opportunities. The author added that not only it benefits the institution, it also benefits the student's individual needs by providing

service and knowledge personalization and customization. Hence, due to large amounts of data being received on a daily basis, big data could become the future direction of online learning.

METHODOLOGY

The study is inclined to the use of a quantitative approach that uses questionnaire survey. Google forms survey was used to obtain the research data, and the survey was shared and distributed through various mediums such as Whatsapp and email. On the whole, 101 responses were obtained from the survey and these were used to test the hypotheses. The hypotheses were developed on the basis of existing theories that are in line with the e-learning context. Demographic section will be analyzed by frequency and percentage while other sections data were analyzed based on descriptive statistics of mean, standard deviation, reliability test and regression analysis.

Study Design

This section demonstrates the study design and instruments used as the part of the study. The survey questions are developed based on Technology Acceptance Model framework (TAM). The questionnaires for the survey were designed based on the hypotheses from the literature review conducted to reach the research objectives. The first part of the survey comprised questions related to the respondents' personal information. This section is intended to capture the background of the subject of the study. Among the items that are collected for personal data are gender, age, institution name, educational level, utilization of e-learning systems.

Respondents were needed to answer six sections of the questionnaire; on personal information, perceived ease of use of the e-learning system, perceived usefulness of the e-learning system, self-efficiency of the e-learning system, intention to use the e-learning system and technology availability and usage. There are six sections in the survey. The first section consists of the personal data of the participants and the utilization of e-learning systems. There are five questions in the second section which signify the present e-learning systems perceived ease of use. There are two questions in the third section which signify the e-learning system perceived usefulness. Six questions in the self-efficiency section and two questions in intention to use section. The final section comprising eight questions which covers the area of technology availability and usage. Figure 3 shows a list of questions used in the study.

Pilot Study

Prior to conducting the survey, a pilot study was carried out to measure the reliability and usability of the questionnaire. Three students were selected for this study. All respondents were able to answer the questionnaire questions without any consent. Therefore, assuming all questions were reliable, and hence, surveys are used in the final study. Following tables represent all the questions that were used for the questionnaire survey for this study. Total of 23 questions were prepared that are categorized into five sub-section.

Business Process Reengineering of Digital Learning Ecosystems

Table 1. Questionnaire questions

Perceived ease-of-use (PEOU)
<ol style="list-style-type: none"> 1. I find the e-learning system is easy to use. 2. The features of the e-learning system are easy to understand. 3. The design and user interface of the e-learning system are attractive and customizable. 4. There are difficulties in adapting the use of e-learning systems. 5. There are guidance and training given on the use of e-learning.
Perceived usefulness (PU)
<ol style="list-style-type: none"> 1. I am able to use the e-learning system for my learning with ease. 2. The e-learning system is useful to fulfill my learning needs.
Self-Efficiency
<ol style="list-style-type: none"> 1. I support the implementation of e-learning in my institution. 2. I believe that e-learning can enhance the quality of education. 3. I believe that using e-learning can increase my productivity. 4. I believe that e-learning enables me to effectively learn more than the traditional classroom-based approach. 5. I believe that e-learning enables students and lecturers to communicate and interact better with one another. 6. I believe that e-learning platforms ease the submission of all related task (assignments, curriculum, forms).
Intention To Use
<ol style="list-style-type: none"> 1. I am willing to use e-learning throughout my semester. 2. I am willing to access my e-learning system daily to check announcements, schedule as well as interaction between teachers and students.
Technology availability and usage
<ol style="list-style-type: none"> 1. I have access to the internet whenever I need. 2. The speed and stability of the internet access in the institution is satisfactory. 3. The hardware facilities provided in the institution are sufficient. 4. The hardware facilities provided in the institution are up-to-date. 5. I have access to electronic technology (e.g. Computer, Mobile Phone, laptop, tablet) whenever I need. 6. I frequently use the internet. 7. I use the internet as a source of information. 8. I can use computers confidently.

Demographics

Based on Figure 4 shows that most of the participants were mainly male (54.5%) while female (45.5%). Most of the respondents were in the age group of 19-30 years (93.1%) followed by below 18 years and below (5.0%), 31-40 years (1.0%) and 40 years and above (1.0%). 77.2% of the respondents were undergraduate students, 12.9% were higher national diploma students, followed by 7.9% were post-graduate were diploma students. All respondents (100%) institutions utilize 2.0% e-learning systems.

DISCUSSION

Table below (Table 3) shows the summary statistics and frequency distributions were calculated for each of the 23 items of the construct. Means for the items range between 2.14 and 4.54 and standard deviations of items are less than 1.336.

Table 2. Respondents demographic

		Frequency	Percentage
<i>N=101</i>			
<i>Gender</i>	Male	55	54.5%
	Female	46	45.5%
<i>Age</i>	18 and below	5	5.0%
	19-30	94	93.1%
	31-40	1	1.0%
	40 and above	1	1.0%
<i>Educational Level</i>	Post-Graduate	8	7.9%
	Undergraduate	78	77.2%
	Higher National Diploma	13	12.9%
	Diploma	2	2.0%
<i>Does your institution utilize e-learning system?</i>	Yes	101	100%
	No	0	0.0%

Table 3. Mean and standard deviation

<i>Item description</i>		<i>Mean</i>	<i>Std. deviation</i>
<i>Perceived ease of use (PEOU)</i>			
PEOU1	I find the e-learning system is easy to use	3.02	1.149
PEOU2	The features of the e-learning system are easy to understand.	2.94	1.094
PEOU3	The design and user interface of the e-learning system are attractive and customizable.	2.75	1.043
PEOU4	There are difficulties in adapting the use of e-learning systems.	3.18	0.994
PEOU5	There are guidance and training given on the use of e-learning.	2.14	0.906
<i>Perceived usefulness (PU)</i>			
PU1	I am able to use the e-learning system for my learning with ease.	3.06	1.231
PU2	The e-learning system is useful to fulfill my learning needs.	3.06	1.085
<i>Self-Efficiency (SE)</i>			
SE1	I support the implementation of e-learning in my institution.	3.41	1.336
SE2	I believe that e-learning can enhance the quality of education.	3.85	0.932
SE3	I believe that using e-learning can increase my productivity.	3.49	0.976
SE4	I believe that e-learning enables me to effectively learn more than the traditional classroom-based approach.	3.16	0.956
SE5	I believe that e-learning enables students and lecturers to communicate and interact better with one another.	3.06	0.947
SE6	I believe that e-learning platforms ease the submission of all related task (assignments, curriculum, forms).	4.00	0.980
<i>Intention to use (ITU)</i>			
ITU1	I am willing to use e-learning throughout my semester.	3.73	1.048
ITU2	I am willing to access my e-learning system daily to check announcements, schedule as well as interaction between teachers and students.	3.34	1.032
<i>Technology availability and usage (TAU)</i>			
TAU1	I have access to the internet whenever I need.	4.05	1.062
TAU2	The speed and stability of the internet access in the institution is satisfactory.	2.82	1.117
TAU3	The hardware facilities provided in the institution are sufficient.	2.69	1.075
TAU4	The hardware facilities provided in the institution are up-to-date.	2.68	0.979
TAU5	I have access to electronic technology (e.g Computer, Mobile Phone, laptop, tablet) whenever I need.	4.09	0.981
TAU6	I frequently use the internet.	4.54	0.843
TAU7	I use the internet as a source of information.	4.48	0.715
TAU8	I can use computers confidently.	4.08	0.924

The first variable Perceived ease of use (PEOU) shows a minimum mean of 2.14 and maximum mean of 3.18. The results show that guidance and training followed by the interface of e-learning are relatively poor. Davis (1989) in his study revealed that usability in the TAM model has positive effects on e-learning. This is because the easy-to-use aspect is one of the factors that leads to the actual use of the lesson system. Therefore, when technology training is absent and the interface is complex, thus, this affects the ease of use of the system, leading to poor performance in using the system.

The second variable (Perceived Usefulness), the average records a fairly above average mean of 3.06. Although it is satisfactory, these variables are impacted by first variables as when e-learning is difficult to use thus affecting the usefulness of using the e-learning system that the person perceives. (F. Abdullah, R.Ward & E.Ahmed, 2016).

The third variable (Self-efficacy) represents the minimum mean of 3.06 and highest mean of 4.00. The lowest mean of these variables shows that e-learning of communicating over the internet is not as effective as physical interaction, where students preferred face to face communication to gain more consensus. However, the students are assertive that e-learning eases the submission of all tasks with a mean of 4.00. This is because e-learning enables paperless submission that can be done anytime and anywhere thus saving time and cost.

The finding of the fourth variable (Intention to use) shows significant willingness by the student in using e-learning throughout their semester with a mean of 3.73 and records mean of 3.34 for using it on a daily basis. This results shows that students are willing to use the e-learning system in assisting in their daily learning activities.

In the variable of Technology availability and usage, records the lowest mean of 2.68 and highest mean of 4.54. The highest shows that most of the students' have access to the internet and can use computers with confidence. These results can be a positive result in the use of e-learning as students are comfortable with the use of technology and seamlessly have access to electronic equipment and the internet. Contrary, the infrastructure provided by the institution shows poor mean value. This can be based on where infrastructure provided in the institution is inadequate, outdated and has very poor maintenance. Infrastructure plays an important role in supporting the effectiveness of e-learning as it contributes to the ease of use and access.

Construct reliability was tested to ensure that the results are reliable and consistent. Cronbach alpha is used to calculate each of the factors and for the entire scale (Cronbach alpha = 0.808) which measures the internal consistency of the scale as shown in figure 6. Internal consistency measures the inter-relatedness of the items used by indicating how a set of items are closely related as a group (Moola and Bisschodd, 2012). Hair et al (2003) recommended Cronbach's alpha values of 0.6 to 0.7 as the limit of satisfaction whilst Streiner (2003) recommended a maximum threshold of 0.09. A very high value for alpha indicates that some items are redundant. However, Nunnally (1967) suggests that a Cronbach alpha value of 0.7 is still acceptable, with a slightly lower value might sometimes be acceptable.

If all variables in the questionnaire show a high level of reliability, an accurate study results can be obtained. The results of the reliability test (Cronbach Alpha) of the total factors is 0.808 shows a high correlation coefficient. The independent variable was that of the perceived ease-of-use recorded 0.586 values, the perceived usefulness records 0.889 values, the self-efficiency had 0.714 values while the intention to value was 0.616 and lastly the technology accessibility and usage had values of 0.759. Cronbach alpha of total variables (CR=0.808) for the construct used in the current study indicates that it can be used for further analysis.

Table 4. Cronbach Alpha

<i>Factors</i>	<i>Cronbach's Alpha</i>
Perceived ease-of-use (PEOU)	0.586
Perceived usefulness (PU)	0.889
Self-Efficiency	0.714
Intention to use	0.616
Technology accessibility and usage	0.759
Total (23 items)	0.808

Correlation

According to Cohen and Manion (1985), the use of correlation test statistics is to understand the relationship or influence of one factor to another. It is essential to confirm reliability and correlation as they are all the underlying assumptions for conducting regression analysis on data. Perceived ease-of-use (PEOU), Perceived usefulness (PU), Self-Efficiency, Intention to use, Technology accessibility and usage were checked for correlation among the variables.

Figure 2. Pearson's correlation coefficient

		PEOUs	PUs	SEs	ITUs	TAUs
PEOUs	Pearson Correlation	1	.749**	.304**	.184	-.032
	Sig. (2-tailed)		.000	.002	.066	.751
	N	101	101	101	101	101
PUs	Pearson Correlation	.749**	1	.392**	.273**	.162
	Sig. (2-tailed)	.000		.000	.006	.105
	N	101	101	101	101	101
SEs	Pearson Correlation	.304**	.392**	1	.742**	.101
	Sig. (2-tailed)	.002	.000		.000	.315
	N	101	101	101	101	101
ITUs	Pearson Correlation	.184	.273**	.742**	1	.246*
	Sig. (2-tailed)	.066	.006	.000		.013
	N	101	101	101	101	101
TAUs	Pearson Correlation	-.032	.162	.101	.246*	1
	Sig. (2-tailed)	.751	.105	.315	.013	
	N	101	101	101	101	101

** . Correlation is significant at the 0.01 level (2-tailed).
 * . Correlation is significant at the 0.05 level (2-tailed).

Based on figure 7, there was high correlation among anticipated perceived ease-of-use and perceived usefulness of 0.749, 0.304 correlation among perceived ease-of-use and self-efficiency, 0.184 correlation among perceived ease-of-use and intention to use and -0.032 correlation among perceived ease-of-use

and technology accessibility and usage. Perceived usefulness had 0.392 correlation with self-efficiency, 0.273 correlation with intention to use and 0.162 correlation with technology accessibility and usage. Self-Efficiency had 0.742 correlation with intention to use and 0.101 correlation with technology accessibility and usage. The intention to use had 0.246 correlation with technology accessibility. This level of correlation is appropriate among the variables and shows that there is a relationship that is present among the variables and also confirming that independent variables are not too highly correlated as that help to avoid the problem of multicollinearity. Avoiding multicollinearity problems in regression analysis is important because the least squares estimation method assumes that the independent variables are not correlated with each other.

Regression Analysis

A regression analysis was conducted to test all the seven hypotheses to determine relationship between variables whether it is supported or not. The hypothesis was tested as follows;

Table 6. Summary of regression analysis

<i>Hypothesis</i>	<i>Independent variable</i>	<i>Dependent variable</i>	β	<i>Standard error</i>	<i>t</i>	<i>p</i>	<i>Hypothesis supported</i>
H1	Self-efficiency	Perceived ease of use	0.315	0.099	3.176	0.002	yes
H2	Self-efficiency	Perceived usefulness	0.236	0.056	4.242	0.000	yes
H3	Technology availability and usage	Perceived ease of use	-0.030	0.093	-0.318	0.751	no
H4	Technology availability and usage	Perceived usefulness	0.087	0.053	1.634	0.105	No
H5	Perceived ease of use	Perceived usefulness	0.435	0.039	11.265	0.000	yes
H6	Perceived ease of use	Intention to use	0.133	0.071	1.862	0.066	no
H7	Perceived usefulness	Intention to use	0.340	0.120	2.822	0.006	yes

Table x summarises the results obtained from the regression analysis testing. Overall, four out of five hypotheses are supported. In the next paragraph, a results of the hypothesis are discussed.

H1: *Self-efficacy (SE) has a significant positive effect on perceived ease of use (PEOU).*

For the first **hypothesis (H1)**, regression analysis was conducted for testing where self-efficiency (SE) was an independent factor while perceived ease of use (PEOU) was a dependent factor. Regression

analysis gave a p-value of 0.002 ($p < 0.05$), which indicates the existence of a significant relationship between the factors SE and PEOU. Thus, SE has impacts on PEOU and hypothesis (H1) is supported.

H2: Self-efficacy (SE) has significant positive effect on perceived usefulness (PU).

Similarly, **hypothesis two (H2)** was also tested, where self-efficacy (SE) was an independent factor while perceived usefulness (PU) was a dependent factor. Regression analysis gave a p-value of 0.000 ($p < 0.05$), which also implies the existence of a significant relationship between the factors SE and PU. Thus, SE has impacts on PU and this hypothesis (H2) is supported.

Self-efficacy represents the judgement of one's belief or capability to perform a particular job or task across a variety of different situations (Bandura, 1997). Self-efficacy is a critical role in influencing behavior. When students perceive their ability to use the system, the easier they find in using the system. As studied by Park (2009) with a sample of 628 university students has found that self-efficacy of e-learning predicted both perceived ease of use and perceived usefulness of e-learning systems in the university. It is believed that individuals with high self-efficacy are able to perform new tasks with ease compared to those who are not. This is because they have higher expectations and confidence in the skills and ability they have in using the e-learning system which they assume the system is easy to use. In contrast, those who have lack of confidence tend to avoid the use of e-learning systems.

Conversely, e-learning self-efficacy through perceive of use has significant effects on behavioral intention, in which, the more interest and self-driven the individual possesses on performing specific tasks the more they perceive the usefulness of new technology. Due to the perception of usefulness on the new technology is believed to be able to enhance performance.

H3: *Technology availability and usage (TAU) has a significant positive effect on perceived ease of use.*

As for **hypothesis three (H3)**, a regression analysis was conducted where Technology availability and usage (TAU) was an independent factor while perceived ease of use (PEOU) was a dependent factor. The analysis gave a p-value of 0.751 ($p > 0.05$) which displays there is no significant influence on PEOU. Thus, this hypothesis (H3) is rejected.

H4: *Technology availability and usage (TAU) has a significant positive effect on perceived usefulness (PU).*

As for **hypothesis four (H4)**, where technology availability and usage (TAU) was an independent factor while perceived usefulness (PU) was a dependent factor, the regression result gave a p-value of 0.105 ($p > 0.05$) which also shows there is no significant influence on PU and thus, the hypothesis (H4) is rejected.

Based on the results above, it can be supported by numerous researchers. Martins and Kellermanns (2004) argued that there was no significant relationship between system accessibility and perceived ease of use of system in which the measures does not involve separation of internal and external technology access but overall general access. In contrast, Lee (2008) contested the accessibility of internal and external technology which he described internal technology as equipment provided by the organization and external technology as equipment outside an organization. However, there was no provided evidence for a relationship between technology accessibility and perceived usefulness, and no support for a relationship between perceived ease of use and internal technology accessibility.

H5: *Perceived ease of use (PEOU) has significant positive effect on perceived usefulness (PU).*

For the **fifth hypothesis (H5)**, where Perceived ease of use (PEOU) was an independent factor while perceived usefulness (PU) was a dependent factor, the regression result gave a p-value of 0.000 ($p > 0.05$) which also reveals there is significant influence on PU and thus, the hypothesis (H5) is accepted.

Based on the TAM model, perceived ease of use has positive impacts on perceived usefulness of an information system (Davis, 1989). When an individual perceives the use of e-learning is easy and hassle free, they are likely inclined to believe that it will improve their performance. In other words, if students perceive that the e-learning system is easy to use, students will be deemed the system useful. The reasoning is that individuals deemed e-learning as useful when they know how to utilize the system. A research study conducted by Lee (2008) of 1,100 student's participants showed that there is a positive and notable relation between student's perceived ease of use of online systems and the perceptions of usefulness of online learning systems.

E-learning ease of use can be improved through the revamping of interface or design. The design and requirement of the system must meet the expectation of the users in terms of its user-friendliness, navigation, aesthetic, access and security. Easy access to the system also plays an important part to provide easy accessibility. A poor design and complicated functionality may cause complications to the use of the system.

H6: *Perceived ease of use (PEOU) has significant positive effect on intention to use (ITU).*

As shown in table x, **hypothesis six (H6)**, the perceived ease of use (PEOU) has no influence on Intention to use. The regression result gave a p-value of 0.066 ($p > 0.05$), therefore the hypothesis (H6) is rejected.

H7: *Perceived usefulness (PU) has significant positive effect on intention to use (ITU).*

However, the last **hypothesis (H7)**, indicates that perceived usefulness (PU) has significant influence on intention to use (ITU). The regression result gave a p-value of 0.006 ($p > 0.05$) thus, the hypothesis (H7) is accepted.

In this study, the perceived ease of use does not have direct influence on the intention to use of e-learning system, although it has direct influence on perceived usefulness. This demonstrates perceived usefulness has significance in e-learning system acceptance. In other words, although e-learning systems are inconvenient,

students will still want to use it for its benefits. Therefore, a system with a high level of perceived usefulness will induce positive attitudes. Oppositely, if the e-learning system is easy to use but does not bring any benefits to the students, then they will not use it.

Consideration of the desire to use technology or not, will depend on the level of ease in learning its use. The easier the technology is, the higher the interest of individuals to use it (Barhoumi, 2016). The more difficult the technology is, the lower the interest of individuals to use it, and the slower individuals and community groups will adopt it. To overcome this, training and guidance availability should be considered to support and influence the student to the use of e-learning systems.

Research has supported that the higher the individual perceived usefulness and ease of use of using new technology, the more positive the attitude toward the new technology, leading to greater intention

to use the system. Lee (2008) argues that easy access and perception of convenience provide a positive effect on the online learning system where in turn, users become more likely to accept it and learn it. Because e-learning itself can be accessed anywhere and anytime and is very convenient, thus perception of usefulness will further encourage students to use e-learning systems.

CONCLUSION

To conclude, e-learning is a way forward in today's world that enables quality education service in Brunei Darussalam. E-learning will not reach its objective and benefits if students refuse or are unable to use the system. This study represents the applicability of TAM to investigate and explain the students' behavior towards e-learning technology. Therefore, an understanding of student acceptance behavior toward the system and technology availability is important in order to improve the online learning environment. A research model and hypothesis were developed based on TAM and evaluated using data collected of 101 students studying at several higher institutions in Brunei. This study is inclined to the use of quantitative methods. Two TAM external variables are used; Self-efficacy and Technology availability and usage which plays a role in influencing the students' intention to use. Based on the data analysis, four out of seven hypotheses were supported. First, self-efficacy had significant influence on both perceived usefulness and perceived ease of use of e-learning systems. On the other hand, technology availability and usage had no significant impact on perceived usefulness well as the perceived ease of use of e-learning systems. Perceived ease of use has a major impact to perceive usefulness. Moreover, the perceived ease of use does not have influence on the intention to use of e-learning system, while perceived usefulness has influence on intention to use. Overall, the determinants of e-learning adoption in higher institutions are Self-efficacy, Perceived ease of use, Perceived usefulness and Intention to use. Furthermore, it was recommended that institutions should provide training and technology support to neuter attitude and acceptance of students towards effective e-learning.

RECOMMENDATION

Capitalize the Use of Technology Among Institution

With the world facing a pandemic outbreak today, the trend of using technology in this situation should be taken advantage of among educational institutions. The adoption of online learning strategies are competent to improve the quality of learning and learning outcomes of different individuals; can use new techniques, methods or learning models and new technologies to improve teacher performance and overall improve the quality of education. The benefit of online learning is, it provides flexibility, particularly in terms of time. Online learning facilitates the learning process to be done anywhere and anytime where internet connection is available. Thus, this enhances students' motivation compared to traditional classroom approaches. In addition, it is very effective and efficient for the students as they don't have to go back and forth to college but only open their devices or laptop at home.

Technology Training

In general, training plays a crucial part to improve an individual's performance and skills. In a learning context, training ensures students are able to understand and use the technology or system. Training in the use of technology is called technology training. Technology training of e-learning involves the transfer of knowledge and guidelines about the specific online learning software or system that will be used by the institution as the platform for e-learning. Training can be conducted internally or externally through departments or courses. According to Agarwal & Prasad (1998), external or internal training is positively related to technology acceptance. Training acts as a forerunner to a positive attitude to technology where it eliminates negative effects such as anxiety of performing new things that is unpredictable. Thus, training facilitates learners' acceptance towards the system or technology consequently leads to a positive attitude of using the technology specifically e-learning system. Furthermore, a study by Lee (2008) found that technology training is positively related to perceived ease of use and perceived usefulness of the technology. Take into consideration, a student who is new to a specific computer program and those who have difficulties in using technology, a training makes it possible to facilitate the use of the computer as well as perceives its usefulness.

Technical Support Availability

Technical support is considered an important component in promoting learners' belief of new technology and making the system effective. The availability of technical support ensures that obstacle or technical problem learners encountered such as system down or bug error, are brought into solution in a matter of time. Failure to provide support will frustrate users and therefore negatively impact technology. Thus, learners will likely perceive a new learning system as easy to use and useful for their learning when system assistance is readily available through their use of the system. In addition, lecturers or staff play an important role in encouraging students to use the e-learning system. Waheed and Hussain (2010) mentioned that the lecturers' characteristics factors can contribute to the acceptance of the satisfaction of the students in system use. Moreover, the success of the e-learning system depends on the lecturer's attitude towards e-learning. Not only the attitude towards the system, but the role of lecturers in the management of e-learning, the dissemination of information, the teaching style, the provision of relevant and quality information and content that influence and influence the acceptance of e-learning among students. Sun et al. (2008), in turn, suggested that lecturers' attitudes toward learning can influence e-learning acceptance among students.

REFERENCES

- Abdullah, F., Ward, R., & Ahmed, E. (2016). Investigating the influence of the most commonly used external variables of TAM on students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of e-portfolios. *Computers in Human Behavior*, *63*, 75–90. doi:10.1016/j.chb.2016.05.014
- Barhouni, C. (2016). User Acceptance of the e-Information Service as Information Resource: A New-Extension of the Technology Acceptance Model. *New Library World*, *117*(9/10), 626–643. doi:10.1108/NLW-06-2016-0045

- Berna-Martinez, J., & Maciá Pérez, F. (2012). Overcoming resistance to change in business innovation processes. *IACSIT International Journal of Engineering and Technology*, 4, 148.
- Burton-Jones, A., & Hubona, G. (2005). Individual differences and usage behavior: Revisiting a Technology Acceptance Model assumption. *ACM SIGMIS Database*, 36(2), 58–77. doi:10.1145/1066149.1066155
- Chen, C. K., Susanto, H., & Leu, F. Y. (2019). Managing Online Learning: Big Data, Social Networks, and Cloud Computing. In *The Emerging Technology of Big Data* (pp. 229-252). Apple Academic Press.
- Chuttur, M. (2009). Overview of the Technology Acceptance Model: Origins, Developments and Future Directions. *Sprouts: Working Papers on Information Systems*, 9.
- Delone, W. H., & McLean, E. R. (2003). The Delone and McLean Model of information systems success: A Ten-Year update. *Journal of Management Information Systems*, 19(4), 9–30. doi:10.1080/07421222.2003.11045748
- Dominici, G., & Palumbo, F. (2013). How to Build an E-Learning Product: Factors for Student/Customer Satisfaction. *Business Horizons*, 56(1), 87–96. doi:10.1016/j.bushor.2012.09.011
- Durodolu, O. (2016). *Technology Acceptance Model as a predictor of using information system to acquire information literacy skills*. Academic Press.
- Grandon, E., Alshare, O., & Kwan, O. (2005). Factors influencing student intention to adopt online classes: A cross-cultural study. *Journal of Computing Sciences in Colleges*, 20, 46–56.
- Ibrahim, F., Gulihana, N. A., & Susanto, H. (2022). An Explanatory Study of User Satisfaction: Evidence From Brunei Health Information and Management System (Bru-HIMS). In P. Ordóñez de Pablos (Ed.), *Handbook of Research on Developing Circular, Digital, and Green Economies in Asia* (pp. 346–369). IGI Global. doi:10.4018/978-1-7998-8678-5.ch017
- Jr, H., Celsi, M., Money, A., Samouel, P., & Page, M. (2015). *The essentials of business research methods* (3rd ed.). doi:10.4324/9781315716862
- Kahiigi, E., Ekenberg, L., Hansson, H., Tusubira, F., & Danielson, M. (2008). Exploring the e-Learning State of art. *The Electronic Journal of e-Learning*, 6.
- Lapointe, L., & Rivard, S. (2005). A Multilevel Model of Resistance to Information Technology Implementation. *Management Information Systems Quarterly*, 29(3), 461–491. doi:10.2307/25148692
- Lee, J., Burnett, G., Vandegrift, M., Baeg, J. H., & Morris, R. (2015). Availability and accessibility in an open access institutional repository: A case study. *Information Research*, 20(1), paper 661. Retrieved from <http://InformationR.net/ir/20-1/paper661.html>
- Liu, Y., & Wang, H. (2009). A comparative study on e-learning technologies and products: From the East to the West. *Systems Research and Behavioral Science*, 26(2), 191–209. doi:10.1002/res.959
- Love, N., & Fry, N. (2006). Accounting Students' Perceptions of a Virtual Learning Environment: Springboard or Safety Net? *Accounting Education*, 15(2), 151–166. doi:10.1080/06939280600609201

- Mohammadi, H. (2014). Investigating users' perspectives on e-learning: An integration of TAM and IS success model. *Computers in Human Behavior*, 45, 359–374. Advance online publication. doi:10.1016/j.chb.2014.07.044
- Mohiddin, F., & Susanto, H. (2021). Three Parties Engagement of Learning Management System: Students-Lecturer Technology Evidence From Brunei. In *Handbook of Research on Analyzing IT Opportunities for Inclusive Digital Learning* (pp. 130-153). IGI Global.
- Mohiddin, F., Susanto, H., & Ibrahim, F. (2021). Implications of Knowledge Management Adoption Within Higher Education Institutions: Business Process Reengineering Approach. In *Handbook of Research on Analyzing IT Opportunities for Inclusive Digital Learning* (pp. 307–351). IGI Global. doi:10.4018/978-1-7998-7184-2.ch016
- Moolla, A., & Bisschoff, C. (2012). Validating a Model to Measure the Brand Loyalty of Fast Moving Consumer Goods. *J. Soc Sci*, 31(2), 101–115. doi:10.1080/09718923.2012.11893019
- Nazamudeen, S., Susanto, H., & Mohiddin, F. (2021). Augmented Reality Towards an Informative Educational Environment: Digitalizing Interactive Learning. In *Handbook of Research on Analyzing IT Opportunities for Inclusive Digital Learning* (pp. 103–129). IGI Global. doi:10.4018/978-1-7998-7184-2.ch007
- Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Journal of Educational Technology & Society*, 12(3), 150–162. http://www.ifets.info/journals/12_3/14.pdf
- Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building approach*. John Wiley & Sons.
- Selvaganapathi, R., & Raja, V. P. (2012). Technophobia of Higher Secondary School Teachers. *International Journal of Teacher Educational Research*, 1(3).
- Siegel, D. M. (2008). *Accepting technology and overcoming resistance to change using the motivation and acceptance model*. Retrieved from http://etd.fcla.edu/CF/CFE0002154/Siegel_Daniel_M_200805_PhD.pdf
- Streiner, D. L. (2003). Being inconsistent about consistency: When coefficient alpha does and doesn't matter. *Journal of Personality Assessment*, 80(3), 217–222. doi:10.1207/S15327752JPA8003_01 PMID:12763696
- Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D. (2008). What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education*, 50(4), 1183–1202. doi:10.1016/j.compedu.2006.11.007
- Susanto, H. (2017). Electronic Health System: Sensors Emerging and Intelligent Technology Approach. In *Smart Sensors Networks* (pp. 189–203). Elsevier. doi:10.1016/B978-0-12-809859-2.00012-7
- Susanto, H. (2018). Smart mobile device emerging Technologies: An enabler to Health Monitoring system. In *High-Performance Materials and Engineered Chemistry* (pp. 241–264). Apple Academic Press. doi:10.1201/9781315187860-8

Susanto, H. (2019). Toward Big Data's Impact on the Learning Process: Generation Y and Z Perspectives. In *The Emerging Technology of Big Data* (pp. 65-92). Apple Academic Press.

Susanto, H., & Almunawar, M. N. (2015). Managing Compliance with an Information Security Management Standard. In *Encyclopedia of Information Science and Technology* (3rd ed., pp. 1452–1463). IGI Global. doi:10.4018/978-1-4666-5888-2.ch138

Susanto, H., & Almunawar, M. N. (2018). *Information Security Management Systems: A Novel Framework and Software as a Tool for Compliance with Information Security Standard*. CRC Press. doi:10.1201/9781315232355

Susanto, H., Almunawar, M. N., Leu, F. Y., & Chen, C. K. (2016). Android vs iOS or Others? SMD-OS Security Issues: Generation Y Perception. *International Journal of Technology Diffusion*, 7(2), 1–18. doi:10.4018/IJTD.2016040101

Susanto, H., & Chen, C. K. (2017). Information and Communication Emerging Technology: Making Sense of Healthcare Innovation. In *Internet of Things and Big Data Technologies for Next Generation Healthcare* (pp. 229–250). Springer. doi:10.1007/978-3-319-49736-5_10

Susanto, H., & Chen, C. K. (2019). The Evolution of Learning Analytics Through Big Data's Emerging Technology. In *The Emerging Technology of Big Data* (pp. 153–171). Apple Academic Press. doi:10.1201/9781351241250-7

Susanto, H., Chen, C. K., & Almunawar, M. N. (2018). Revealing Big Data Emerging Technology as Enabler of LMS Technologies Transferability. In *Internet of Things and Big Data Analytics Toward Next-Generation Intelligence* (pp. 123–145). Springer. doi:10.1007/978-3-319-60435-0_5

Susanto, H., Hamid, H., Mohiddin, F., & Setiana, D. (2021). Role of Learning Technology Strategies Among People With Disabilities: A Job Opportunities Barrier. In *Handbook of Research on Analyzing IT Opportunities for Inclusive Digital Learning* (pp. 215–248). IGI Global. doi:10.4018/978-1-7998-7184-2.ch012

Susanto, H., Ibrahim, F., Nazmudeen, S. H., Mohiddin, F., & Setiana, D. (2021). Human-Centered Design to Enhance the Usability, Human Factors, and User Experience Within Digital Destructive Ecosystems. In *Global Challenges and Strategic Disruptors in Asian Businesses and Economies* (pp. 76–94). IGI Global. doi:10.4018/978-1-7998-4787-8.ch005

Susanto, H., Leu, F.-Y., Caesarendra, W., Ibrahim, F., Haghi, P. K., Khusni, U., & Glowacz, A. (2020). Managing Cloud Intelligent Systems over Digital Ecosystems: Revealing Emerging App Technology in the Time of the COVID19 Pandemic. *Appl. Syst. Innov.*, 3(3), 37. doi:10.3390/asi3030037

Tabak, F., & Nguyen, N.T. (2013). *Technology Acceptance and Performance in Online Learning Environments: Impact of Self-Regulation*. Academic Press.

Ünal, Y., Alir, G., & Soydal, İ. (2013, September). Students readiness for e-learning: an assessment on Hacettepe University Department of Information Management. In *International Symposium on Information Management in a Changing World* (pp. 137-147). Springer.

Business Process Reengineering of Digital Learning Ecosystems

Waheed, M., & Hussain, M. F. (2010). *Empirical study of e-learner contentment towards e-Learning: Influential role of key factors*. The 2010 MIT LINC Conference in Stratton Center on the MIT Campus, Boston, MA.

Woen, A., Sylvia, C., & Handoko, H., & Abdurachman, E. (2018). E-learning acceptance analysis using technology acceptance model (Tam) (case study: Stmik mikroskil). *Journal of Theoretical and Applied Information Technology*, 96, 6292–6305.

Chapter 8

Technological Innovations in Supply Chain Management Towards a Circular Economy in the Healthcare Sector of the UAE

Sumita Dave

Amity University, Chhattisgarh, India

Nikita Shaikh

Amity University, Chhattisgarh, India

ABSTRACT

Traditional techniques of linear economy generate a lot of waste, which leads to unsustainable practices in the supply chain management. This chapter analyses the impact of circular economic system practices on company overall performance for a circular supply chain and explores the mediating position the technologically driven supply chain plays inside these relationships in the healthcare sector in reference to UAE. UAE and the 2030 Agenda of Sustainable Development Excellence in Implementation 2017 report suggests that UAE raises cognizance of, and integrates, sustainability standards into its agenda to promote sustainable lifestyles. Since most products in UAE are imported, the supply chain is lengthy and fragmented, making procurement expensive. Hence, an innovative technology-driven green supply chain can be an effective solution for both cost and waste reduction.

INTRODUCTION

The GCC region has witnessed spectacular growth in the last two decades, specially in the Healthcare sector. Therapid demand in the Healthcare sector has been due to primarily the senior citizen popula-

DOI: 10.4018/978-1-7998-9664-7.ch008

tion and also due to rising widespread of lifestyle diseases. However, the GCC countries have made exceptional efforts to make world class healthcare facilities accessible to all its residents and citizens.

This has driven the GCC healthcare market at a CAGR of 7.7% (2009-14) to reach US\$55 bn by 2014. The UAE and Saudi Arabia are the major economies in the GCC region and are projected to grow at almost 76% by 2018.

The major chunk of the services in the healthcare sector in the GCC region is provided by the expatriate healthcare workforce. The government is taking leaps to bring down this dependency by setting up good quality training institutes and educational organizations.

In the last decade, the UAE has made path breaking efforts to create a robust healthcare infrastructure that is now increasingly being considered at par with international standards.

Since 2007, the UAE has more than doubled its healthcare budget, spending 3.3 percent of GDP on healthcare in 2014. In the years 2016-22, the market is expected to grow at an impressive CAGR of 8%.

The Northern Emirates' major healthcare regulator is the Ministry of Health (MoH). It is the federal authority in charge of bringing the UAE's healthcare policies together, building a comprehensive and nationwide healthcare service, and ensuring that healthcare is available throughout the country.

The Dubai Health Authority (DHA) is the Emirate's healthcare regulator and operator. It develops and supports medical education and research institutions, as well as defining the region's healthcare policy and strategy. In Dubai and its free-trade zones, it also oversees and licenses all healthcare facilities and services.

The Health Organization of Abu Dhabi (HAAD) is a financially and administratively independent public health authority in Abu Dhabi that issues requisitions for healthcare facilities and establishes regulations for the region's healthcare providers. At the policy level, it also oversees the management of healthcare services.

The UAE's healthcare infrastructure outshines that of other GCC countries.

In terms of physician and nurse density, Dubai and Abu Dhabi top the GCC region, although they lag somewhat behind in terms of bed density, indicating that there is significant room for more of these facilities to be built.

In November 2014, Dubai enacted the first phase of its new health insurance law. All businesses with more over 1,000 employees were required to provide medical coverage for their employees, who were then responsible for covering their dependents. Smaller businesses must follow suit by 2016. (GCC Healthcare Sector A Focus Area for Governments October 2015. (2015). Ardent Advisory and Accounting).

The UAE has a comprehensive government- funded healthcare provider and a swiftly developing private healthcare sector.

In the last decade, the UAE has made committed efforts to create a robust healthcare infrastructure that is now increasingly more being viewed at par with worldwide standards.

The UAE Vision 2021 targets to achieve a world-class healthcare device in the us of a through public and private participation. The Vision seeks to have all public and non-public hospitals approved in accordance to national and global high-quality standards with regard to clinical services and staff. The National Agenda additionally emphasises the importance of preventive remedy and seeks to minimize the incidence of cancer and lifestyle-related illnesses to help citizens live a longer and healthier life.

Compliance to nearby standards and regulation is specifically fundamental in the healthcare zone of any united states for medical and operational effectives, as well as for accreditation purposes however, due to the fact most medical products are imported in the UAE, the provide chain is often long and fragmented making it difficult for procurement gurus to track.

Further complicating the supply chain in the UAE healthcare area is that producers frequently have special retailers restricted through precise geographic boundaries inside the UAE, limiting timely servicing including warranties, restocking consumables and substitute parts which end result in short supply and ineffective procurement processes.

A circular economy is an industrial system that is restorative or regenerative by way of intention and design. It replaces the end-of-life notion with restoration, shifts toward the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse and return to the biosphere, and pursues for the removal of waste through the finest format of materials, products, systems, and enterprise models. (The World Economic Forum's Definition of Circular Economy)

With a developing market demand for several merchandise within the latter 1/2 the twentieth century, quite a few corporations ventured into risky alternatively frugally profitable modes of production, compromising long-run affects each on society and also the surroundings (Rajeev et al., 2017). Stakeholders, collectively with regulative authorities, manufacturers, customers, and the public, have been compelled to rethink economic business models and to question the implications of commercial enterprise practices on society and the environment (Rajeev et al., 2017); The depletion of the Earth's finite sources through elevated consumption, industrialization, and economic procedure induced organizations to rethink then again they ought to contend in the returning years and a long time (Roscoe et al., 2016).

The Circular Economy (CE) has been a policy initiative for supply chain techniques to reuse, refurbish, recycle, minimize, eliminate, share, and optimize material and energy use whereas keeping firm earnings (Nandi et al., 2020). Circular economy business models (CEBM) are counseled for accomplishing this aggressiveness for corporations and their supply chains (Pieroni et al., 2019). There are three historic degrees inside the supply chain: procural, production and distribution. All of these stages could also be composed of countless amenities in numerous areas round the world (Thomas, D. J., & Griffin, P. M. 1996). Historical procurement in the primary purpose attention on three criteria that are: i) cost; ii) quality; and iii) delivery. Sustainable practices, is an approach to achieve sustainability as a result of considering environment, as an integral part of green supply chain management (Foo et al., 2021).

Various papers assist the importance of sustainable supply chain management for the circular economy. The use of sustainable policies and actions that reap additional benefits and sustainable practices provide greater results, through, facilitating the flow, aiding "just-in-time" deliveries among supply chains, adopting 3R (reduce/reuse/recycle), and up sustainability of the operations (Dulebenets, M. A. (2018).

Apostle Penfield of the Whiteman school of Management extends the definition of Green Supply Chain Management (GSCM) to sustainable supply chain management as "the approach of exploitation environmentally friendly inputs and redesigning these inputs into outputs which will be saved and re-used at the pinnacle of their lifecycle therefore making a sustainable supply chain." The definitions and explanations by using numerous researchers on this difficulty lead us to a fashionable platform with assorted groupings of practices in GSCM (Gao et al., 2017). A definition that integrates the three ideas of innovation, sustainability, and also Green Supply chain is a part of the systematic literature evaluation printed in 2017 by workplace and colleagues (Giudice et al., 2020).

From a scientific literature evaluation to built-in definition for Sustainable Supply chain innovation (SSCI) (Giudice et al., 2020). These authors processed that the thinking of Sustainable Supply Chain Innovation (SSCI) comes from Supply Chain Innovation (SCI), which may additionally be outlined as an integrated amendment from revolutionary to radical changes inside the product, process, marketing,

technology, resource and/or organization, that are related to all the related parties, protecting all associated functions in supply chain and making rate for all stakeholders. If the SCI ends up in the balanced overall performance of economic, social and environmental dimensions, that ability that every one three dimensions have fantastic innovation performance, then it is referred to as associate SSCI (Giudice et al., 2020).

This paper is primarily based on secondary data and conclusions are drawn based on secondary work of research.

LITERATURE REVIEW

Circular economic system emphasizes that commercial enterprise fashions should move a long way past the conventional linear economic system technique primarily based totally on production–consumption–disposal; they have to flow to a version primarily based totally at the 3Rs of recycle, lessen and reuse (Banaite, D. 2016). Circular economic system is a method of retaining and optimizing using resources (Younis et al., 2020). It as a consequence represents a brand new idea of extra sustainable improvement, because it goals to growth the performance of aid use with a view to reap monetary, environmental and societal improvement via way of means of balancing and contemplating monetary, environmental, technological and social factors (Soda et al., 2016). Investigating the connection among inexperienced deliver chain control and company overall performance the usage of a blended technique technique, in phrases of monetary overall performance, of the 4 GSCM practices, handiest inexperienced shopping turned into observed to have a tremendous effect on monetary overall performance (Conference Proceedings Factors Influencing Sustainable Procurement Practices in The Malaysian Manufacturing Firm 2019 9th International Conference on Operations and Supply Chain Management. 2021). According to the report UAE and 2030 Agenda for Sustainable Development by Federal Competitiveness & Statistics Authority, Implementation efforts for health-associated SDGs are aligned with the continuing agenda in the direction of the pillar of “World-Class Healthcare” in UAE’s Vision 2021 which emphasizes the significance of ailment prevention and a sturdy healthcare system, able to responding efficaciously to epidemics or health risks (Umar et al., 2020). The UAE aspires to create one of the fine healthcare structures within the international and the National Agenda specifies a fixed of formidable objectives and indicators (KPIs) to reap this. Many of those objectives are intently associated with the health-associated objectives within the SDGs.

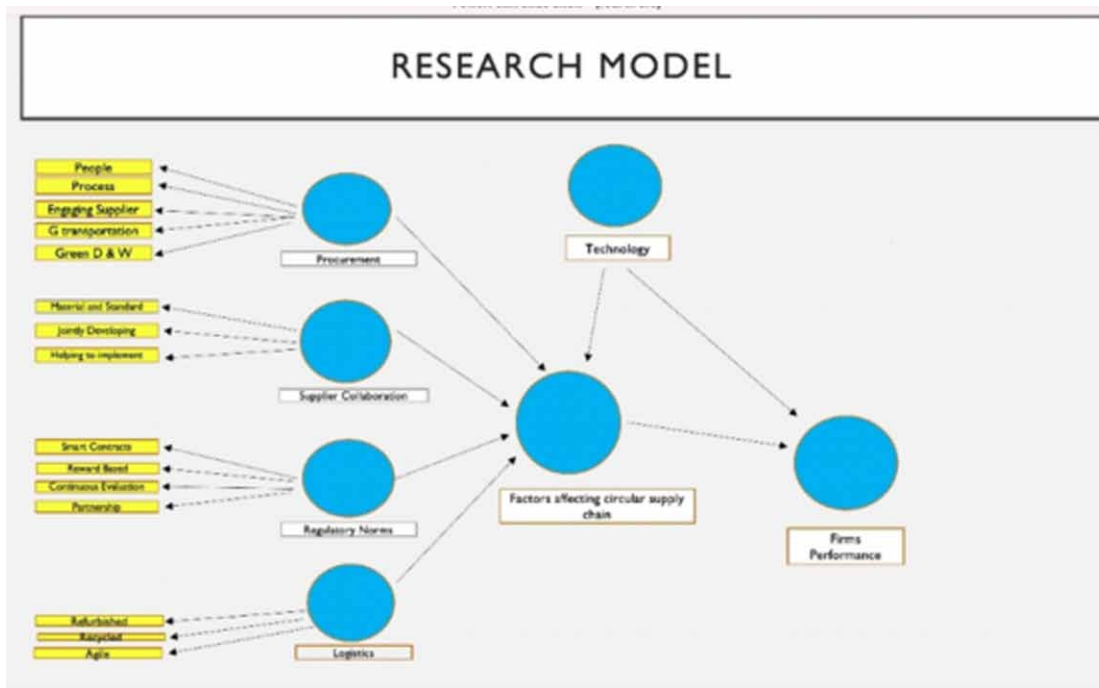
Model

The Smart Analysis of the variables in the model has not been undertaken. The model is a proposed model for the purpose of research.

VARIABLES EXPLAINED

Sustainable Procurement: encourages to think about environmental factors into the continued process of supply chain management, from the initial stage of deed raw materials to the tip of product helpful life (Tu et al., 2013). It’s additionally been mentioned that the SSCM practices carries with it sustainable

Figure 1. Research model



procural; style for environment; and reverse provision (Panigrahi et al., 2019). Sustainable procurement needs procuring product from the suppliers that use sustainable materials corresponding to non-toxic, reusable and recyclable; encourages waste reduction and reduction of venturous materials (Affia et al., 2019). the method of SSCM involves the 2 most important activities which are called choice and procurement (Handfield, R. B., & Bechtel, C. 2002).

Collaboration with suppliers: Collaboration with suppliers is receiving attention in environmental problems by screening associated evaluating suppliers within the SP implementation (Humphreys et al., 2003). Suppliers’ choice and collaboration is one among the procedure that promotes sustainable and environmental performance of an organisation. This procedure makes bound that toxic or unsustainable materials aren’t being purchased and directly parallel with the organisation environmental standing (Meehan, J., & Bryde, D. 2011).

Regulatory Pressure: Regulatory pressures additionally play a vital role in influencing the implementation of sustainable procurement SP practices (Rao, P., & Holt, D. 2005). Many organisations would in fact implement SP practices if it’s being inspired by the govt bodies on environmental rules and regulations (Zhu et al., 2005). ‘The role of state by implementing strict rules to be complied by corporations encourage SP practices in partitioning environmental problems is turning into a lot of and more important, that is well known by organizations (Holt, D., & Ghobadian, A. 2003). Environmental regulation leads to improved supply chain (Freedman, M., & Jaggi, B. 1988). This is in addition to the study done by (Impact of government regulations on pollution performance of pulp and paper firms. Environmental Management), wherever government regulations is seen because the ‘main propulsion for firms to adopt sustainable practices, to reinforce towards environmental improvement’ (Handfield, R. B., & Bechtel, C. 2002).

Reverse Logistics: The paper (Handfield, R. B., & Bechtel, C. 2002) indicates managers with the data of the inexperienced impact of reverse provision on the supply chain, supported green image, material usage, gain associated alternative indicators take better decisions. The importance of ending analysis on sustainable practices is essential to the very fact that it enhances the organisational performance along by making an environmentally friendly world (Schot et al., 1997).

ROLE OF TECHNOLOGY

Use technological innovation is vital to sustainable supply chain practices. The event of e-commerce and m-commerce (mobile commerce) created supply chain management an important space of business. Management of Inventories, coordination value and transactions in small level and macro level to be analyzed to convey higher prospective. Relationship and management structure resembling cooperation, Competition and alternative impacts were mentioned from socio-psychological and behavioural aspects. Suppliers, manufacturers, shippers, distributors, retailers and clients are major stakeholders in supply chain management. because of increasing importance to technology advancement and alter of customer demand and expectation, the need of integrated supplying management obtaining a lot of attention. (Islam et al., 2017). Effective management of supply chain may be a terribly essential feature in any business because it is directly connected with the price of the merchandise factory-made and conjointly business arrange and also the prominence of logistics (Suprapti, Atiek., 2020). The technological advancements, international trade, consolidation activities and outsourcing of comes have solely led to growth within the engineering science logistics services market and this trade can still evolve in the coming back years (Khaddam et al., 2020).

Blockchain Technology is an rising technology that's disrupting the marketplace and increasing business horizons. BT uses a suburbanised "trustless" info that allows for prime volume transactions and method disintermediation, as conjointly decentralization between acquiring members (Rengamani, J., & Venkatraman, V. 2015). Blockchain has all the properties which will alter disparate offer chain members to coordinate their actions to realize a collective goal. just in case of property offer Chain Management, transparency and validity of the sustainable practices will be increased mistreatment Blockchain Technology (Crosby et al., 2016). The utilization of advanced information technology ideas resembling BlockChain Technology to make sure knowledge security and supply the required support in technology adoption for the property SupplyChain Management initiative (Nayak, G., & Dhaigude, A. S. 2019). Adopting ICT provides one more advantage because it provides crucial info in real-time. It provides support to numerous individuals within the supply chain, enabling them to realize their objectives. ICT may even be accustomed connect with upstream and downstream players for economical flow of information, thereby gaining their acceptance to be a section of the system (Prause, G. 2019). Automating procural Contracts in the health care supply Chain mistreatment Blockchain good Contracts (Omar et al., 2021) will facilitate blockchain and suburbanised storage technologies to market collaboration, transparency, knowledge integrity, and data rootage among stakeholders in the healthcare supply chain. (Groschopf et al., 2021). So as to achieve sustainable development, a lot of attention is being paid to circular economy, that permits resource usage and waste production to be reduced (Meijer, D., & Ubacht, J. 2018). Riotous technologies, resembling the Internet of things, huge knowledge analytics and artificial intelligence, are touching the manner supply chain managers build strategic and operational choices (G. Ramesh et al., G. 2018). In particular, big data created on the market by the unfold

of cloud computing, mobile digital business platforms, business analytics and social networks haven't solely considerably modified the procedure of the many corporations however have conjointly been accustomed bring home the bacon higher performance by optimizing circular economy supply chain solutions (Guidice et al., 2021). Recently, there has been dialogue on whether and the way the emergence of huge knowledge and riotous technologies can have an effect on supply chain practices, management and outcomes so as to strengthen knowledge and connexion (Muller et al., 2018). Though disruptive technologies are touching all price chains (Scuotto et al., 2019), the link between circular economy and data-driven supply chains is of recent conceptualization, and it focuses primarily on the results of one dimension of the questionable triple bottom line (environmental, economic and social sustainability). In addition, although the role of big data in effective decision-making processes has been acknowledged (Stock, T. and Seliger, G. 2016), few empirical studies have targeted on how big data will be leveraged to support the circular economy supply chain performance of corporations in environmental, social and economic terms. Therefore, any advances stay necessary if we tend to are to know the link between circular economy supply chain management, huge knowledge and firm performance (Gupta et al., 2019). Corporations willing to adopt a circular model are needed to maneuver toward technologies and business models characterised by longevity, renewability, recycle and repair so as to optimize the ways in which during which resources and materials already on the market are used and to cut back the consumption of raw materials and connected waste (Ghisellini et al., 2016). At the amount of the firm, circular economy implies the adoption of cleaner production and distribution (supply chain) patterns, particularly by introducing higher technologies. This results in the adoption of recent business models that need a broader and far a lot of comprehensive scrutinize the planning of radically various solutions, network relationships, the engagement of people over the complete cycle of any method and radical changes in practices (Jabbour et al., 2019). Therefore, circular economy may be a key part of the sustainable development which will offer corporations a superior competitive advantage, since it allows them to revamp and reorganize their operations (including manufacturing, supply chain management and training) by minimizing resource inputs, waste and emissions outflow (Genovese et al., 2017). So as to realize this, corporations ought to be organized in such how that their processes are capable of making the most of circular economy principles, resource exchange and interactions (Hussain, M.; Malik, M. 2020). During this connection, The Ellen MacArthur Foundation and McKinsey Company (2012, 2014) have stressed the importance of progressing from property offer chain management to a circular supply chain, shaping it because the power of circling longer (i.e. a continuation of the amount of your time throughout that materials are used). To develop a good circular economy supply chain, huge knowledge are definitely worthwhile; they allow rich, correct and valuable info and insights to be extracted, and that they build it attainable to capture and manage information for decision-making in supplying, producing and order fulfillment (Genovese et al., 2017). In particular, huge knowledge ought to be accustomed emphasize neutral orientation (Kazancoglu et al., 2017), develop a lot of efficient, quicker and higher synchronic logistics processes (Zhao et al., 2017).

And optimize the sustainable solutions that companies adopt for their supply chain management (Balkau, F, Sonnemann, G., 2011). From a group action perspective, Big Data have emerged as a key half which is able to support the implementation of circular economy at intervals corporations, rationalize operations and develop sustainable solutions (Pagoropoulos et al., 2017). Though the role of Big Data in effective decision-making inside the sphere of supply chain has been acknowledged (Fawcett et al., 2011), any advances are still necessary (Dubey et al., 2019). There is very restricted understanding of Big Data is going to be leveraged to support firm performance for the circular economy supply chain.

This lack of information of the links between circular economy supply chain practices, Big data and firm performance reflects a substantial gap in understanding, theory and observe. Therefore, the understanding of this relationship is fertile ground that has got to be cultivated (Hazen et al., 2016). Some recent contributions have highlighted positive returns for companies that arise from the management of Big data from a property perspective (Aminoff, A. and Kettunen, O. 2016). As (McAfee et al., 2012) discovered, “it is time to maneuver on the way aspect examining but Big data and predictive analysis (BDPA) are going to be accustomed enhance operational – and economic – supply chain outcomes to examination of however BDPA can increase measures of supply chain sustainability that have gotten more and more important in today’s international marketplace.” Also, in terms of the blending between circular economy and supply chain management, there is still an abstract gap regarding the connected combination mechanisms (Wang et al., 2016). Big data presently have a sway on all business sectors and functionalities, moreover as supplychains, supplying, management in shopper and market insights and innovation development (Ying, J. and Li-jun, Z. 2012). Comprehensive data may be a essential issue in supply chain management (Fosso et al., 2017), since they permit new ways in which during which of organizing and analyzing supply chain processes to appreciate higher supply chain performance (Waller et al., 2013). Perceptive information for decision-making, resembling big data and enormous information analytics, can facilitate companies in creating circular economy business systems (Aker et al., 2016). Inside the context of supply chains, big-data-driven supply chains enhance productivity and growth and impact on overall firm performance. Big data play an excellent role in rising a firm’s overall performance, notably in supplying and supply chain management (Aker et al., 2016). Previous studies have noted that big data includes a positive impact on supply chain and environmental, social and economic performance (Song et al., 2017). (Yu et al., 2018) Big data, if used with acceptable care, will facilitate corporations to realize higher performance. huge data have conjointly been recognized as a assistant of up on and reliable choices for the adoption of circular economy ways and for the implementation of circular economy business practices [Pagoropoulos et al., 2017]. Corporations can a lot of effectively make the most of recent insights gained from big data once they leverage and exploit it to drive their supply chains. Corporations with better big-data-driven offer chains have higher capabilities to boost their circular supply chain than people who admit choices supported restricted knowledge sets. In fact, big data will be accustomed better perceive a way to style supply chain processes, coordinate operations and networks, enable supply chain members to join forces and have interaction staff with the circular economy paradigm (Acioli et al., 2021). The challenge is that the additional the usage of huge information, the additional important activities a firm is to undertake, circular economy practices with fully totally differentlcompletely different levels of huge information usage make sure different levels of firm performance (Srinivasan, R. 2019). To achieve fight several firm’s exploitation supply chain merger that isn’t new in business world. However, it absolutely was done manually (Whang et al., 2001). Attributable to the technical advancement in nineteenth century dimensions of business has been changed drastically. Most of the companies diagonally connect their supply chain components electronically to manage their finance, product and information and data and knowledge flow reflective the standing to their partners for accessing and sharing the knowledge and information. Through net organizations can go one step any in partnership, through synchronization, integration and even mechanisation of essential business processes. work flow synchronization will comprise activities like procural, demand performance, industrial modification, strategy improvement, and business exchanges. The outcomes are way more economical, quick, dependable and fewer blunder in supply chain processes (Hayes, Ians. 2004).

Limitations: This Paper supported on the market secondary data that has not been tested empirically, examined solely through secondary research.

Suggestions: The findings of the paper are involving the health care sector which might be applied to the opposite sectors also.

CONCLUSION

The increasing global concern for sustainable development has brought unprecedented opportunities and challenges to the sustainable development of green supply chains.

Because of the recent changes within the supply chain dynamics, Technology can play an important role in remodeling the procural and collaboration method at intervals the provision chain and might cause a lot of resilient and self-sustainable, inexperienced supply chains. The speedy advancement in technology like use of good Contracts and computing can pave thanks to “smart supply chains” that lead to any innovation and smarter practices within the offer chain management.

The antecedently dominant linear model of consumption is ending. GCC countries perceive that they have to move toward a circular economy. Attention on cities ought to be the priority, with a specific stress on the designed surroundings and transportation, that manufacture the biggest output of waste. for his or her part, communities must learn to consume energy, food, and water a lot of efficiently. All stakeholders — governments, consumers, and industries — stand to achieve from a circular economy, and must collaborate to search out optimum solutions, learning from the successes of alternative regions and countries. If handled correctly, this transition is ready to bring enormous monetary and environmental edges to multiple sectors and also the region as a whole.

The U.A.E.’s leadership acknowledges that there are serious obstacles that has got to be addressed on the trail to devel- oping a world category care sector and understands that operating with international partners is crucial to overcoming a number of these barriers. In particular, the U.A.E. is wanting to their international partners to help within the development of specialty care practices in the fields of women’s care, oncol- ogy, pediatrics, and diabetes.

However, the tremendous growth of the U.A.E.’s healthcare market poses two major challenges for the U.A.E.: (Umar et al., 2020) recruiting and educating enough quality medical personnel, and (Putting, G. C. C. Sustainable growth in a circular economy) containing costs.

This paper is primarily based on secondary data and conclusions are drawn based on secondary work of research.

REFERENCES

Acioli, C., Scavarda, A., & Reis, A. (2021). Applying Industry 4.0 technologies in the COVID–19 sustainable chains. *International Journal of Productivity and Performance Management*, 70(5), 988–1016. doi:10.1108/IJPPM-03-2020-0137

Affia, I., Yani, L. P. E., & Aamer, A. M. (2019). Factors affecting IoT adoption in food supply chain management. In *9th International Conference on Operations and Supply Chain Management* (pp. 19–24). Academic Press.

- Akter, S., Wamba, S. F., Gunasekaran, A., Dubey, R., & Childe, S. J. (2016). How to improve firm performance using big data analytics capability and business strategy alignment? *International Journal of Production Economics*, *182*, 113–131. doi:10.1016/j.ijpe.2016.08.018
- Aminoff, A., & Kettunen, O. (2016). Sustainable supply chain management in a circular economy—towards supply circles. In R. Setchi, R. Howlett, & Y. T. P. Liu (Eds.), *Sustainable Design and Manufacturing* (pp. 61–72). Springer.
- Balkau, F., & Sonnemann, G. (2011). *Addressing sustainability issues through enhanced supply chain management*. Academic Press.
- Banaité, D. (2016). Towards circular economy: Analysis of indicators in the context of sustainable development. *Social Transformation in Contemporary Society*, *4*(9), 142–150.
- Crosby, M., Nachiappan, Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). Blockchain Technology - Beyond Bitcoin. *Berkley Engineering*.
- Del Giudice, M., Chierici, R., Mazzucchelli, A., & Fiano, F. (2020). Supply chain management in the era of circular economy: The moderating effect of big data. *International Journal of Logistics Management*.
- Dubey, R., Gunasekaran, A., Childe, S. J., Papadopoulos, T., Luo, Z., Wamba, S. F., & Roubaud, D. (2019). Can big data and predictive analytics improve social and environmental sustainability? *Technological Forecasting and Social Change*, *144*, 534–545. doi:10.1016/j.techfore.2017.06.020
- Dulebenets, M. A. (2018). A diploid evolutionary algorithm for sustainable truck scheduling at a cross-docking facility. *Sustainability*, *10*(5), 1333. doi:10.3390/u10051333
- Fawcett, S. E., Wallin, C., Allred, C., Fawcett, A. M., & Magnan, G. M. (2011). Information technology as an enabler of supply chain collaboration: A dynamic-capabilities perspective. *The Journal of Supply Chain Management*, *47*(1), 38–59. doi:10.1111/j.1745-493X.2010.03213.x
- Foo, M. (2021). Green Purchasing: Capabilities, Practices and Effects on Firms' Triple Bottom Line Performance. *Estudios de Economía Aplicada*, *39*(3), 6. doi:10.25115/eea.v39i3.4160
- Fosso Wamba, S., Gunasekaran, A., Akter, S., Ren, S. J., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, *70*, 356–365. doi:10.1016/j.jbusres.2016.08.009
- Freedman, M., & Jaggi, B. (1988, May). Impact of government regulations on pollution performance of pulp and paper firms. *Environmental Management*, *12*(3), 391–396. doi:10.1007/BF01867528
- Gao, D., Xu, Z., Ruan, Y. Z., & Lu, H. (2017). From a systematic literature review to integrated definition for sustainable supply chain innovation (SSCI). *Journal of Cleaner Production*, *142*, 1518–1538. doi:10.1016/j.jclepro.2016.11.153
- Genovese, A., Acquaye, A. A., Figueroa, A., & Koh, S. L. (2017). Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications. *Omega*, *66*, 344–357. doi:10.1016/j.omega.2015.05.015

- Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, *114*, 11–32. doi:10.1016/j.jclepro.2015.09.007
- Groschopf, W., Dobrovnik, M., & Herneth, C. (2021). Smart Contracts for Sustainable Supply Chain Management: Conceptual Frameworks for Supply Chain Maturity Evaluation and Smart Contract Sustainability Assessment. *Frontiers In Blockchain*, *4*.
- Gupta, S., Chen, H., Hazen, B. T., Kaur, S., & Santibañez Gonzalez, E. D. R. (2019). Circular economy and big data analytics: A stakeholder perspective. *Technological Forecasting and Social Change*, *144*, 466–474. doi:10.1016/j.techfore.2018.06.030
- Handfield, R. B., & Bechtel, C. (2002). The role of trust and relationship structure in improving supply chain responsiveness. *Industrial Marketing Management*, *31*(4), 367–382. doi:10.1016/S0019-8501(01)00169-9
- Hayes, I. (2004). *Optimizing the e-supply chain: The final frontier*. Academic Press.
- Hazen, B. T., Skipper, J. B., Ezell, J. D., & Boone, C. A. (2016). Big data and predictive analytics for supply chain sustainability: A theory-driven research agenda. *Computers & Industrial Engineering*, *101*, 592–598. doi:10.1016/j.cie.2016.06.030
- Holt, D., & Ghobadian, A. (2003). Greening the Supply Chain-Critical Factors Driving Operational Activity. *Innovating for Sustainability*, (October), 12–15.
- Humphreys, P. K., Wong, Y. K., & Chan, F. T. S. (2003). Integrating environmental criteria into the supplier selection process. *Journal of Materials Processing Technology*, *138*(1-3), 349–356. doi:10.1016/S0924-0136(03)00097-9
- Hussain, M., & Malik, M. (2020). Organizational enablers for circular economy in the context of sustainable supply chain management. *Journal of Cleaner Production*, *256*, 120375. doi:10.1016/j.jclepro.2020.120375
- Islam, M., Turki, A., Murad, M., & Karim, A. (2017). Do sustainable procurement practices improve organizational performance? *Sustainability*, *9*(12), 2281. doi:10.3390/s9122281
- Jabbour, C. J. C., Jabbour, A. B., L.de, S., Sarkis, J., & Filho, M. G. (2019a). Unlocking the circular economy through new business models based on large-scale data: An integrative framework and research agenda. *Technological Forecasting and Social Change*, *144*, 546–552. doi:10.1016/j.techfore.2017.09.010
- Kazancoglu, Y., Kazancoglu, I., & Sagnak, M. (2018). A new holistic conceptual framework for green supply chain management performance assessment based on the circular economy. *Journal of Cleaner Production*, *195*, 1282–1299. doi:10.1016/j.jclepro.2018.06.015
- Khaddam, A., Irtaimah, H., & Bader, B. (2020). The effect of supply chain management on competitive advantage: The mediating role of information technology. *Uncertain Supply Chain Management*, *547–562*. doi:10.5267/j.uscm.2020.3.001
- McAfee, A., Brynjolfsson, E., Davenport, T. H., Patil, D. J., & Barton, D. (2012). Big data: The management revolution. *Harvard Business Review*, *90*(10), 60–68. PMID:23074865

Meehan, J., & Bryde, D. (2011). Sustainable procurement practice. *Business Strategy and the Environment*, 20(2), 94–106. doi:10.1002/bse.678

Meijer, D., & Ubacht, J. (2018, May). The governance of blockchain systems from an institutional perspective, a matter of trust or control? In *Proceedings of the 19th Annual International Conference on Digital Government Research: Governance in the Data Age* (pp. 1-9). 10.1145/3209281.3209321

Müller, J., Kiel, D., & Voigt, K.-I. (2018). What Drives the Implementation of Industry 4.0? The Role of Opportunities and Challenges in the Context of Sustainability. *Sustainability*, 10(1), 10. doi:10.3390/s10010247

Nandi, S., Hervani, A. A., & Helms, M. M. (2020). Circular economy business models—Supply chain perspectives. *IEEE Engineering Management Review*, 48(2), 193–201. doi:10.1109/EMR.2020.2991388

Nayak, G., & Dhaigude, A. S. (2019). A conceptual model of sustainable supply chain management in small and medium enterprises using blockchain technology. *Cogent Economics & Finance*, 7(1), 1667184. doi:10.1080/23322039.2019.1667184

Omar, I. A., Jayaraman, R., Debe, M. S., Salah, K., Yaqoob, I., & Omar, M. (2021). Automating procurement contracts in the healthcare supply chain using blockchain smart contracts. *IEEE Access: Practical Innovations, Open Solutions*, 9, 37397–37409. doi:10.1109/ACCESS.2021.3062471

Pagoropoulos, A., Pigosso, D. C. A., & McAloone, T. C. (2017). The emergent role of digital technologies in the circular economy: A review. *Procedia CIRP*, 64, 19–24. doi:10.1016/j.procir.2017.02.047

Panigrahi, S., Bahinipati, B., & Jain, V. (2019). Sustainable supply chain management. *Management of Environmental Quality*, 30(5), 1001–1049. doi:10.1108/MEQ-01-2018-0003

Pieroni, M. P., McAloone, T. C., & Pigosso, D. C. (2019). Business model innovation for circular economy and sustainability: A review of approaches. *Journal of Cleaner Production*, 215, 198–216. doi:10.1016/j.jclepro.2019.01.036

Prause, G. (2019). Smart Contracts for Smart Supply Chains. *IFAC-PapersOnLine*, 52(13), 2501–2506. doi:10.1016/j.ifacol.2019.11.582

Raffoni, A., Visani, F., Bartolini, M., & Silvi, R. (2018). Business performance analytics: Exploring the potential for performance management systems. *Production Planning and Control*, 29(1), 51–67. doi:10.1080/09537287.2017.1381887

Rajeev, A., Pati, R. K., Padhi, S. S., & Govindan, K. (2017). Evolution of sustainability in supply chain management: A literature review. *Journal of Cleaner Production*, 162, 299–314. doi:10.1016/j.jclepro.2017.05.026

Ramesh, G., & ... , G. (. (2018). Efficient Information Management In Technical Education System Supply Chain Using Data Integration System (DIS). *International Journal Of Mechanical And Production Engineering Research And Development*, 8(3), 125–132. doi:10.24247/ijmperdjun201814

Rao, P., & Holt, D. (2005). Do green supply chains lead to competitiveness and economic performance? *International Journal of Operations & Production Management*, 25(9), 898–916. doi:10.1108/01443570510613956

Rengamani, J., & Venkatraman, V. (2015). Study on the impact of reverse logistics in the transportation sector. *International Journal of Design and Manufacturing Technology*, 6(2).

Roscoe, S., Cousins, P. D., & Lamming, R. C. (2016). Developing eco-innovations: A three-stage typology of supply networks. *Journal of Cleaner Production*, 112, 1948–1959. doi:10.1016/j.jclepro.2015.06.125

Schot, J., Brand, E., & Fischer, K. (1997). The greening of industry for a sustainable future: Building an international research agenda. *Business Strategy and the Environment*, 6(3), 153–162. doi:10.1002/(SICI)1099-0836(199707)6:3<153::AID-BSE109>3.0.CO;2-Y

Scuotto, V., Garcia-Perez, A., Cillo, V., & Elisa, G. (2019). Do stakeholder capabilities promote sustainable business innovation in small and medium-sized enterprises? Evidence from Italy. *Journal of Business Research*, 119.

Song, M., Cen, L., Zheng, Z., Fisher, R., Liang, X., Wang, Y., & Huisingh, D. (2017). How would big data support societal development and environmental sustainability? Insights and practices. *Journal of Cleaner Production*, 142, 489–500. doi:10.1016/j.jclepro.2016.10.091

Srinivasan, R. (2019). Supply chain and shipping management: A key factor for logistic innovation. *International Journal of Engineering and Advanced Technology*, 414–417.

Stock, T., & Seliger, G. (2016). Opportunities of sustainable manufacturing in industry 4.0. *Procedia CIRP*, 40, 536–541. doi:10.1016/j.procir.2016.01.129

Thomas, D. J., & Griffin, P. M. (1996). Coordinated supply chain management. *European Journal of Operational Research*, 94(1), 1–15. doi:10.1016/0377-2217(96)00098-7

Tu, J., Chiu, P., Huang, Y., & Hsu, C. (2013). Influential Factors and Strategy of Sustainable Product Development under Corporate Social Responsibility in Taiwan. *Mathematical Problems in Engineering*, 2013, 1–15. doi:10.1155/2013/303850

Umar, T., Egbu, C., Ofori, G., Honnurvali, M. S., Saidani, M., Shibani, A., Opoku, A., Gupta, N., & Goh, K. (2020, March). UAE's commitment towards UN Sustainable Development Goals. *Proceedings of the Institution of Civil Engineers. Engineering Sustainability*, 173(7), 325–343. doi:10.1680/jensu.19.00036

Waller, M. A., & Fawcett, S. E. (2013). Data science, predictive analytics, and big data: A revolution that will transform supplychain design and management. *Journal of Business Logistics*, 34(2), 77–84. doi:10.1111/jbl.12010

Wang, G., Gunasekaran, A., Ngai, E. W. T., & Papadopoulos, T. (2016). Big data analytics in logistics and supply chain management: Certain investigations for research and applications. *International Journal of Production Economics*, 176, 98–110. doi:10.1016/j.ijpe.2016.03.014

Whang, Lee, & Seungjin. (2001). *E-business and supply chain integration*. Stanford University. https://www.thebci.org/uploads/assets/uploaded/c5_0072bf-df5c-4c98-a5e1876aafb15bd0.pdf

Ying, J., & Li-jun, Z. (2012). Study on green supply chain management based on circular economy. *Physics Procedia*, 25, 1682–1688. doi:10.1016/j.phpro.2012.03.295

Younis, H., Sundarakani, B., & O'Mahony, B. (2020). Investigating the relationship between green supply chain management and corporate performance using a mixed method approach: Developing a roadmap for future research. *IIMB Management Review*, 32(3), 305–324. doi:10.1016/j.iimb.2019.10.011

Yu, W., Chavez, R., Jacobs, M. A., & Feng, M. (2018). Data-driven supply chain capabilities and performance: A resource-based view. *Transportation Research Part E, Logistics and Transportation Review*, 114, 371–385. doi:10.1016/j.tre.2017.04.002

Zhao, R., Liu, Y., Zhang, N., & Huang, T. (2017). An optimization model for green supply chain management by using a big data analytic approach. *Journal of Cleaner Production*, 142, 1085–1097. doi:10.1016/j.jclepro.2016.03.006

Zhu, Q., Sarkis, J., & Geng, Y. (2005). Green supply chain management in China: Pressures, practices and performance. *International Journal of Operations & Production Management*, 25(5), 449–468. doi:10.1108/01443570510593148

Chapter 9

Digital Economy Transformation in Nexus With External and Social Sustainability: The Indonesian Experience

Arif Budimanta Sebayang

SigmaPhi Research Institute, Indonesia

Telisa Aulia Falianty

Universitas Indonesia, Indonesia

Firdha Anisa Najiya

Sigmaphi Research Institute, Indonesia

Gusti Raganata

SigmaPhi Research Institute, Indonesia

ABSTRACT

In response to Indonesia's accelerating digital use, this study aims to address challenges to implement digital business models and identify the impact of digital economy to external and social and environmental sustainability. This study uses desk study, descriptive statistical analysis, and quantitative regression model and qualitative information from discussion with relevant stakeholders. This study provides several important results. First, increase in mobile cellular subscription will lead to increase in inequality, while percentage of internet user to population has shown otherwise. Second, the study also found that technology has a possibility to affect environment since it could increase CO2 emission. The digital technology gives the pressure to increase balance of payment deficit. The recommendations include increasing digital access and digital literacy, developing pro-environment technology, and increasing the exports of digitally deliverable services.

DOI: 10.4018/978-1-7998-9664-7.ch009

INTRODUCTION

Digitalization could be a game changer to support development in Indonesia. As the largest archipelago in the world with a total number of more than 17.500 islands, it will help people in the remote areas, cities, and villages to gain access to basic public services. Moreover, digitalization process contributing impact to the development of smart innovation in everyday lives including economic activity. That process in Indonesia gained a massive adoption and impact especially in Java Island. Indonesia digital technology, according to McKinsey, could raise GDP by US\$150 billion, equivalent to an average 1.2 percentage points of additional growth each year over the next seven years. And this would fulfill nearly 60 percent of the increase required to reach the Indonesia government's 2025 target of 7 percent annual GDP growth (McKinsey & Company, 2018).

While there has been much discussion of smart manufacturing and smart cities in which transportation, energy, and ICT systems are integrated to provide more efficient and sustainable delivery of necessary services, the researchers argued that there is a need to move beyond the city as a focus for such 'smart' innovation and digitalization. For rural, outlying, and sparsely inhabited locations, similar mobility and access to digital public services solutions are as essential and crucial. The 'smart village' concept, which aims to use ICT to improve access and support the development of transportation and other services, is an attempt to replicate the smart city concept in rural areas.

However, there are still many obstacles to overcome in order to reap the desired benefits, as well as gaps that are preventing the adoption of digital technology-assisted sustainable business models. Our exploratory and qualitative study aims to clarify these perspectives because the existing literature on the benefits and difficulties of digitization is still quite limited. A huge research gap makes it difficult to comprehend such difficulties and discover answers to them. The researchers discovered problems related to the adoption of novel business models, data collecting and management, teamwork, and competency requirements during their investigation. The impact of the digital economy's development on external sustainability, as well as social and environmental sustainability, will be investigated in this study. The role that the selected digital technologies play in overcoming the sustainable economy difficulties is also presented and explored, based on the outcomes of the empirical inquiry.

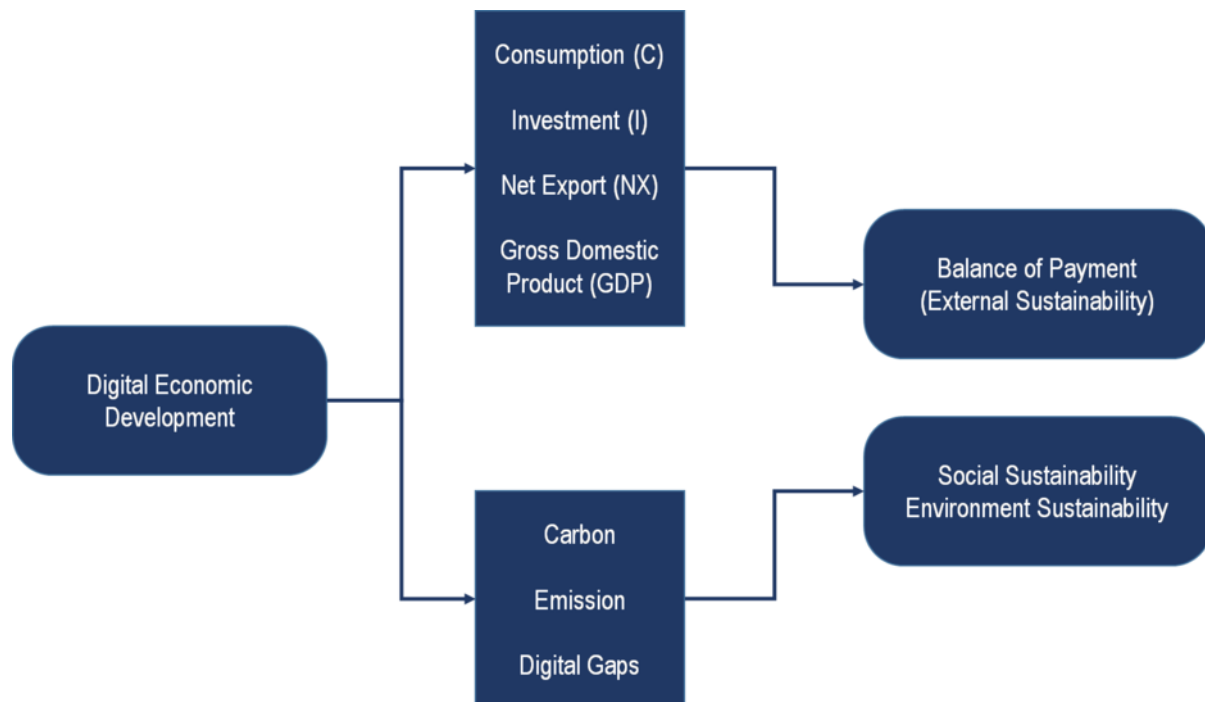
LITERATURE REVIEW

Definition of Variables

The term "digital economy" has no broadly agreed definition, although the most widely accepted, if limited, idea is the Information and Communication Technologies (ICT) sector's percentage of GDP (OECD, 2014). Meanwhile, one group stated that the digital economy encompasses a wide range of economic activities, such as the use of digitized information and knowledge as a key factor of production, modern information networks as an important activity space, as well as effective ICT use as a key driver of productivity growth and economic structural optimization (G20 Research Group, 2016).

Currently, the digital economy is at a high rate of development, innovates rapidly and is widely applied to other economic fields, particularly during the Covid-19 period. The digital economy is becoming an increasingly vital driver of global economic growth and plays an essential role in every aspect of the economy. The digital economy has usually been credited with contributing to social-economic-environ-

Figure 1. Research framework



mental development nexus assessments. This section reviews the literature that has been well established and investigated the link between the digital economy and social-economic-environmental development.

Digital Economy and External/BOP Sustainability

With past studies have overlooked the relations between TBP and international competitiveness, this study has put emphasis on it since most countries are shifting towards a knowledge-based economy and trading of intangible assets. TBP, or technological balance of payment is the international trade flows of intangible assets such as patents, licenses, knowledge, technical service, and many more. These trades reflect the ability of a country to sell technologies abroad. This study focuses on four nations in southern Europe. Greece, Italy, Portugal, and Spain, the results conducted using dynamic panel data estimations have shown that a positive TBP significantly contributes to a country's international competitiveness. Using three proxies; Real Effective Exchange Rate (REER), Labor Productivity, and Total Factor Productivity, a positive TBP is strongly associated with a higher price competitiveness (lower REER), higher labor productivity, and an increased in the TFP. Between the four countries, in general the trend of TBP balance is negative which shows that there is not much of activities of countries exporting its own technology and countries does not have the capacity to produce own (Figure 2). Figure 2 reaches the highest value of TBP balance for Spain at 0,61%, which this positive TBP is contributed because of an increase in Spain's knowledge-based services and increase of sales of intangible products. This shows that an increased in the TBP is strongly associated with a country's international competitiveness through specialization of industries. Other factors that may contribute to the international competitive-

ness besides those proxies are human capital, public spending, and also institutional quality (Teixeira & Barros, 2020).

Another study tries to find the relationship of balance of payment constraint in long-run economic growth, particularly how the role of National Innovation System (NIS) helps in improving export quality and lessening the technological gap, using Nigeria as an evidence. The study uses the Thirlwall's BOP Growth model to examine whether Nigeria's economic growth is BOP constrained or otherwise. Referencing Nigeria as a Periphery-South economy in a Balance of Payment Constrained Growth (BOPCG) model and using the autoregressive distributed lag model, the result shows as well that Nigeria as a Periphery-South economy is growing slower than expected, at a rate of -0.70%. Moreover, the research also shows that real exchange rate is an important aspect to the Nigerian economy with coefficient of -0.1303 and is significant at 0.10 level. Furthermore, investment of research and development activities would help in creating a sustainable export activity, with a coefficient of 1.89 and is significant 0.05 level of significance. The study shows that Nigeria not only have a slow growth but also it does not have an efficient NIS, which is why the country cannot be competitive in the international market. If the NIS is used effectively and is exploited, Nigeria could grow at a growth rate of $\dot{y}B1=5.16\%$. This interprets to how the role of an efficient NIS is important in accelerating economic growth and that with development and innovations of technology, it can lessen the technology gap and improve exports quality (Panshak, Civcir & Ozdeser, 2020).

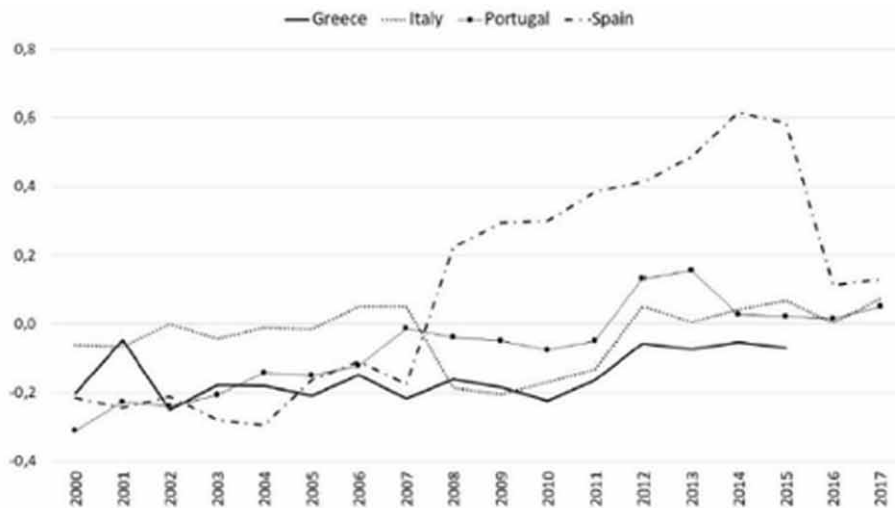
The digital economy is a broad term that refers to a variety of economic activity including the use of digitized information and knowledge as a key factor of production, modern information networks as a vital activity space, and the effective application of information and communication technology (ICT) as a key driver of productivity growth and economic structural optimization (G20 Research Group, 2016). In recent years, the digital economy has usually been credited with contributing to social-economic-environmental development nexus assessments. This section reviews the literatures that have been well established in order to investigate the link among digital economy and social-economic-environmental development.

Digital Economy and Social Development

Poverty eradication is one of the Sustainable Development Goals (SDG) set by the United Nations that was established by the organization in 2015 in its goals to achieve better future for everyone. Through this, many have addressed that information and communication technologies (ICTs) have great promise to reduce poverty in many countries. World Resource Institute (2000) in the International Conference on Creating Digital Dividends, generally states that closing the divide (unequal access to digital technologies) would help alleviate poverty and improve the economy while also creating a large business opportunity for technology growth and development. Moreover, World Bank argued that ICTs development would enable developing countries to break the vicious cycle of poverty while giving greater and real-time access to global sources of information (McNamara, 2003).

Multiple studies have shown that digital technology and innovation can help improve social development in different sectors. For instance, a study by Tiwari (2008) examines the impact of ICT, particularly the government-owned computer network in India, Gyandoot, and its impact to reduce poverty. Results shown that ICT does have notable success to stimulate rural labour market and strengthen the livelihood structures, though there are still some limitations to the benefit of the network (Tiwari, M., 2008). Another example is a study by Faludi (2020), which emphasis that digital social innovation can help to connect

Figure 2. Evolution of the TBP balance (% of GDP), Southern European Countries, 2000-2017 (Teixeira & Barros, 2020)



Source: Own elaboration based on data from the Bank of Spain, Bank of Italy, INE, OECD and Pordata.

between different social groups and layers to understand their needs which can help to address the initial goals, to reach more targeted outcome and implement for social practices and help (Faludi, J., 2020).

A research conducted by Oyedemi and Choung (2020) who examined the relationship between digital inequality and youth unemployment, specifically in South Africa have shown the result that lack of access to technologies have highly impacted chances on employment, particularly for youth. Factors that may affect the unemployment rate includes, the limited access to personal computers, tablets, or public places that provides internet services, the high cost of mobile broadband data as well as geographical effect (individuals living in rural or urban area) (Oyedemi, T.D. & Choung, M., 2020). Another study by Richmond and Triplett (2017) found that though ICT can improve conditions of a population and reduce income inequality, there are still challenges needed to overcome as there are still difficulties in accessing to broadband or mobile subscriptions to ease technology usage. Moreover, the study found that increase in mobile subscriptions have higher effect to reduce income inequality and decrease the Gini index rather than the increase in fixed broadband subscriptions, as the result would contrast – increase income inequality and Gini index (Richmond, K. & Triplett, R. E., 2018).

Furthermore, there are few studies that reflects the effect of ICT in terms of gender, and this is also important to emphasis. For instance, Rashid (2016) in his study found that there are little differences in terms of digital capabilities between men and women in the five countries being studied (Brazil, Chile, Ghana, the Philippines, and Bangladesh), with the exception of Bangladesh and also there are significant difference in the preferences and needs between the two genders for the use of ICTs (Rashid, A.T., 2016). This is important as social inequality are greatly reflected in digital inequality and understanding this would help for policymakers to focus on the specific resources and demands of the populations. To further discuss, a study by Nedomova, Maryska, and Doucek (2017) conducted in Czech found that although there seems to be increase in wages for both men and women, it does not help to reduce the wage gap as there is still unequal wage pay for men and women and the gap only decreases little to no

changes in the period that the research was conducted, particularly for specialized professions such as ICT specialists and technicians (Nedomová, L., Maryska, M., and Doucek, P., 2017).

However, it should be noted that digital technologies and innovations cannot simply solve all the problems for social development, particularly poverty reduction. Gates, in his opening keynote speech in International Conference on Creating Digital Dividends (2001), states that technology would not address the world's poorest people (Gates, W. H., 2000). This is emphasized by Venkat (2008) in his study, which states that there are problems as to why technology cannot be the only road to reducing poverty as poverty-stricken people require a great deal of assistance before they're able to purchase high-tech products, let alone use them. In addition, technology companies cannot do anything to help beside selling their goods to those who can afford it in developing countries (Venkat, K., 2001). Furthermore, Rothe (2020) implies that ICT may have negative impact on development as it would not help the targeted populations, and have harmful impact towards health, food security and climate-driven migration (Rothe, F., 2020). Thus, what all these studies have shown is while digital technology and innovation might help to address the social development problems, it is not the key answer to solve all of this. Partnerships between governments, businesses and all agents in the economy is important to help solve the issue of poverty and social development.

Nexus Between Digital Economy and Economic Development

At the aggregate level, numerous studies have assessed the effect of digital economy in accelerating economic development. G20 Research Group (2016) has argued that digital economy is an increasingly important driver of global economic growth and plays a significant role in enhancing productivity of existing industries, cultivating new markets and industries, and achieving inclusive, and sustainable growth (G20 Research Group, 2016). Related studies used a multi-country analysis: in relation to EU countries (Evangelista, R., Guerrieri, P. & Meliciani, V., 2014), G7 economies (Jorgenson D.W., 2007), and 110 countries (Jorgenson, D. W., and K. Vu., 2007). These studies around the world have recognized that the advancement of digital economy and investment in digital technologies facilitate the driving forces of economic, productivity, and employment growth.

Nonetheless, there are different conclusions regarding whether or not digital economy has the same significant impact both in developed and developing countries. For instance, Thompson and Garbacz (2007) who examined the economic impact of communication networks and economic reform in 93 developed and developing countries from 1995 to 2003. Using a stochastic frontier production function approach, they found evidence that the penetration rates of telecommunications services are significantly associated to productivity enhancement, particularly in some subsets of low-income economies (Thompson and Garbacz, 2007).

However, according to Wang (1999), there is little evidence to suggest that ICT development in Taiwan contributes to economic growth (Wang, 1999). Kenny (2003) also points out that ICT development has a limited impact on economic growth, particularly in underdeveloped countries (Kenny, 2003). According to certain studies, ICT development in developing nations does not contribute to economic growth. Lee et al. (2005) concluded that ICT contributes to economic growth in many rich and newly industrialized economies (NIEs), but not in poor countries, using Solow's Residual and time-series analytic tools. They point out that the key factors enhancing ICT contribution to economy are government policies and development strategies which are identified different between in developed and developing countries (Lee, Gholami, and Tong, 2005).

A previous study came to the same conclusion. Dewan et al. (2000) use panel data from 36 countries from 1985 to 1993 to develop an intercountry production function connecting IT and non-IT inputs to GDP output. The findings confirmed that there are considerable disparities in the structure of capital investment returns between developed and developing countries. For affluent countries, returns on IT capital investments are expected to be positive and substantial; however, for the developing countries subsample, returns on IT capital investments are not statistically significant (Dewan and Kraemer, 2000). Thus, this study revisits this issue using the time-series data of Indonesia, as a developing country, between 1990 and 2020 to examine whether digital economy would have a positive relationship with national economic development or rather quite the opposite.

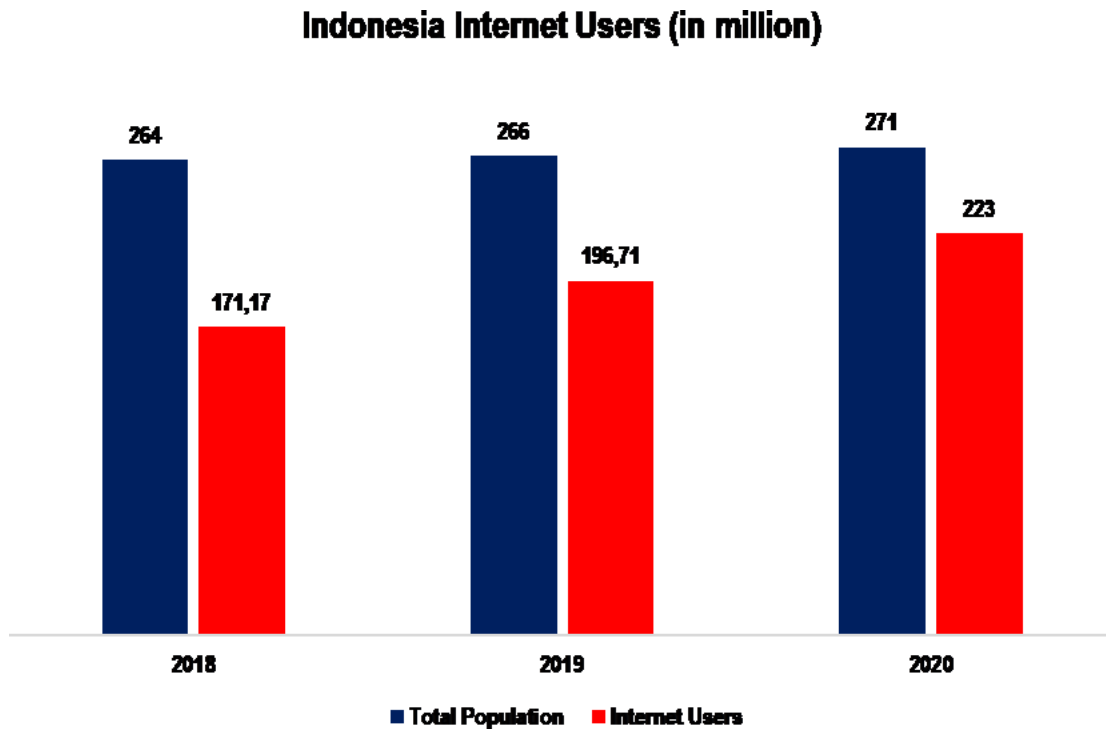
Nexus Between Digital Economy and Environment Sustainability

The advancement of information and communication technology (ICT) favourably contributes to economic progress; yet, their environmental repercussions must not be neglected. Drawing on the data set from 1976 to 2018, Shehzad et al. (2021) investigate the impact of ICT, energy consumption, economic growth, and financial development on the air quality in Pakistan using Nonlinear Autoregressive Distributed Lag model. The findings demonstrated a significant amount of asymmetric cointegration between ICT and CO₂ emissions. The empirical results unfold that positive shocks in ICT negatively affect CO₂ emissions, implying that an increase in ICT brings a decrease in CO₂ emission; negative shocks in ICT publicized a negative association with CO₂ emissions, inferring that a decrease in ICT will bring an upsurge in CO₂ emissions (Shehzad, et al., 2021).

Other study also found that ICT use significantly decreases environmental pollution and thus, increases the environmental quality (Park, Meng, and Baloch, 2018). Meanwhile, Susam and Hudaverdi Ucer (2019) look into the link between energy usage and CO₂ emissions. The findings suggest that information and communication technology (ICT) can help achieve energy efficiency goals, particularly in the industrial sector. This is a pressing issue since energy consumption and CO₂ emissions may surpass critical levels, resulting in negative direct externalities on human health and the environment (Susam and Ucer, 2019). Furthermore, with focus on EU countries, report from the World Energy Council (2018) implies that ICT play a significant role in initiating and enabling the EU to meet its energy and environmental commitments. Estimates vary from 50% to 125% of the total 20% GHG reduction required by 2020 (World Energy Council, 2018).

However, there are still conflicting findings from other studies as to whether digital development plays an important role on CO₂ reduction. A study conducted by Fettweis and Zimmermann (2008) found that ICT systems have been linked to a 2% increase in worldwide CO₂ emissions, which is equal to the total carbon emissions from international aviation travel (Fettweis and Zimmermann, 2008). Using cointegration and causality techniques for a panel of 9 Asian countries, Lee & Brahmairene (2014) also found that ICT shows significant to highly significant positive effects on CO₂ emissions (Lee and Brahmairene, 2014). A recent research of the role of information and communication technology (ICT) and financial development (FD) in carbon emissions and economic growth for the G7 countries from 1990 to 2014 came to the same conclusion. This research reveals that information and communication technology has a long-term favorable impact on emissions (Raheem, Tiwari, and Balsalobre-Lorente, 2020). Hence, using time-series data of Indonesia, this study will investigate as to whether digital development might be not environmentally neutral or rather the opposite.

Figure 3. Indonesia internet users (in million) (APJII, 2018-2020; Hootsuite, 2021)



DIGITAL ECONOMY EVOLUTION IN INDONESIA

Recently, Indonesia has taken important records in terms of digital use. According to latest Hootsuite's report for Indonesia, there were 202.6 million internet users in January 2021, increased by 27 million (+16%) between 2020 and 2021, while In January 2021, internet penetration was at 73.7%. This report also shows a very high increase in the number of mobile connections between January 2020 and January 2021, increased by 4.0 million (+1.2%), making it equivalent to 125.6% of the total population (Hootsuite/We Are Social, 2021).

These numbers are not surprising. According to McKinsey, digital revolution is driven by four types of technologies that move a nation deeper into digital natives. They are Mobile Internet, Cloud technology, Internet of Things (IoT), and Big Data (McKinsey & Company, 2016). Massive adoption of mobile network in Indonesia is not coming overnight. The growth was driven by rapid investment in network infrastructure by the private sector. The investment was paid-off when today most Indonesians accessing internet through mobile phones and affordable internet service due to telco companies competition. Moreover, it is also reflected by the declining of 2G phones services and the increase of 3G/4G phones ownership. Hence, the wide availability of internet advanced technology enabling opportunities for productive capabilities such as trade, work, studying, etc (World Bank, 2021). In that matter, it also enabling a wide use of cloud technology, IoT, and Big Data utilization.

Indonesians who are connected to the internet utilize it for communication, social media, and leisure. Being internet user is almost synonymous with being social media user. Indonesian is familiar with many social media platforms. They widely discussed lifestyle, news, politics, even celebrity gossips.

But the first that brought digital technology going mainstream is online forums. For example, the first boom of Internet forum was in mid-2000 where one example of internet forum in Indonesia and followed by several other internet forums are going mainstream. They evolved from online discussion to online selling forum. Although, some of urban citizen already use other famous platform, this internet forum platform brought internet inclusively and inspired many others techpreneur to rose (Luthfihadi and Dhewanto, 2013).

However, platform that offered also show some cleavage where fraud regularly happens in online selling. These situations force Indonesian government to start seriously about regulating online transactions. Then, in 2008, the Indonesian government passed the Electronic Information and Transactions Law. The regulation was among the first regulations being issued to regulate digital realm in Indonesia and controversial. While it was giving a clear governance to online transaction, it was used multiple times to sent people to prison because their online behavior (Lubis and Maulana, 2010). With all the controversy surround it, Electronic Information and Transaction law paves a legal basis for the next business model to come, e-commerce and ride hailing apps.

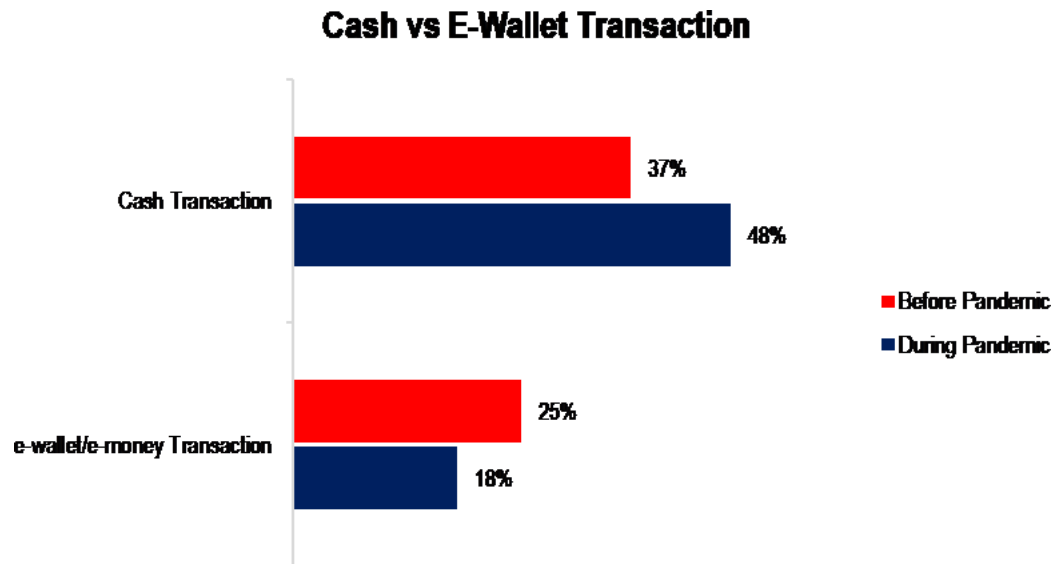
E-commerce and ride hailing apps were both second generation business model looming after its internet platform era in the mid-2000. In the early to mid-2010s, many venture capital and business incubators invested and grooming startups in Indonesia (Asian Development Bank, 2020). They saw the problem in Indonesia and technology had potential to disrupts the problems and gain profits from it (World Bank, 2021). Ride hailing apps for example was born because lack of public transportation services that can effectively serve the citizens. E-commerce popular because it can provide safer online transaction compared to online selling forums that was corrupted by numerous of fraud. Most pioneer of ecommerce in Indonesia were inspired by internet forum online selling. They opportunities to bring Small Medium Enterprises (SME) have a better and safer access to sell their goods.

Backed by domestic and foreign venture capital, one of pioneer e-commerce in Indonesia now become one of the largest e-commerce platforms in Indonesia and claimed to help more than 10 million business owners to collaborate, grow their business, and innovate (LPEM FEB UI, 2019). Homegrown ride hailing apps in Indonesia was founded because they saw the advantage of motorcycle drivers can help big cities congested traffic but online drivers gained low income from it. Similar as pioneer e-commerce platform, with the help of foreign and domestic venture capital, the founder of Indonesia ride hailing application to become the first unicorn in Indonesia and open job opportunities to millions of Indonesia populations (LD FEB UI, 2018).

Both e-commerce and ride hailing apps also promoting another ecosystem to growth. Increase number of logistics company and financial technology is the part of the chain that raised together with e-commerce and ride hailing apps (World Bank, 2021). While e-commerce platform boost supply of goods across the nation the demand for fast and cheap logistics also safe payments also rises up. In the decades of 2010s, numbers of logistics company are founded because the demand for e-commerce delivery before that only 1 or 2 logistics players dominated the market since the demand rapidly increased so does the logistics. Fintech in the beginning was not a part of ecosystem, it was aimed to served more than 200 million underbank and unbanked populations in Indonesia who need capital, faster, and efficient financial services.

Many fintech players actually started run their business since 2000s but they seen as complementary in banking ecosystem (McKinsey & Company, 2016). After 2010s, peer to peer lending booming in the e-commerce traders soon followed by digital payment system (owned by ride hailing pioneer). Because their affiliation and backed by huge of funders, fintech start to become of e-commerce and ride hailing apps by giving a lot of incentives to the customers. The practice known as cash burn rate is become a

Figure 4. Cash and e wallet transaction proportion (%) (Indonesia FinTech Association (AFTECH), 2021)



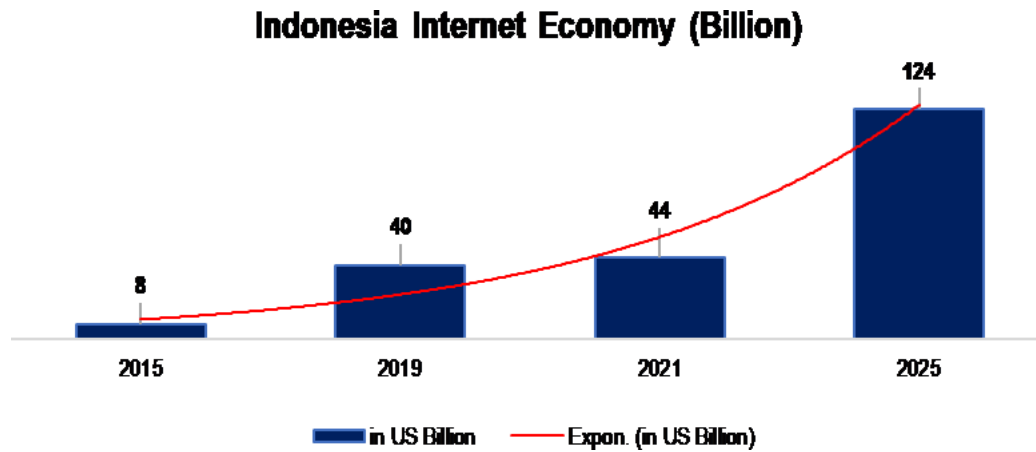
common practice to these digital players hoping the customers or population getting familiar with the product. With the increase popularity of fintech P2P and digital payment system they start to become serious banks contender especially in Covid19 pandemi era where adoption of digital technology is inevitable.

After e-commerce and ride hailing apps, many digital businesses model followed such as online travel agency, education technology (edutech), health technology (health tech), and fintech. In 2016, Indonesia only had 1 unicorn but now they have 1 decacorn and 4 unicorn. Google, Bain, and Temasek estimates that digital economy in Indonesia can achieved 124 billion USD in 2025 (Google, Temasek and Bain, 2020). Many decacorn and unicorn to come.

With many strengths and opportunities Indonesia had to prospered in digital era, unfortunately, there are several sectors needed to work on. First, the number of digital users is not positively impacted to the national economic development yet. ICT sector still contributes a deficit to the current account balance. And the deficit increases since 2012. In 2020, the deficit of current account from ICT sector stood at USD2.1 billion, grew by 17% (year on year) (Bank Indonesia, 2021).

Secondly, not all people in Indonesia enjoy this digital development. In fact, the country still has internet inequality. Many regional areas in Java and even more outside the most populated island in Indonesia still do not have an adequate internet connection. The 2018 Podes data states that there are still 13,720 Villages that do not yet have an internet signal and cellular phone signal. With the largest distribution in Papua (4,511 Villages), West Papua (1,365), and West Kalimantan (853) (Indonesia Statistics, 2018). Although, mobile network still affordable, but both fixed and mobile broadband speeds in Indonesia are among the lowest in ASEAN, and the poorer quality in the more populous parts of the country suggests that network congestion is a major challenge (World Bank, 2021). With this number of inequalities, the digital divides will be deeper than expected. Third, Job creation from digital platforms are widely opens but recently there are backlash from the gig workers or partners from the platforms where they were not treated equally and have bad work conditions.

Figure 5. Indonesia internet economy (in billion) (Google, Temasek, and Bain, 2020)



Next, there are many inputs from focus group discussion that Indonesia should consider about data protection law. Indonesia does not have a personal data protection law yet. This is one key challenge that need to be addressed if Indonesia want to gain potential benefits from digital platforms. Personal data protection regulations are scattered on several ministry or agency level regulation i.e. OJK had one, Bank Indonesia had one, ICT Ministry had one, etc. The problem is ministry or agency level regulation did not have a strong legal basis if personal data leaked on one platform. There were several leaked happened like national ID or national health insurance that contain very sensitive information.

RESEARCH METHODS

The Research Methods used in this study would be a combination of:

1. Descriptive statistical analysis and Quantitative Regression Model
2. Qualitative data from a Focus Group Discussion with Key Stakeholders

To capture the impact of technology on the environment, the researchers run the regression model with carbon emission as the dependent variable given as follow:

$$LOG(CARBON) = \beta_0 + \beta_1 LOG(POPULATION) + \beta_2 TECH + \beta_3 LOG(GDPR) + \varepsilon \quad (1.1)$$

where log denotes logarithm and β_0 , β_1 , β_2 , and β_3 denotes elasticities of population, real GDP per capita, and mobile cellular subscriptions, respectively. $LOG(POPULATION)$ is a vector variable that includes mobile cellular subscriptions and the proportion of internet users in the population, as well as the yearly growth rate of real GDP. The model can be changed into the following variations:

$$LOG(CARBON) = \beta_0 + \beta_1 LOG(POPULATION) + \beta_2 LOG(MOBILE) + \beta_3 LOG(GDPR) + \varepsilon \quad (1.2)$$

Digital Economy Transformation in Nexus With External and Social Sustainability

$$\text{LOG}(CARBON) = \beta_0 + \beta_1 \text{LOG}(POPULATION) + \beta_2 \text{INTERNET_USER} + \beta_3 \text{LOG}(GDPR) + \varepsilon \quad (1.3)$$

Moreover, the researchers will also further investigate the impact of technology on income inequality by using Gini coefficient as the dependent variable on the second model.

$$\text{GINI} = \beta_0 + \beta_1 \text{LOG}(GDPR) + \beta_2 \text{TECH} + \beta_3 \text{LOG}(HDI) + \varepsilon \quad (1.4)$$

where log denotes logarithm and β_0 , β_1 , β_2 , and β_3 denotes elasticities of real GDP per capita, technology, and human development index, respectively. $\text{LOG}(GDPR)$ represents the annual growth of real GDP, TECH is a vector variable of mobile cellular subscriptions and the percentage of internet users to population, and $\text{LOG}(HDI)$ is the growth rate of human development. The model can be breakdown as follows:

$$\text{GINI} = \beta_0 + \beta_1 \text{LOG}(GDPR) + \beta_2 \text{LOG}(MOBILE) + \beta_3 \text{LOG}(HDI) + \varepsilon \quad (1.5)$$

$$\text{GINI} = \beta_0 + \beta_1 \text{LOG}(GDPR) + \beta_2 \text{INTERNET_USER} + \beta_3 \text{LOG}(HDI) + \varepsilon \quad (1.6)$$

The ordinary least square (OLS) estimator will be used. Initially, Auto-regressive Moving Average (ARMA) is used to control the autocorrelation problem.

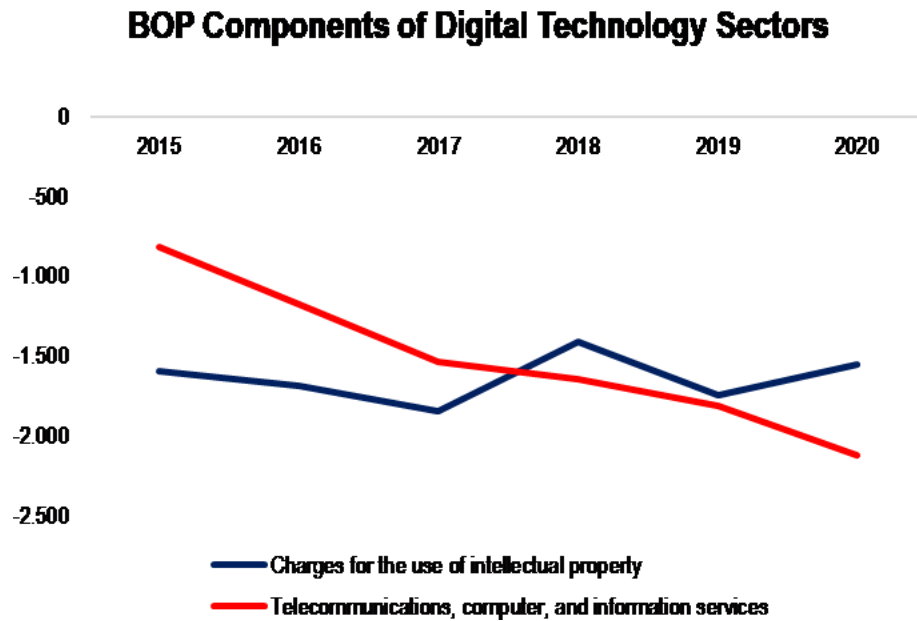
The data used in this study is secondary data, which collected indirectly through various sources. This study uses time-series data in Indonesia between the period of from 1990 to 2018. To measure technology, the researchers will use two alternative measurement, namely annual growth rate of mobile cellular subscriptions and the percentage of internet users to population gathered from the International Telecommunication Union (ITU). Subscriptions to a public mobile telephone service that uses cellular technology to give access to the PSTN were described as mobile cellular subscriptions. Furthermore, internet users were classified as anyone who had utilized the internet in the previous three months. BOP data is taken from Economy and Finances Statistics, Central Bank of Indonesia.

To measure environmental quality, the researchers will use the carbon dioxide produced within a country stemmed from the consumption of solid, liquid, and gas fuels and gas flaring. Moreover, the researchers will also use Gini coefficient as a proxy to income inequality. Both data will be gathered from the World Bank Data.

DIGITAL ECONOMY AND EXTERNAL BALANCE SUSTAINABILITY (BALANCE OF PAYMENT SUSTAINABILITY)

This section will shows how technology is an important aspect to balance of payment and that technological or intangible products plays a vital role to account for a country's BOP. Trades of these products in the international markets are reflected in the BOP and as these trades occurs, there are spillover effects that helps a country to adapt to these technologies which could be used as a jumpstart in the development and innovation of products that will create gains of trade in the international market. Moreover, as

Figure 6. BOP components of digital technology sector (Million USD) (Bank Indonesia, 2021)



countries shift towards a knowledge-based economy, it is important to highlight the role of an efficient National Innovation System which helps in creating innovation to increase the technological balance of payments, help assist technological and knowledge spillovers and create a sound policy that would help to increase the international competitiveness to foster economic growth such as improving exports and thus creating sustainability in the long run.

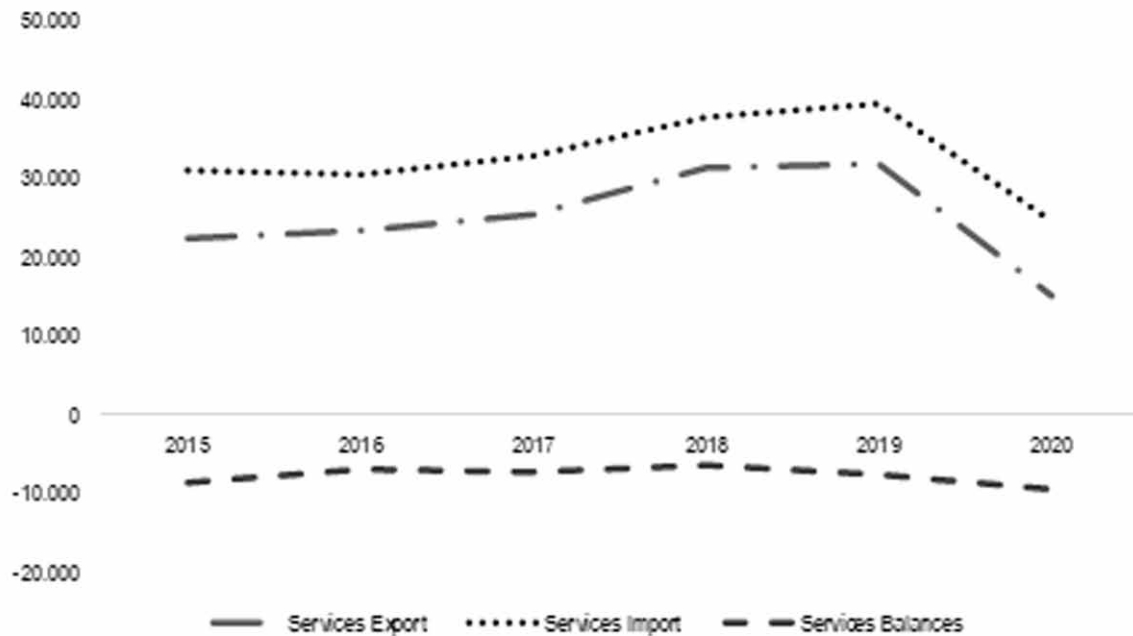
The digital economy development has the consequences for Indonesia Balance of Payment (BOP). Indonesia experiencing deficits in digital technology sector component of BOP. The deficits for telecommunication, computer and information services in Indonesia was become worsen. Indonesia also experiencing deficit in charge of the use of intellectual property. But one positive things, Indonesian deficit is narrower in the use of intellectual property.

The story of Indonesia BOP deficit usually related with deficit in services balances. Figure 7 shows that Indonesia services import is always larger than services export. It is also applied in telecommunication, computer, information, and intellectual property sector. Digital economy development in Indonesia should consider this trend and anticipating for external sustainability. Indonesian economy should strengthen the ability to capture services activities related with digital economy activities.

DIGITAL ECONOMY, SOCIAL SUSTAINABILITY, AND SOCIETY PROSPERITY CONSIDERATION

The sustainable economy is a crucial component of the Indonesia Green Deal. The Sustainable Economy themes have been elaborated as the policy moving forward in Vision Indonesia 2045. Here, digital technologies could be a key facilitator, as they facilitate the scaling up of the sustainable economy. The sustainable goals of optimizing functionality on the one hand and developing products-as-a-service on

Figure 7. Services export, import and balances (Million USD) (Bank Indonesia, 2021)

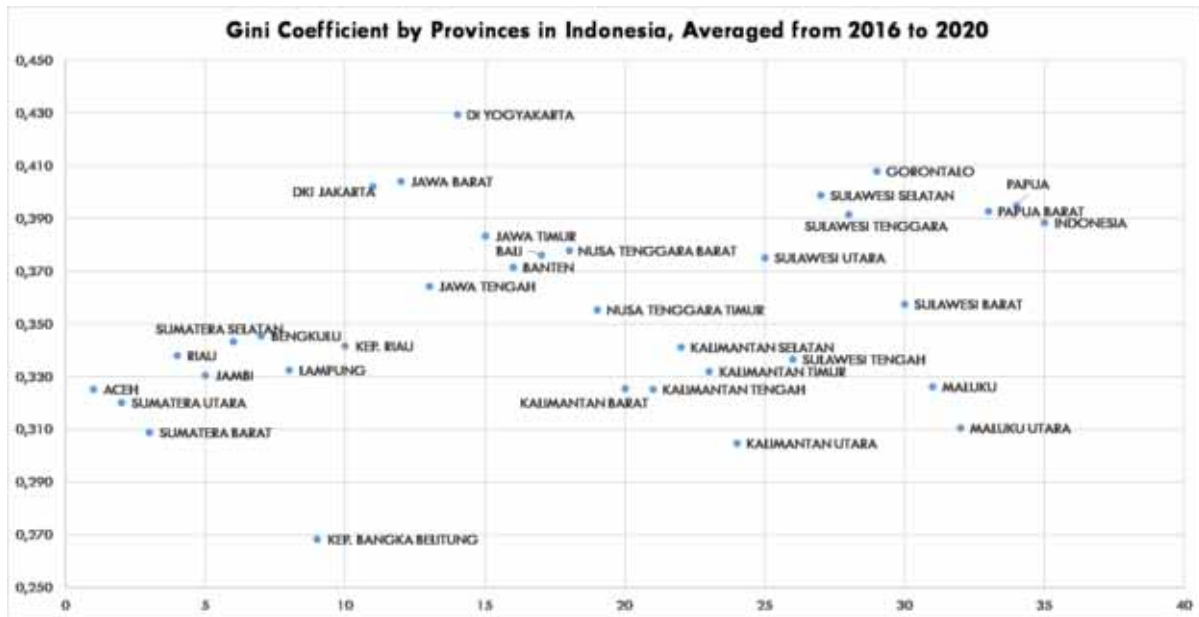


the other rely heavily on digital technologies such as functional electronics, distributed ledgers, and the Internet of Things. Digitalization also enables more efficient business processes, reduces waste, promotes product longevity, and reduces transaction costs. As a result, digitalization helps to develop sustainable economy business models by helping to close the loop, delay the material loop, and shrink the loop with improved resource efficiency. As digitalization may have its benefits and have helped in reshaping the economy, there are also new challenges that rises because of this. With the rise of the digital economy, it is possible that technology may lead to an increase in income inequality, as can be measured using a Gini coefficient. In Indonesia itself, as of 2021, the Gini index is 37.8. Although it seems that the number is high, the value is still considered below the average of 38.43. Comparing to other Southeast Asian countries such as Thailand, Singapore, Malaysia, Philippines, and Laos, each country have a Gini index of 36.4, 45.9, 41.0, and 44.4, and 36.4, respectively. What this implies is with digitalization, there is also a larger gap of income inequality in many Southeast Asian countries, and there needs to be an innovative way to help bridge these inequalities for the economy to prosper and be sustainable. The solution to bridge the inequality may also come from technology as well.

DIGITALIZATION AND INEQUALITY

Digitalization was expected to enable access and opportunities for people to improve their quality of life as it promotes efficiency in a lot of aspects and accelerate the globalization process. Kharlamova, Stavtyskyy, & Zarotiadis (2018) argued that the technological development had increased labour productivity both directly and indirectly, opened access to new market, and encouraged firms to differentiate

Figure 8. Gini coefficient by provinces (Statistics Indonesia, 2016-2020)



their product. However, it also disrupted the labour market as it shifted the demand of low skilled workers to automation. As a result, poorly skilled workers will have to face the risk of job loss and become economically vulnerable.

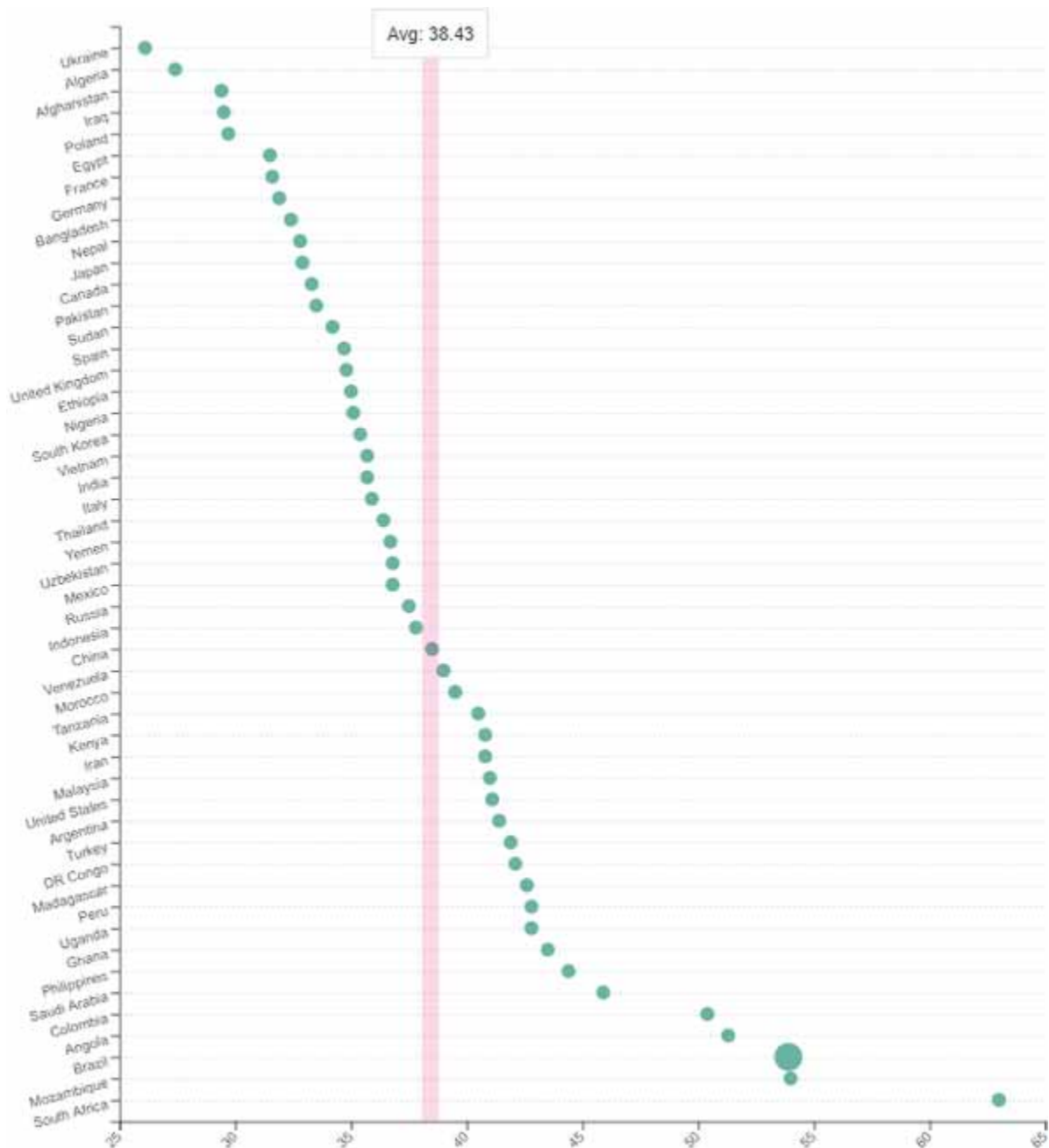
Up until today, there exist a large empirical literature supporting the argument that digitalization increases income inequality. Guellec & Paunov (2017) argue that digitalization has increased market rents which disproportionately benefits the top income groups in OECD country. Such phenomenon could happen because the digital non-rivalry allows for huge economies of scale and reduces the cost innovation. Because the costs of innovation are lower, higher rates of creative destruction are stimulated, posing a greater risk because even marginally improved items can take over entire markets. As rents for digital innovation are mainly shared between those in top tier of income distribution, the income inequality deepens. However, Mönnig, Maier, & Zika (2019) argued that although digitalization have intensified the impact of structural change on income inequality, the impact of digitalization on income inequality is rather low (Anke, Tobias, and Gerd, 2019).

There are also growing empirical evidence in the scope of Indonesia. Lee & Wie (2013) had examined the impact of technological changes on skill demand and income inequality in Indonesia over the period of 2003 – 2009. The result of the study also supported the argument that the shift was driven by the reallocation of labour forces between industries and within the industry. Such findings support the argument that there is a skill-biased technological changes, meaning that there is a shift in demand for skills which favours the skilled labours. Mulyaningsih, Miranti, Daly, & Manning (2019) reaffirms the finding, where they argue that labours with knowledge of new technologies and computerization are now more preferred in Indonesia, providing evidence of the existence of skill premium which in turn contributes to the rising income inequality.

Figure 11 shows the digitalization proxied by mobile cellular subscriptions and income inequality in Indonesia between the period of 1990 and 2019. The coefficient correlation between both variables

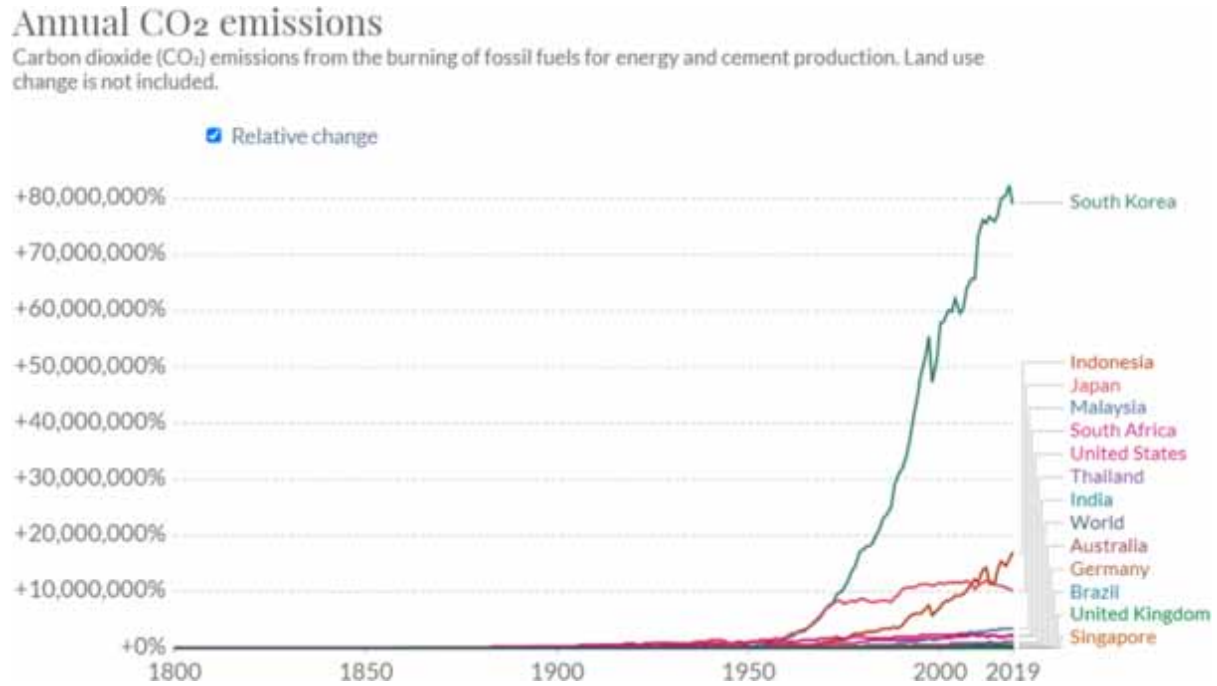
Digital Economy Transformation in Nexus With External and Social Sustainability

Figure 9. Gini coefficient by country 2021 (World Population Review, accessed July 15th, 2021)



is 0.903, indicating that digitalization may increase inequality. Such correlation was illustrated with the rise in Gini coefficient following the increase in mobile cellular subscription from 1990 to 2014. However, after 2014, the increase in mobile cellular subscription is no longer followed by the rise in inequality, but instead followed by improvement towards equality. In 2017, both variables move in the same direction again. The percentage of population using internet were also considered to be the proxy

Figure 10. Annual CO₂ emissions, relative change (Our World in Data, accessed July 15th, 2021)



of digitalization but its correlation coefficient with income inequality is only 0.6. Therefore, in this study, the use of mobile cellular subscriptions as the proxy variable to digitalization may be preferable than

Figure 11. Mobile cellular subscription and income inequality in Indonesia (1990 – 2019) (World Bank, 2021)

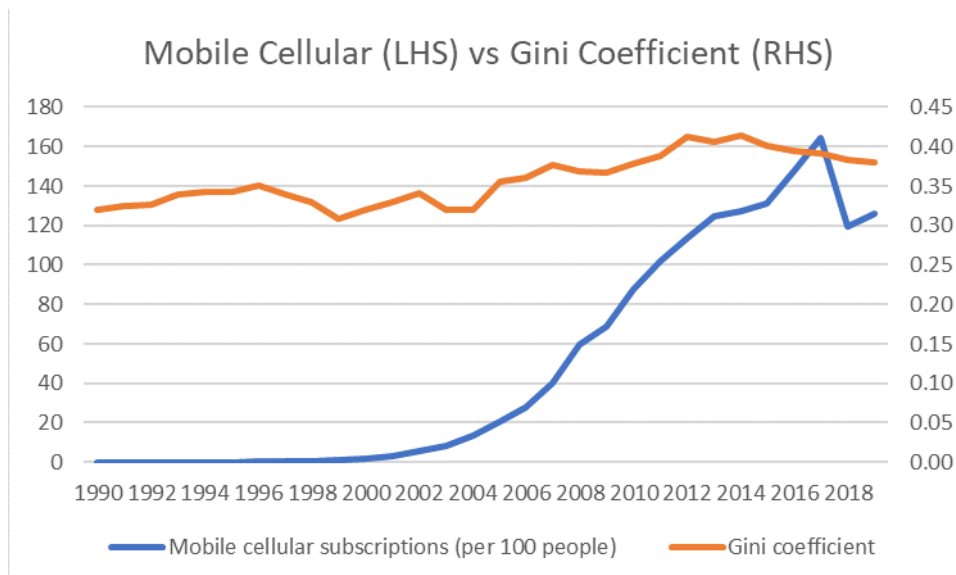


Table 1. Model 1 & 2 - Regression of the impact of technology to inequality

Independent Variables	Model (1)	Model (2)
LOG(GDPR)	0.179*** (0.051)	0.245*** (0.039)
LOG(MOBILE)	0.014** (0.006)	
INTERNET_USER		-0.002** (0.0008)
LOG(HDI)	-0.940** (0.373)	-0.425*** (0.127)
Constant	-2.898** (0.944)	-3.626*** 0.663
R ²	0.894	0.906
Adjusted R ²	0.872	0.882
Observations	30	26
*** p<1%, ** p<5%, * p<10%. The numbers in parentheses are standard errors.		

using the percentage of internet population. Moreover, the correlation of digitalization and inequality in Indonesia also support the previous empirical studies within the scope of Indonesia. However, since correlation does not signify causation, then further analysis must be conducted to estimate the impact of digitalization on inequality.

Table 1 presented the estimation result of technology on inequality. In both model, all of the technology variables shown a statistically significant results. Mobile cellular subscription shown a positive and statistically significant coefficient at 5% confidence level. The increase in mobile cellular subscription by 1% will result to an increase of Gini coefficient by 0.014. This result supports the illustration from Figure 11 which indicates that digitalization may increase inequality shown from the rise in Gini coefficient following the increase in mobile cellular subscription from 1990 to 2014. However, the regression results is not consistent with the movement of mobile cellular subscription and equality in 2014 and 2017. This result has also supported the study by Richmond and Triplett (2017) which found that the increase in mobile subscriptions have higher effect to reduce income inequality and decrease the Gini index rather than the increase in fixed broadband subscriptions, as the result would contrast – increase income inequality and Gini index (Richmond, K. & Triplett, R. E., 2018).

On the other hand, internet user shown a negative and statistically significant coefficient at 5% confidence level. In other words, the increase in percentage of internet user to population will decrease Gini coefficient by 0.002. This result is in line with the study that the wide availability of internet advanced technology enables opportunities for productive capabilities such as trade, work, studying, etc (World Bank, 2021). The investment was paid-off when today most Indonesians accessing internet through mobile phones and affordable internet service due to telco companies competition. Moreover, it is also reflected by the declining of 2G phones services and the increase of 3G/4G phones ownership.

Therefore, it can be concluded that different measurement of technology would have different impacts on inequality. The increase in mobile cellular subscriptions would lead to a higher income inequality, but the increase in percentage of internet to population would lead to income equality. Moreover, the

magnitude of both alternative measurement is also different. Mobile cellular subscriptions has a stronger impact on inequality, while percentage of internet user to population has a weaker impact. For real GDP per capita, both coefficients in Model 1 and 2 shown positive and significant result, indicating that as economic grows, inequality may rise accordingly. On the other hand, an increase in human development index will leads to equality, provided by the negative and significant coefficient of HDI in both models.

Digital Economy and Environment Sustainability

This section will discuss how the digital economy could affect social and environmental sustainability as well as social prosperity in Indonesia. The researchers will also discuss the strategy to use digitalization as a tool to achieve social and environmental sustainability.

CO2 Emission in Indonesia Compared with Peers

In 2016, Indonesia ranked 10th as the biggest CO₂ polluter globally, contributing 1.48% of the global carbon emission. Indonesia also holds the first rank as the biggest CO₂ polluter in the ASEAN region, followed by some of its neighbouring countries, Thailand and Vietnam. In the past decade, Indonesia's growth rate of carbon has not seemed to slow down with an average annual growth rate of 4.61%, despite their pledge to cut emissions by 29% of BAU level by 2030 (UNFCCC, 2021). Compared with its neighbouring countries, Vietnam recorded a higher average annual growth rate of 8.05% in the last decade, possibly catching up with Thailand, which has slowly but successfully cut its emission rate and recorded an average annual growth rate of only 1.76%.

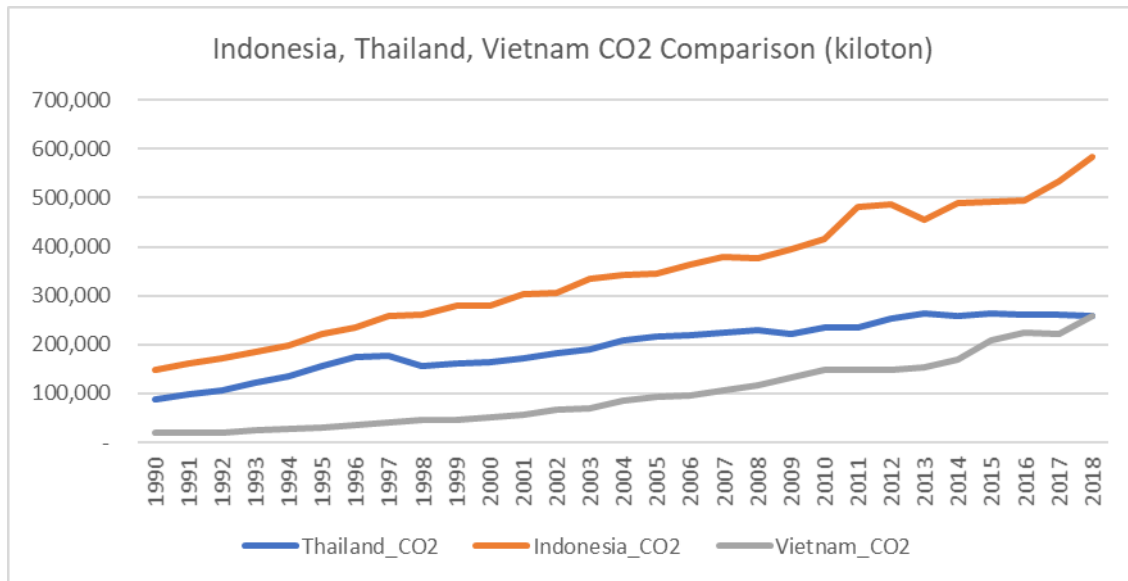
Correlation Between Technology and CO2 Emission

Prior to this study, many existing works of literature are available that examine the impact of technology on carbon emission. The information and Communication Technology (ICT) sector had been widely used as the proxy variable to measure technological improvement and digitalization. It symbolizes the use of the internet, which enables technological advancement in other sectors. However, the relationship between technology on CO₂ emission is still widely debated in various previous literature and has not yet reached a consensus.

Some studies found that technological development would harm the environment. In 2010, Malmodin, Moberg, Lundén, Finnveden, & Lövehagen argued that the Information and Communication Technology (ICT) sector operations produced more greenhouse gas (GHG) at the global level emissions than the manufacturing sector. The study further presented that the sector has produced 1.3% of global GHG emissions and corresponds to 3.9% of global electricity used. The study is then later continued by Malmodin & Lundén's (2018) study, which provides evidence that the ICT sector's carbon footprints globally are increasing in line with the increased number of ICT and TV subscriptions between the period of 2010 - 2015. However, the carbon footprints grow slower compared to the number of subscriptions since the technology development allows less required energy to connect mobile users.

On the contrary, some study argued that the technology development would improve the environmental quality because it enables carbon reduction across other various sectors. Berkhout & Hertin (2004) argued that although ICT sector does not directly support improvement of the environment, but it provides opportunities to develop more environmentally friendly options. They proposed that the ICTs would

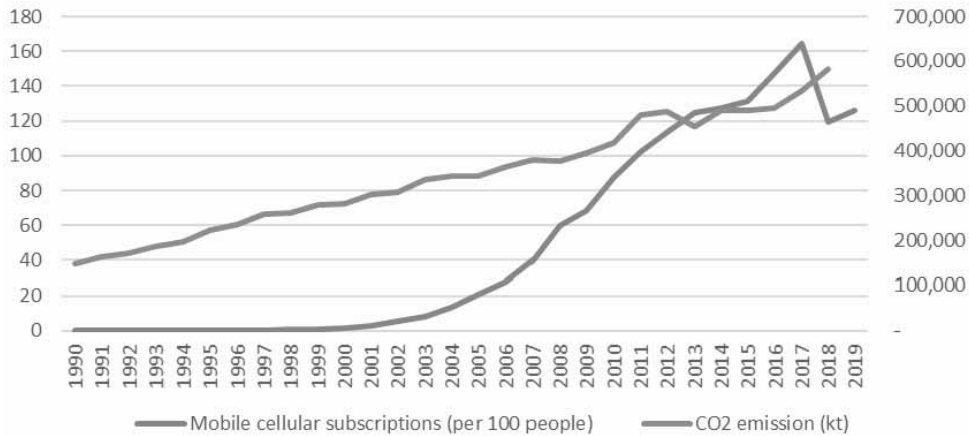
Figure 12. Indonesia, Thailand, and Vietnam CO2 comparison (in kiloton) (World Bank, 2021)



trigger structural change in the economy and increase efficiency in production and logistics. Similar notion were also proposed by Toffel & Horvath (2004), where they argued that although ICT sector does produce carbon emission, the environmental impacts resulted from its production have lower impacts on the environment compared to the applications it replaces. Ishida (2015) provide empirical evidence in Japan between 1980 and 2010 that although investment in the ICT sector does not contribute to an increase in GDP, but it will contribute to a moderate reduction in energy consumption. In the ASEAN region, Haini (2021) found that ICT sector development have a negative and significant relationships to carbon emission, leading to the improvement of environmental quality.

In the context of Indonesia, there is a strong and positive correlation between CO2 emission in where the coefficient correlation is 0.91. In other words, when there exist an increase in the mobile cellular subscription, there may also be an increase in the CO2 emission. Which paper supports this? The notion held true in almost every year between 1990 and 2019, except in 2013 and 2018. In 2013, although the mobile cellular subscription increased by 9.61% year-on-year, the CO2 emission decreased by 6.66% on the same year-on-year basis. Meanwhile in 2018, the decrease in mobile cellular subscription by 27.43% was followed by an increase in CO2 emission by 9.42%. It should be noted the variabilities of CO2 emission year-on-year in Indonesia are caused by a lot of ‘slash and burn’ deforestation activities in Indonesia, resulting in frequent peatland megafires. The correlation coefficient of mobile cellular subscription and carbon emission are also stronger in Indonesia than the neighbouring countries like Thailand (0.89) and Vietnam (0.9). However, all of these countries have something in common in which they have reached a point where the increase in mobile cellular subscription no longer followed by the growth of CO2 emission.

Figure 13. Mobile cellular subscription (LHS per 100 people) and CO2 emission (RHS kiloton) in Indonesia (1990 – 2019) (World Bank, 2021)



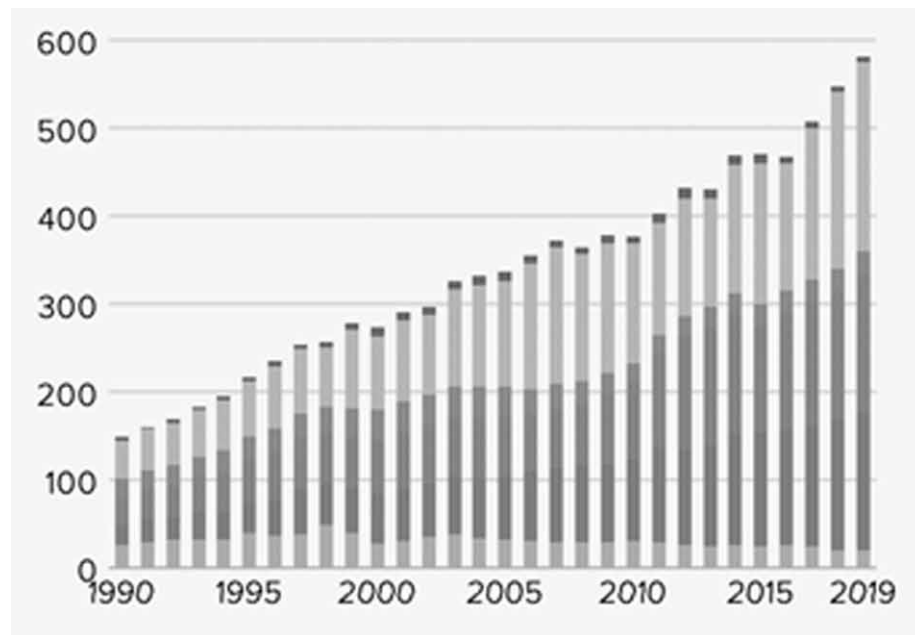
REGRESSION RESULT OF THE IMPACT OF TECHNOLOGY TO CARBON EMISSION

Table 2 presented the estimation result of technology on CO2 emission. In Model 1, only two of the variables shown a statistically significant results, namely population and mobile cellular subscription. Mobile cellular subscription shown a positive and statistically significant coefficient at 10% confidence level although the impact is far lower than the impact of population. The increase in mobile cellular subscription by 1% will result to an increase of CO2 emission by 0.037%. Thus, the result supports the argument of Malmodin & Lundén (2018) and Malmodin et al. (2010) that technology advancement does harm the environment. The coefficient of population is also positive and statistically significant

Table 2. Model 1 - Regression of the impact of technology to carbon emission

Independent Variables	Model (1)
LOG(POPULATION)	2.063* (1.115)
LOG(GDPR)	0.080 (0.243)
LOG(MOBILE)	0.037* (0.020)
Constant	-28.279 (18.136)
R ²	0.989
Adjusted R ²	0.987
Observations	29
*** p<1%, ** p<5%, * p<10%. The numbers in parentheses are standard errors.	

Figure 14. Annual CO2 emissions from fuel combustion (MtCO2/Year) (Climate Transparency, 2020)



at 10% confidence level. This indicates that when the number of population increases by 1%, the CO2 emission will increase by 2.06%.

Energy - Related CO2 Emissions by Sector

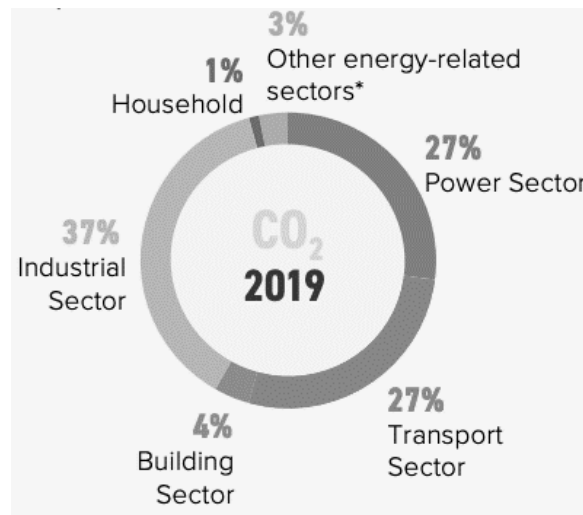
However, it is important to differentiate CO2 emissions from different sectors in Indonesia. It is important because some sectors are directly related to ICT use and others are not. With that said, the largest driver of overall GHG emissions in Indonesia are CO2 emissions from fuel combustion, not from ICT. In Indonesia, emissions have increase dsignificantly since 1990, reaching a high of 581 MtCO2, in 2019. The industry sector contributes the most, at 37% followed by transport (27%) and electricity and heat generation (27%).

The power sector in Indonesia is dominated by fossil fuels, with coal accounting for the majority of energy generation (63 percent). Because transportation is dominated by fossil fuels, it accounts for 27% of Indonesia's energy-related CO2 emissions. Building emissions occur directly (burning fuels for heating, cooling, etc), and indirectly (grid-electricity for air conditioning, appliances, etc).

ICT Sectors of Asia/Pacific

The all-pervasive digital shift by Asia/Pacific* enterprises to achieve digital resiliency has helped ICT spending grow by over 7.1% to \$950 billion in 2021, and is expected to reach \$1.1 trillion by 2025, according to the latest release of the Worldwide ICT Spending Guide Industry and Company Size. Multiple sectors have already begun their infrastructure as business models changed throughout the year, pushing a relatively large spend in innovating current offerings and undergoing the digital journey.

Figure 15. Percentage of industries with the biggest CO₂ emissions (Climate Transparency, 2020)



A series of new digital infrastructure projects are strengthening Indonesia's information and communications technology (ICT) sector as the country prioritizes the digital economy as an area of growth. Finance and insurance are two industries where information technology degrees are in high demand. Through the use of ICT, these industries must keep financial and personal data structured and safe. Another industry where information technology degrees are in high demand is education. The manufacturing industry is also associated with high-tech practices. Like other industries, manufacturing requires advanced computer technology systems. Telecommunications, the industry that provides communications via telephone, broadcasting and cable, is another of the industries where information technology degrees are in-demand. Technology is integral to communication through these channels. Companies that process data must, by definition, maintain their data structured and secure from hackers. They rely on information technology to construct and maintain databases, design efficient software applications, execute cybersecurity plans, and give technical help when needed to accomplish this.

CONCLUSION AND POLICY RECOMMENDATION

Indonesia has recorded impressive achievements in terms of digital use in the last decade. Digital transformation in Indonesia has the potential to support the sustainable development through three important channels: economic, social, and environmental sustainability. Digitalization and ICTs development would increase efficiency and sustainability in the provision of necessary services not only in the cities, but also in the rural, peripheral, and sparsely populated areas. Therefore, this study intends to explore the various challenges to implement digital technology-aided sustainable business models in Indonesia. Moreover, the researchers will also discuss possible policy recommendation to transform digitalisation in Indonesia as a tool for economic, social, and environment sustainability as three important nexuses.

This study uses a combination of desk study, descriptive statistic analysis, and qualitative information gathered from focus group discussion with relevant stakeholder. Moreover, the study also utilize

a a vector variable of mobile cellular subscriptions and the percentage of internet users to population as a proxy of digitalization to capture its impact on carbon emission and economic inequality. ARMA method is used to control the autocorrelation problem exist in a model, then estimated using the ordinary least square (OLS) estimator.

By using correlation graph and OLS estimator, the researchers found two important results. First, the correlation between technology and Gini coefficient is strong and positive, suggesting that technology will causes income inequality. This is in line with the results of the study by Shehzad, et al., 2021 which reveals that there is a substantial presence of asymmetric cointegration between ICT and CO2 emissions; the empirical results unfold that positive shocks in ICT negatively affect CO2 emissions, implying that an increase in ICT brings a decrease in CO2 emission; negative shocks in ICT publicized a negative association with CO2 emissions, inferring that a decrease in ICT will bring an upsurge in CO2 emissions. The result also supports the finding of another study by Park, Meng, and Baloch, 2018, which also found that ICT use significantly decreases environmental pollution and thus, increases the environmental quality.

However, by using OLS estimator, this paper also found that different measurement of technology may causes different impact on income inequality. Using mobile cellular subscription as a proxy variable will lead to increase in inequality, while using percentage of internet user to population will lead to equality. Moreover, mobile cellular subscriptions has a stronger impact on inequality than the percentage of internet user to population. The finding supports Lee & Wie (2013) and Mulyaningsih, Miranti, Daly, & Manning (2019) results that digitalization is followed by skill-biased technological changes, making labours with knowledge of new technologies and computerization are now more preferred in Indonesia.

Second, correlation analysis proven that there is a strong and positive correlation between CO2 emission and technology. Statistical regression by OLS estimator confirms the correlation, where it is found that by using mobile cellular subscription as a proxy to technology, technology will cause a detrimental impact on the environment since it increases CO2 emission. This indicates that technology advancement has the potency to harms the environment. The digital technology also gives the pressure to increase Balance of payment (BOP) deficit that could affect external sustainability.

The study proposes several policy recommendations. First, the government should ensure the accessibility of digital usage across Indonesia, including in the rural areas. By doing so, it is hoped that the society will have equal access to information, better communication means, and innovation tools that will narrow the existing digital divide. Second, aside from increasing the accessibility, the government should ensure that the society also have access to digital literacy. Digital literacy will not only enable people to understand and use the technology, but also enable them to find the relevant information and use the technology to solve their daily problems which will increase their standard of living. Third, the government should anticipate the possible environmental cost of technology. This could be done through increasing both the efforts and financial flow to research and development aimed towards environmentally friendly and clean technologies. With these new technologies, it is hoped that both households and business will have easier and cheaper access to consume and produce sustainably. Lastly, the study recommends that there should be more efforts to increase the export of digitally deliverable services such as creative economy or even financial services as well as preparing digital talent/human resource to decrease import of technology dependencies in the future. Increasing the export of digitally deliverable services will ensure that the balance of payment is not deficit and supporting external macroeconomy sustainability. In parallel, these efforts also must be supported by reforming the management of intellectual property

rights that is fundamental to the process of innovation and invention. Giving financial aid for younger generations to increase their technological skills may also be needed in order to achieve that goal.

ACKNOWLEDGMENT

We thank to Ms. Bianca Andrea Alexandra, Ms Nadira Dayo, Ms. Asoka Widyanto for their helpful data assistance and editing process. We also thanks to Mr. Arif Amin, Mr. Muhamad Islam, and Mr. Muhammad Ali for the support for data availability.

REFERENCES

G20 Research Group. (2016). *G20 Digital Economy Development and Cooperation Initiative*. G20 Research Group at the University of Toronto. Dipetik August 7, 2021, dari <http://www.g20.utoronto.ca/2016/160905-digital.html>

Anke, M., Tobias, M., & Gerd, Z. (2019). Economy 4.0 – Digitalisation and Its Effect on Wage Inequality. *Journal of Economics and Statistics*, 239(3), 363-398. https://econpapers.repec.org/scripts/redir_pf?u=https%3A%2F%2Fdoi.org%2F10.1515%2Fjbnst-2017-0151;h=repec:jns:jbstat:v:239:y:2019:i:3:p:363-398:n:1

Asian Development Bank. (2020). *Innovate Indonesia: Unlocking Growth through Technological Transformation*. Asian Development Bank. doi:10.22617/SGP200085-2

Bank Indonesia. (2021). *Statistik Ekonomi dan Keuangan Indonesia*. Dipetik August 2021, dari Bank Indonesia: <https://www.bi.go.id/id/statistik/ekonomi-keuangan/seki/Default.aspx#headingFour>

Berkhout, F., & Hertin, J. (2004). De-materialising and re-materialising: Digital technologies and the environment. *Futures*, 36(8), 903–920. doi:10.1016/j.futures.2004.01.003

Climate Transparency. (2020). *Climate Transparency Report: Comparing G20 Climate Action and Responses to the Covid-19 Crisis*. <https://www.climate-transparency.org/>

Dewan, S., & Kraemer, K. (2000). Information Technology and Productivity: Evidence from Country-Level Data. *Management Science*, 46(4), 548–562. doi:10.1287/mnsc.46.4.548.12057

Evangelista, R., Guerrieri, P., & Meliciani, V. (2014). The Economic Impact of Digital Technologies in Europe. *Economics of Innovation and New Technology*, 23(8), 802–824. doi:10.1080/10438599.2014.918438

Faludi, J. (2020). How to Create Social Value Through Digital Social Innovation? Unlocking the Potential of the Social Value Creation of Digital Start-Ups. *Journal of Social Entrepreneurship*, 1–18. Advance online publication. doi:10.1080/19420676.2020.1823871

Fettweis, G., & Zimmermann, E. (2008). ICT Energy Consumption-Trends and Challenges. *Proceedings of the 11th international symposium on wireless personal multimedia communications*.

Digital Economy Transformation in Nexus With External and Social Sustainability

- Gates, W. H. (2000). *Remarks by Bill Gates at the Digital Dividends Conference*. Retrieved August 2021, from <https://www.gatesfoundation.org/ideas/speeches/2000/10/bill-gates-creating-digital>
- Google, Temasek, & Bain. (2020). *E-Conomy SEA 2020 – At Full Velocity: Resilient and Racing Ahead*. Author.
- Guellec, D., & Paunov, C. (2017). *Digital Innovation and the Distribution of Income*. Available at SSRN: <https://ssrn.com/abstract=3065799>
- Haini, H. (2021). Examining the Impact of ICT, Human Capital and Carbon Emissions: Evidence from the ASEAN Economies. *Inter Economics*, 166, 116–125. doi:10.1016/j.inteco.2021.03.003
- Hootsuite/We Are Social. (2021). *Digital 2021: Global Overview Report*. Hootsuite/We Are Social. Retrieved from <https://wearesocial.com/digital-2021>
- Indonesia, S. (2016-2020). *Gini Coefficient in Indonesia*. https://www.bps.go.id/pressrelease.html?katsubjek=23&Brs%5Btgl_rilis_ind%5D=&Brs%5Btahun%5D=&yt0=Cari
- Indonesia FinTech Association (AFTECH). (n.d.). *Cash and E Wallet Transaction Proportion*. <https://www.fintech.id/id>
- Ishida, H. (2014). The effect of ICT development on economic growth and energy consumption in Japan. *Telematics and Informatics*, 32(1), 79–88. Advance online publication. doi:10.1016/j.tele.2014.04.003
- Jorgenson, D. W. (2007). Information Technology and the G7 Economies. In U. Apte & U. Karmarkar (Eds.), *Managing in the Information Economy. Annals of Information Systems* (Vol. 1). Springer. doi:10.1007/978-0-387-36892-4_2
- Jorgenson, D. W., & Vu, K. (2007). Information technology and the world growth resurgence. *German Economic Review*, 8(2), 125–145. doi:10.1111/j.1468-0475.2007.00401.x
- Kenny, C. (2003). The Internet and economic growth in less-developed countries: A case of managing expectations? *Oxford Development Studies*, 31(1), 99–113. doi:10.1080/1360081032000047212
- Kharlamova, G., Stavvytskyy, A., & Zarotiadis, G. (2018). The impact of technological changes on income inequality: The EU states case study. *Journal of International Studies*, 11(2), 76–94. doi:10.14254/2071-8330.2018/11-2/6
- LD FEB UI. (2018). Hasil Riset LD FEB UI Tahun 2018. In *Triliun ke Perekonomian Indonesia*. Jakarta: Universitas Indonesia.
- Lee, J. W., & Brahmasrene, T. (2014). ICT, CO2 Emissions and economic growth: Evidence from a panel of ASEAN. *Global Economic Review*, 43(2), 93–109. doi:10.1080/1226508X.2014.917803
- Lee, J.-W., & Wie, D. (2013). *Technological Change, Skill Demand, and Wage Inequality in Indonesia*. Asian Development Bank Economics Working Paper Series No. 340. Available at SSRN: <https://ssrn.com/abstract=2245380>
- Lee, S. Y. T., Gholami, R., & Tong, T. Y. (2005). Time series analysis in the assessment of ICT impact at the aggregate level – Lessons and implications for the new economy. *Information & Management*, 42(7), 1009–1022. doi:10.1016/j.im.2004.11.005

- LPEM FEB UI. (2019). *Dampak Tokopedia terhadap Perekonomian Indonesia*. Universitas Indonesia.
- Lubis, M., & Maulana, F. A. (2010). Information and electronic transaction law effectiveness (UU-ITE) in Indonesia. *Proceeding of the 3rd International Conference on Information and Communication Technology for the Moslem World (ICT4M) 2010*.
- Luthfihadi, M., & Dhewanto, W. (2013). Technology Acceptance of E-commerce in Indonesia. *International Journal of Engineering Innovation and Management*, 3(1), 9–18.
- Malmodin, J., & Lundén, D. (2018). The Energy and Carbon Footprint of the Global ICT and E&M Sectors 2010–2015. *Sustainability*, 10(9), 3027. doi:10.3390/u10093027
- Malmodin, J., Moberg, A., Lunden, D., Finnveden, G., & Lovehagen, N. (2010). Greenhouse Gas Emissions and Operational Electricity Use in the ICT and Entertainment & Media Sectors. *Special Issue: Environmental Applications of Information & Communication Technology*, 14(5), 770–790. doi:10.1111/j.1530-9290.2010.00278.x
- McKinsey & Company. (2016). *Unlocking Indonesia Digital Opportunity*. McKinsey Indonesia Office.
- McKinsey & Company. (2018). *The digital archipelago: How online commerce is driving Indonesia's economic development*. <https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Asia%20Pacific/The%20digital%20archipelago%20How%20online%20commerce%20is%20driving%20Indonesias%20economic%20development/The-digital-archipelago-Executive-summary.ashx>
- McNamara, K. S. (2003). *Information and communication technologies, poverty and development: Learning from experience*. The World Bank.
- Mulyaningsih, T., Miranti, R., Daly, A., & Manning, C. (2019). Regional Skill Differentials: A Study of the Indonesian Labor Market. *The Singapore Economic Review*, 1–22. doi:10.1142/S0217590819500371
- Nedomová, L., Maryska, M., & Doucek, P. (2017). Unequal Wage of Men and Women in ICT in the Czech Republic? *Gender, Technology and Development*, 21(1-2), 116–134. doi:10.1080/09718524.2017.1385317
- OECD. (2014). *Measuring the Digital Economy: A New Perspective*. OECD Publishing. doi:10.1787/9789264221796-
- Our World in Data. (2021). *CO2 and Greenhouse Gas Emissions Country Profiles*. <https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>
- Oyedemi, T. D., & Choung, M. (2020). Digital Inequality and Youth Unemployment. *South African Journal for Communication Theory and Research*, 46(3). Advance online publication. doi:10.1080/02500167.2020.1821738
- Park, Y., Meng, F., & Baloch, M. A. (2018). The Effect of ICT, Financial Development, Growth, and Trade Openness on CO2 Emissions: An Empirical Analysis. *Environmental Science and Pollution Research International*, 25(30), 30708–30719. Advance online publication. doi:10.1007/11356-018-3108-6 PMID:30178410

Digital Economy Transformation in Nexus With External and Social Sustainability

Raheem, I. D., Tiwari, A. K., & Balsalobre-Lorente, D. (2020). The Role of ICT and Financial Development in CO2 Emissions and Economic Growth. *Environmental Science and Pollution Research International*, 27(2), 1912–1922. Advance online publication. doi:10.1007/11356-019-06590-0 PMID:31760620

Rashid, A. T. (2016). *Digital Inclusion and Social Inequality: Gender Differences in ICT Access and Use in Five Developing Countries*. Asian Institute of Technology. doi:10.1177/0971852416660651

Richmond, K., & Triplett, R. E. (2018). ICT and Income Inequality: A Cross-national Perspective. *International Review of Applied Economics*, 32(2), 195–214. Advance online publication. doi:10.1080/02692171.2017.1338677

Rothe, F. (2020). Rethinking Positive and Negative Impacts of ‘ICT for Development’ Through the Holistic Lens of the Sustainable Development Goals. *Information Technology for Development*, 26(4), 653–669. Advance online publication. doi:10.1080/02681102.2020.1756728

Shehzad, K., Zaman, U., Ahmad, M., & Liu, X. (2021). Asymmetric Impact of Information and Communication Technologies on Environmental Quality: Analyzing the Role of Financial Development and Energy Consumption. *Environment, Development and Sustainability*. Advance online publication. doi:10.1007/10668-021-01506-w

Statistics, I. (2018). *Village Potential Statistics of Indonesia*. Jakarta: Indonesia Statistics. Retrieved from <https://www.bps.go.id/publication/download.html?nrbfveve=MTk2ZWWEwNDk4NmE0NTQwMjYxYmE5OTRk&xzmn=aHR0cHM6Ly93d3cuYnBzLmdvLmlkL3B1YmxpY2F0aW9uLzIwMTg0MTIvMTcvMTk2ZWWEwNDk4NmE0NTQwMjYxYmE5OTRkL3BvdGVuc2ktZGVzYS0yMDE4Lmh0bWw%3D&twoadfnorfeauf=MjAyMS0wOC0xMSAwO>

Susam, S. O., & Ucer, B. H. (2019). Modeling the Dependence Structure of CO2 Emissions and Energy Consumption Based on the Archimedean Copula Approach: The Case of the United States. *Energy Sources. Part B, Economics, Planning, and Policy*, 14(6), 274–289. doi:10.1080/15567249.2019.1671550

Teixeira, A. A. C., & Barros, D. (2020). Technology Balance of Payments and Countries’ International Competitiveness. A Dynamic Panel Data Analysis of OECD Countries, 2000-2017. *Applied Economics Letters*, 27(12), 992–996. doi:10.1080/13504851.2019.1654599

The Indonesian Internet Service Providers Association (APJII). (2018-2020). *Indonesia’s internet penetration rate*. <https://apjii.or.id/survei>

Thompson, H. G. Jr, & Garbacz, C. (2007). Mobile, fixed line and Internet service effects on global productive efficiency. *Information Economics and Policy*, 19(2), 189–214. doi:10.1016/j.infoecopol.2007.03.002

Tiwari, M. (2008). ICTs and poverty reduction: User perspective study of rural Madhya Pradesh, India. *European Journal of Development Research*, 20(3), 448–461. Advance online publication. doi:10.1080/09578810802245600

Varblane, U., Dyker, D., & Tamm, D. (2007). How to improve the national innovation systems of catching-up economies? *Trames Journal of the Humanities and Social Sciences*, 11.

Venkat, K. (2001). Digital Divide and Poverty. *Journal of Poverty*, 5(4), 113–116. Advance online publication. doi:10.1300/J134v05n04_06

Wang, E. H. H. (1999). ICT and economic development in Taiwan: Analysis of the evidence. *Telecommunications Policy*, 23(3–4), 235–243. doi:10.1016/S0308-5961(99)00005-1

World Bank. (2021). *Beyond Unicorns: Harnessing Digital Technologies for Inclusion in Indonesia*. Author.

World Energy Council. (2018). *The Role of ICT in Energy Efficiency Management Household Sector 2018*. World Energy Council. Retrieved from https://www.worldenergy.org/wp-content/uploads/2018/06/20180420_TF_paper_final.pdf

World Population Review. (2021). *Gini Coefficient by Country 2021*. <https://worldpopulationreview.com/country-rankings/gini-coefficient-by-country>

ADDITIONAL READING

De Souza, M., Pereira, G. M., Lopes de Sousa Jabbour, A. B., Chiappetta Jabbour, C. J., Trento, L. R., Borchardt, M., & Zvirtes, L. (2021). A digitally enabled circular economy for mitigating food waste: Understanding innovative marketing strategies in the context of an emerging economy. *Technological Forecasting and Social Change*, 173, 121062. doi:10.1016/j.techfore.2021.121062

Deev, M., Gamidullaeva, L., Finogeev, A., Finogeev, A., & Vasin, S. (2021). The convergence model of education for sustainability in the transition to digital economy. *Sustainability (Basel, Switzerland)*, 13(20), 11441. doi:10.3390/u132011441

Fang, H., Yang, Q., Wang, J., & Liu, X. (2021). Coupling coordination between technology transfer in universities and high-tech industries development in china. *Complexity (New York, N.Y.)*, 2021, 1–16. doi:10.1155/2021/1809005

Gaol, P. L. (2021). Implementation of performance management in artificial intelligence system to improve indonesian human resources competencies. *Earth and Environmental Science*, 717(1), 12010. 10.1088/1755-1315/717/1/012010

Hicks, J. (2021). A ‘data realm’ for the global south? evidence from indonesia. *Third World Quarterly*, 42(7), 1417–1435. doi:10.1080/01436597.2021.1901570

Jawad, M., Naz, M., & Maroof, Z. (2021). Era of digital revolution: Digital entrepreneurship and digital transformation in emerging economies. *Business Strategy & Development*, 4(3), 220–228. doi:10.1002/bsd2.145

Kahn, K., & Winters, N. (2021). Constructionism and AI: A history and possible futures. *British Journal of Educational Technology*, 52(3), 1130–1142. doi:10.1111/bjet.13088

King, B., & Petty, R. (2021). *The rise of technosocialism: how inequality, AI and climate will usher in a new world order*. Marshall Cavendish International.

Mukhoryanova, O., Kuleshova, L., Rusakova, N., & Mirgorodskaya, O. (2021). Sustainability of micro-enterprises in the digital economy. Paper presented at the, 250 06008. 10.1051/e3sconf/202125006008

Oetomo, C., Setiawan, F., & Consulting, G. (2021). *COVID-19 transforms Indonesia's digital economy and TP landscape*. *International Tax Review*.

Tett, G. (2021). *Anthro-vision: a new way to see in business and life*. Random House Business.

Walton, N., & Nayak, B. S. (2021). Rethinking of marxist perspectives on big data, artificial intelligence (AI) and capitalist economic development. *Technological Forecasting and Social Change*, 166, 120576. doi:10.1016/j.techfore.2021.120576

Yousaf, Z., Radulescu, M., Sinisi, C. I., Serbanescu, L., & Păunescu, L. M. (2021). Towards sustainable digital innovation of SMEs from the developing countries in the context of the digital economy and frugal environment. *Sustainability (Basel, Switzerland)*, 13(10), 5715. doi:10.3390u13105715

Zakaria, M., Aoun, C., & Liginlal, D. (2021). Objective sustainability assessment in the digital economy: An information entropy measure of transparency in corporate sustainability reporting. *Sustainability (Basel, Switzerland)*, 13(3), 105. doi:10.3390u13031054

KEY TERMS AND DEFINITIONS

Digitalization: Facilitating or improving processes through the use of digital technologies and data. Also defined as the use of digital technologies to change a business model and provide new revenue and value-producing opportunities.

External Sustainability: Sustainability of external macroeconomy position reflected by Balance of Payment and Current account condition. The balance is sustainable when the present value of its future trade surpluses equals the current level of debt.

Gini Coefficient: A measure of the distribution of income across a population to measure inequality. Higher Gini Coefficient means higher inequality.

Intellectual Property Rights: Legal rights that protect creators' original works, inventions, innovations, or the appearance of products and scientific advances.

Internet Users: Individuals who have used the Internet (from any location) in the last 3 months, as the percentage to population.


Mobile Cellular Subscription: Subscriptions to a public mobile telephone service that provide access to the PSTN using cellular technology. The indicator includes (and is split into) the number of postpaid subscriptions, and the number of active prepaid accounts (i.e., that have been used during the last three months). The indicator applies to all mobile cellular subscriptions that offer voice communications. It excludes subscriptions via data cards or USB modems, subscriptions to public mobile data services, private trunked mobile radio, telepoint, radio paging and telemetry services.

Sustainability: The integration of environmental health, social equity and economic vitality in order to create thriving, healthy, diverse and resilient communities for this generation and generations to come.


Chapter 10

Sustainability and Consumerism: How Green Are the Green Sectors

Subhanil Banerjee

 <https://orcid.org/0000-0001-7485-9967>
Amity University, Chhattisgarh, India

Shilpi Gupta

 <https://orcid.org/0000-0003-4382-3616>
Amity University, Chhattisgarh, India

Souren Koner

Amity University, Chhattisgarh, India

ABSTRACT

The Brundtland Commission report Our Common Future in 1987 gave birth to the concept of sustainable development. The meaning is benefitting the present without compromising the future. It was felt that, unless conventional growth and development are replaced by sustainable development through environmentally friendly actions, doomsday is very near. However, such sustainable development was followed by a global spree of consumerism that only added to the environmental burden. This dichotomy needs to be understood, and for the same purpose, one needs to go back to that point of Earth's history when ecology and economy were synonymous. From then on, the drift between the ecology and economy that has brought us to today's scenario needs to be understood. In this background, the chapter raises questions on how green the green sectors are. Furthermore, can sustainable development and consumerism be captured as one body of 'sustainable consumerism'?

INTRODUCTION

Sustainability and consumerism are two contradictory ideas that dawn the Anthropocene era. Sustainability

DOI: 10.4018/978-1-7998-9664-7.ch010

Sustainability and Consumerism

is a concept that started to take shape during the second last decade of the last millennia following the formation of the Brundtland Commission in 1983 and its dissolve in 1987 after their report *Our Common Future* (Brundtland, 1987; Rusu et al., 2020; Hajian and Kashani, 2021; Spencer, 2021). It was understood by the time that the way Mother Nature was exploited following the Industrial Revolution in Great Britain in 1750 (Hobsbawm and Wrigley, 1999; Cole, 2020; Dogaru, 2020; Elheddad et al., 2021), the future generation might not be left with any resources to depend on. The term sustainable development became famous following the mentioned report and benefitting the present without sacrificing the future started to overwhelm the usual concept of growth and development theories. Environmental economics became a popular discipline that dedicated itself to finding alternative pathways of development that would not risk Mother Nature's resilience anymore instead of restoring it to its previous status. Alternative sources of energy that are benign with significantly less or no emission of carbon monoxide and carbon dioxide, environmentally-friendly sectors started to get highlighted worldwide. The term green sector had been coined to identify sectors embracing environmentally friendly practices (UNIDO, 2011; Alrasheedi et al., 2020; Centobelli, Cerchione and Esposito, 2020; Kaswan and Rathi, 2020). The tertiary sector or the service sector automatically gained confidence as the green sector as it does not use any fossil fuel and erodes the earth of its resources. The green sector became more critical and proliferated following the global commitment towards the liberalization, globalization, and privatization or the LPG model, forming the world trade organization or WTO to monitor and promote international trade that replaced GATT following the Uruguay round (Neubauer, 2009; Hopewell, 2020; Mavroidis, 2021; Yavuz, 2021).

However, these actions also promoted conspicuous consumption and a worldwide consumption spree (Jovanovic, 2010; Igwe, 2021, Li, Xiao and Huang, 2021; Mohanty, 2021). The digital divide that made connectivity with the world mobile from static and the formation of online markets followed by the introduction of smartphones that brought the market at the tip of the fingers worked as a positive catalyst to consumerism (Banerjee et al., 2018; Chaouche, 2020; Borborah and Das, 2021; Panizzut et al., 2021). The slogan for sustainability or sustainable development turned into a whisper following these developments all around the world. Sustainable development remained alive in Papers and United Nations sustainable development goals. The actual scenario started to be dominated by sky-high malls that promoted impulsive buying behavior and online market places like Amazon and Flipkart, which gave a fascinating tour of the virtual market. Supported by the safe online payment mode and readily available credit cards and consumer loans, the entire world embarked on a consumption spree (Banerjee et al., 2018; Chaouche, 2020; Borborah and Das, 2021; Panizzut et al., 2021). These discussions unravel a burning question that why economics is so contradictory when it comes to addressing some real phenomena. It was believed that the problem lies at the root of the discipline that it never tried to understand worldly activities beyond its myopic view until the advent of environmental economics, which was a good but insufficient step towards understanding the world.

All the natural sciences have explained the formation and evolution of the earth. However, such an attempt on behalf of Social science was highly missing until recently Harari (2014; 2016) explained it from the perspective of history, and Dartnell (2020) has extended an explanation from the perspective of Geography. Till one of the major disciplines of social science Economics, remains silent in this aspect.

The research problem and objectives: The chapter attempts to dig deep to the point where economics and ecology are synonymous, and then find that era when they became a substitute. This is important considering the following objectives.

First of all, following the exhaustive literature search it was concluded that there are no similar texts or even peripheral texts on the mentioned issue. It is novel.

Secondly, unless it is understood that how ecology and economics became a substitute from complementary one might never be able to turn them in complementary again and that will be a hurdle to sustainable development.

Again, the present chapter delves into whether sustainability and consumerism can co-exist in an overtly capitalist world where the mantra of consumption holds the key to the survival of that very capitalist construct.

Moreover, the chapter takes up the issue of whether the so-called green sectors are green.

However, to understand this trade-off between sustainability and consumerism, one needs to start as early as the earth's formation and dig deep to that extent when ecology and economics were synonymous and all were bounded by natural law and technology.

Earth the Beginning an Economic Explanation Towards Sustainability and Consumerism

Around 4.5 billion years ago, the earth was formed through accretion from the Solar Nebula (Klahr and Schreiber, 2015; Morrison and Hazen, 2020; Weiss, Bai and Fu, 2021; Fu et al., 2021). What accretion is to astrophysics; appropriation is to the economics, and they can easily exchange places. If the Earth is considered as a product of accretion from the solar nebula, then it might easily represent the production of the earth through a production function. Volcanic outgassing created the primordial atmosphere and the ocean (Marsuo, 1978; Baumeister et al., 2020; Netchitailo, 2021; Swain et al., 2021). In a two-input one output production function, if Q is the output and K and L are two inputs, Q might be expressed as:

$Q = F(K, L)$, where F represents the technology. So, if Earth is represented as E , primordial atmosphere as PA , and ocean as O , then $E = VOG(PA, O)$ where volcanic outgassing or VOG acts as the technology. However, the point missed was that the expression mentioned is static, whereas the formation of earth was dynamic. This can easily be adjusted if it is considered a dynamic production function instead of a static one. The initial day's earth was a melted body due to frequent volcanic eruptions (similar to the economic shocks), resulting in a massive flood of molten lava. So, if the molten earth is denoted as E_t^m , then $E_t^m = VOG(PA, O)$, and with time earth cooled down, its solid crust was formed and flooded by the ocean water, so $E_{t+n}^s = C(A, S, O)$ where E_{t+n}^s is the solidified earth A is the atmosphere, S is the surface and O is the ocean. The first of the four geological eons were Hadean that lasted for 540 million years and was recognized as the building period of the earth (Carter, 2008; House, 2015; Bertrand and Legendre, 2021; Joseph and Duvall, 2021). The earth was yet to receive any living organisms. That eon has been described by the above functions and might be considered an economic interpretation of the concerned eon. However, the job does not end here, each neon needs to be represented in a form of the production function.

The second of the four geological eons were Archean, and during this era, the highly primary form of life took form from organic compounds through abiogenesis. Though those microbial organisms were anaerobic, they were responsible for emitting free oxygen into the earth's atmosphere (Barcaldo and Cardona, 2019; Camprubí et al., 2019; Carter, 2008; House, 2015; Kang, 2021). Abiogenesis can be explained from the point of view of economics as well. It is often said that economics is a subject that deals with scarcity. One may say that the scarcity of free oxygen in the atmosphere led to the emergence of mentioned microbial organisms. Here humans are witnessing a technological change as well as change in inputs and outputs. The earth, the output, is now EO_{t+n+m}^s , the earth with oxygen, and the period passed

Sustainability and Consumerism

$t+n+m$. This eon might be depicted as $EO_{t+n+m}^s = AB(AO_2, S, O)$ where AB denotes the technology abiogenesis AO_2 is the atmosphere with oxygen S is the surface, and O is the ocean.

After the Archean eon came, the Proterozoic eon and the earth felt the presence of Oxygen emitting single-celled photosynthesizing organisms for the first time. These organisms are essential if the evolution of life on earth is considered. Proterozoic is the largest of the four geological eons of the earth and is specifically essential as it spanned from the appearance of the free oxygen in the atmosphere to just before the advent of the complex life form on earth (Barcaldo and Cardona, 2019; Diamond, 2021; Kwok, 2021; Sanchez-Baracaldo, 2021). In functional form, one may write $E_{t+n+m+o}^L = P(AO_2, S, O, PB)$ where EL implies earth with life P implies photosynthesis that is nothing but a natural technology ($t+n+m+o$) define the time, AO_2 implies atmosphere with oxygen, S stands for surface, O stands for the ocean and PB stands for photosynthesizing organisms. The difference between the Archean and Proterozoic era's functional form is that the earth has much biodiversity, abiogenesis was replaced by photosynthesis (a technological change), PB implies photosynthesizing bacteria as a new input.

By this time, enough understanding has been developed that technology is not a human monopoly Mother Nature has its technology, and technological changes over the first three geographical eons were natural. Further, there are natural inputs that, coupled with each other within a natural technology, have turned earth from an inhabitable molten lava state to a habitable planet with free oxygen in the air that could support some very primitive, simple form of life. There was economics, or at least an economic explanation of the same but economics was the mirror image of ecology during that period. The discussion will get complex by the move to the last geological eon due to its diversity in life form and a series of an era that is chronologically important to explain. Following Darwin's theory of evaluation that followed survival of the fittest, it was seen that his theory was not always true. Environmental shocks similar to economic shocks often determine the future of species. All these are important to discuss to understand why ecology and economy started hand in hand but parted ways at a certain point in time. Why has this divergence kept on increasing over the years, and why has sustainability become a significant issue? It is also necessary to understand the roots of consumerism. Only after these ordeals, the chapter will return from where the conflict initiated between Sustainability and Consumerism at the backdrop of the so-called green sectors. It will be better understood whether the so-called green sectors are green or come with a shed of grey. However, for the time being, let these questions rest and come back to the explanation of geological eons. Still another eon is left, and in terms of life form, it is most distinctive and complex.

The Phanerozoic eon is the current geological eon, and to date, it is around 541 million years old. The eon witnessed an abundance of plant and animal species. This eon is divided into three subdivisions, and they are further divided into 12 sub-periods. Within the limited space of the chapter, it is not possible to delve into all these sub-division and give an economic explanation of the same. In simple words, without getting into those periodic tablets, it might be said that the eon started with a life form called phyla, and simple phyla grew into more complex algae, fungus, and even plants. This also led to more complex plant forms. Some elementary and now-extinct forms of arthropods also developed during the early Cambrian period (Keefe, 2011; McMenemy, 2020; Ou et al., 2020; Zhabg and Payne, 2012). If it is represented in the form of a production function then it may be written as $E_{t+n+m+o+r}^P = P(ph) = P(A, F, p, Ar)$. Where $E_{t+n+m+o}^P$ implies earth in the Phanerozoic period, P is the technology that is photosynthesis. A, F, and p stands for algae, fungi, and plants; Ar stands for arthropods. However, this only represents the early Phanerozoic era when there were no land plants.

The primary interest here is two sub-periods of the Phanerozoic era, namely the Mesozoic and Cenozoic eras. The Mesozoic era interests us as the age of Dinosaur and the Cenozoic era that may be called

the age of mammals (Dal et al., 2020; Kimura, 2020; Ksepka, 2012; Rougier, Martinelli and Forasiepi, 2021), and thus the age of the forefathers. If the evolutionary theory of Charles Darwin is followed, it will seem that he has completely ignored any discussion on them. The tense relationship between Charles Darwin and Victorian anatomist Richard Owen (Cowles, 2020; Johnson, 2019; Rupke, 2009; Nagai, 2020) has been extended as the primary cause of this attitude. However, paleontology was at a nascent stage at that time, so that can be another cause. The question that arises is Charles Darwin's famous theory of survival of the fittest that he proposed in his seminal book *Origin of the species* can or cannot explain the existence, proliferation, and extinction of the Dinosaurs. Following its natural law or natural technology, Mother Nature always created the Predators and Prey to keep things in balance. The Mesozoic era was no different. There were herbivores and carnivores, a food pyramid, and unambiguously the Carnivorous Dinosaurs were at the top of the food chain. Overall, it is the age of the Dinosaurs as they were the prime species of that time. The K-PG extinction event that is majorly cited as the prime cause of Dinosaurs extinction was the collision of a massive comet with earth (Magee and Hohna, 2021; Prothero, 2018; Chiarenza et al., 2020; Zhongming, Linong, and Wangqiang, 2020). In terms of economics, it may be called as an external shock, which led to the extinction of the Dinosaurs. The extinction of the Dinosaurs left plenty of space for other species to evolve, leading to the emergence of mammals, birds, snakes, termites, etc. This also announced the initiation of the Cenozoic era or the era of mammals. If any economic sector is considered it is usually observed that once the largest player passes into oblivion; the minor players start gaining the share of the market.

The discussion so far has been encouraged only to prove that technology is not only a humane affair or sustainability is an issue that popped up in the 1980s. Nature has its technology, and it is sustainable so that different geological eons came and went turning earth into a habitable place with diverse forms of lives even before the hominids arrived. It is needed to understand what went wrong with that technology and why sustainability became a question mark. However, before that, it is needed to understand the historicity of consumerism and again relate it with Mother Nature.

The big question that hangs before, is whether consumerism is a human affair or depicted in other species? Acquisition or appropriation of consumer goods is reflected in other species than human-like Shrews (Class et al., 2021; Masoero, 2020; Rychik and Jancewicz, 2002; Martinsen, 1969), Moles (Kem, 1994; Ellerhoff, 2020; Schmidly and Bradley, 2021;), Fire ants (Gayahan and Tschinkel, 2008; Halkin and Bray, 2021; Khalife and Peeters, 2020; Tragust et al., 2020), Fiddler crabs (Egawa et al., 2021; Kim, 2010; Yong and Lim, 2021;), Red squirrels (Busher et al., 2020; Chow et al., 2021; Lee, 2002) and Bees (de Paula et al., 2020; Dornhaus and Chittka, 2005; Li et al., 2021). However, that consumerism is instigated by the need of the dire time. Among the humans, even farmers are storing crops for deficient monsoon, which is appropriation so consumerism as well. This kind of consumerism was in harmony with nature's untiring effort towards sustainability. So, what turned sustainability and consumerism from complimentary to substitute commodities? To understand this puzzle, again a deep dive was taken into the prehistoric period for the need to understand how human technology came, evolved beside natural technology, and then superseded the natural technology to bring today's world. Further, focus was shifted to understand the evolution of consumerism. How human consumerism evolved beside natural consumerism and then eventually overpowered it.

In the beginning, sustainability and consumerism were complementary as both were guided and guarded by nature. If all other species were disregarded from now on and the concentration was on humans, it is well accepted that the early prehistoric human was nothing but animals, and in terms of genetic difference, it was slightly different from its closest cousin Chimpanzee. Bereft of sharp and long

Sustainability and Consumerism

canine and claws and lacking the speed, the early occupation of human's forefathers might either be vegetarian surviving on fruits and pulps, omnivores surviving on fruits pulps, insects and scavenging on the carcass of animal either died of natural causes or accident or hunted, eaten by other predators that left the rest out. The earth's orbit was not around anymore; it was oval-shaped, so there was seasonal change and variation in nature's bounty regarding different seasons. In those times, the human's early self was forced to appropriate as food supply was uncertain. This appropriation or consumerism was naturally led and was a necessity, not a luxury. It needs to be kept in mind that Harari (2014; 2016) and Dartnell (2020) have mentioned that the forefathers belonged to the mid of the food chain or food pyramid and used to prey and get preyed upon. Until the Palaeolithic era; the forefathers were either vegetarian or omnivores where animal protein was provided through scavenging. It is evident that food supply was a risky business in this background, and the appropriation of dry foods such as nuts and all might have been a common thing. This was consumerism, but it was necessary, not luxury. Till that time, natural technology was far superior to human technology.

During the Palaeolithic age, the forefathers became hunter-gatherers using some common and primitive tools like sharp stones and primitive axes. This is the first cognitive development and was driven by need, particularly a growing number and hunger. This cognitive development promoted them from the base of the food pyramid to the mid of the food pyramid (Cleuziou and Tosi, 2021; Marlowe, 2005; Norton, 2021). However, the most important event of the Palaeolithic age was the human mastering fire. How this happened is very shabby, but the critical thing is that only humans can light a fire at their will among all the animals. This gave them protection against predators and helped them hunt and promote them to the top of the food pyramid (Ayres, 2021; Barsky, 2021; Glikson, 2013; 2021). Considering the shabby circumstances regarding human mastery of fire, it is considered that like many other inventions that happened through accident, it may be compared with an unexpected economic shock. This particular event has been so crucial in human evolution that all the successive ages of human evolution are profoundly indebted to their mastery of fire. This also brings an end to the superiority of natural technology over human technology. Fire made humans the master of the world (Cleuziou and Tosi, 2021; Hariri, 2014; Hsu, 2021; Petit, 2021). Using fire over the historical time zone that followed before the first step of the modern human being or Homo Sapiens, humans created their law of survival that is no longer subject to the natural rule, law, or technology. This was when ecology and economy started to move away from each other. Unlike the previous natural balance that made Mother Nature sustainable for millions of years, human technology intervened and distorted that balance in their favor. The human population kept thriving at the cost of the other species, and continuous cognitive development turned humans into the most intelligent species in the world. As humans learned to farm, there were plenty of lands to cultivate; however, a growing population to feed and the urge for appropriation soon needed more land, and forests were cleared. For a chapter, it is impossible to explain all these developments in detail, and cautiously authors are jumping over thousands of years with the stroke of a pen as the transition from natural technology to human technology has already been discussed. Farming might be considered the first environmental atrocity carried by humans and the first to pave the way for appropriation and consumerism (Coddington et al, 2021; Hafeez et al., 2020; Kirch 1982; Mieth and Bork, 2003).

Since the origin of appropriation has been traced and consumerism and the superiority of human technology over the natural technology that parted economics and ecology, now it is better to consider the modern world. The different early civilizations like Mesopotamian, Egyptian, and Indus has been considered. It is observed that at least for the first two extravaganzas of wealth in various forms such as gold, silver, jewelry, high palaces with frescos were very common and a remarkable depiction of

appropriation and consumerism (Glikson, 2021; Green, 2020; Grossman and Paulette, 2020; Richards, Buren, and Audouze, 2000; Scarre et al., 2021). By this time, primitive communism was history, and the division of labor and classes was dawning the social structure. Instead of money wage, the laborers were paid in food, or often they were part of the slave mode of production. In those days and the days that followed till the industrial revolution in England in 1750, consumerism was an affair of elites. The industrial revolution created the wage-earner class and the bourgeois class that set the foundation for the middle class. In terms of wealth, this bourgeois class was between the elite and the wage earner or labor class and later played a pivotal role in promoting consumerism. The industrial revolution changed the environmental atlas of the world. It has been estimated that the atmosphere's carbon dioxide content is doubling every 30 years following the industrial revolution (Aresta and Dibenedetto, 2021; Hofman et al., 2009; Hoffmann et al., 2021; Hung et al., 2020) that later brought all the environmental maladies from thinning of the Ozone layer to global temperature rise through the greenhouse gas effect.

It would not be just if the aspect of colonialism from the point of view of consumerism is not explained. Appropriation of more wealth and introducing all unseen materials to the colonial countries by enslaving another country referred to as a colonized nation is the most severe form of consumerism the world has ever witnessed. A classic example is India, which was under British domination for 190 years and from one of the world's most prosperous countries, reduced to a poor country at the time of its independence in 1947 (Hyndman, 2020; Roy, 2020; Kaushal, 1979; Siddiqui, 2020).

Leaving these behind in the 20th century of the last millennia, the society was divided into elites, the middle class, and the poor or the laborer class. Consumerism was still an affair of the rich, but the middle class was soon catching up owing to the bandwagon effect and inter and intra class competition. In this background, two world wars happened, and the last one introduced the world to a new kind of environmental threat: nuclear waste. Though now humans live in an eon called Holocene since the world climate underwent little change in the last 11700 years, the introduction of nuclear waste, plastic waste, and domestication of chicken from 1950 till date is unofficially called Anthropocene (Crutzen and Stoermer, 2000; Kumar, 2020; Lalenti, 2020; Praskievicz, 2021). As has been illustrated in this chapter, it was believed that the Anthropocene era started much earlier, and assigning an exact date or year might not be possible.

From here on, the authors are again going back from where the discussion was started. Considering the dilapidated condition of the environment in the 1980s, the Brundtland Commission was formed in 1983, and it dissolved in 1987 after their report *Our Common Future*. It was realized that in order to follow the ancestors and keep living for millions of years, one's attitude towards nature needed a change. The actions should be more environmentally friendly, renewable, and less carbon-emitting energy sources should be identified, cultivated, and adopted. Specific sectors were marked as green such as service-providing sectors, as they visually do not emit any harmful gas. In the 1990s, however, following the global LPG swing, the enthusiasm for sustainable development got somewhat subsided. International trade was at its peak, and plastic became an element that covered most of the appliances, from mobile to microwave, from laptops to automobiles. The entire world uses more than 5 trillion plastic bags every year, and every minute, one million plastic bottles are purchased in form of mineral water. The total plastic garbage in the world weighs around 300 million metric tonnes, almost the same weight as the human population (Herberz et al., 2020; unep.org). However, the old concept of the green sector remained unaltered. Soon malls mainly emerged in urban centers, and the entire world indulged in a buying spree. From here on certain events need a closer look.

Sustainability and Consumerism

First, the Brundtland Commission and their famous report followed a top-down approach, limiting themselves to academicians, certain country heads, and far away from the common people. It was not a spontaneous response of common people towards restoring the environment. So, when the malls were open, and mobile became cheap, so as computers and banks became very lenient in consumer and automobile loans, there was a consumption spree mainly led by the middle class. Three factors lured the middle class into buying, the bandwagon effect, impulsive buying, and competitive buying behavior. So the so-called green sectors became the harbinger of further pollution, adding to the plastic garbage of the world as well as adding harmful chemicals into the earth such as mobile phone waste, computer waste that is full of lithium. Even the products that came out of the malls were wrapped in and delivered in plastic bags. Small shops followed their big brothers, and plastic became a medium of carrying instead of bio-degradable recycled paper packs and jute bags. The ready-to-cook meals, mineral water bottles, and innumerable products adopted plastic as an easier mode for the package. The malls became ticking plastic time bombs. Further to these, most of the malls are centrally air-conditioned, and only in the United States of America, the air conditioners emit 117 million metric tonnes of carbon dioxide in the air each year. It also uses huge power that, to date, mostly comes from fossil fuels; further, it leaks potent greenhouse gases (Folger, 2021). Chlorofluorocarbons, Hydrofluorocarbons, and Halons emitted by several man-made machines such as air-conditioners, refrigerators, and even fire extinguishing systems promised to be ceased by 2020 (environment.gov.au), yet compliance to this is doubtful. It needs to be understood that the agents above, once deplete the Ozone layer of the stratosphere, increase the chances of skin cancer and cataract, damage the immune system, damage the terrestrial and aquatic plant life, and finally increase the ground level Ozone formation that is known as Smog. The capital city of India, New Delhi, is a classic example of smog formation and the associated hazards. It should not be forgotten that New Delhi is a metro city famous or infamous for its Malls and other service sectors that also include offices (cnn.com). It is observed that within the present construct, consumerism and sustainability are substitutes than complimentary, and the so-called green sectors are often grey, even black. As depicted and computed from Table I and II; if some statistics regarding carbon dioxide, methane, and nitrous oxide emissions are considered, it will indicate the graveness of the present situation. CO₂ emissions from electricity and heat production, total (% of total fuel combustion) has increased from 29% in 1960 to 49% in 2014 during the Brundtland Commission that is from 1983 to 1987 it was around 37% to 38%. Carbon dioxide emission from the consumption of gaseous fuel has experienced a rise of 624% in the last 48 years, and it has almost doubled from what was during the period of the Brundtland Commission. The carbon dioxide gas emission from liquid fuel consumption has increased by around 246% in the last 48 years and almost 25% after the publication of the Brundtland report. In the last 41 years, the total greenhouse gas emission has increased by more than 69%, and from the ending years of the Brundtland commission, almost 32%. Agricultural methane emissions have increased by more than 22% in the last 48 years, and from the ending years of the Brundtland Commission, it has increased by around 14%. Agricultural nitrous oxide emissions have increased by more than 80% in the last 48 years, and after the Brundtland commission, it was almost 35%. Methane emissions increased by more than 54% in the last 48 years, and from the ending years of the Brundtland commission, it was almost 27%. Methane emissions in the energy sector have increased by more than 114% in the last 48 years, and after the Brundtland commission, it was almost 64%. Nitrous oxide emissions have increased by more than 35% in the last 48 years, and after the Brundtland commission, it was almost 2.7%. Nitrous oxide emissions in the energy sector have increased by more than 57% in the last 48 years, and after the

Brundtland commission, it was almost 41% by 2018. It is apparent that even after the Brundtland Commission; environmental atrocities were in full swing (Computed from Table I and II).

Table 1. Emissions of CO₂ – time series data

Year	CO ₂ emissions from electricity and heat production, total (% of total fuel combustion)	CO ₂ emissions from gaseous fuel consumption (kt)	CO ₂ emissions from liquid fuel consumption (kt)	Year	CO ₂ emissions from electricity and heat production, total (% of total fuel combustion)	CO ₂ emissions from gaseous fuel consumption (kt)	CO ₂ emissions from liquid fuel consumption (kt)
1960	28.56407144	975070.9571	3025727.146	1988	38.48597842	3876844.764	8713793.945
1961	29.12824016	1029718.04	3185843.447	1989	39.72426536	4072637.721	8902883.119
1962	29.41552329	1131368.839	3418102.616	1990	43.3169481	4227305.296	8534485.038
1963	29.58478917	1225205.848	3649872.213	1991	43.76219653	4384284.682	8668807.019
1964	30.20604688	1348665.898	3906880.482	1992	44.81106221	4035709.006	8389934.455
1965	30.60734898	1439240.867	4201791.925	1993	44.79137406	4142077.13	8476348.04
1966	31.0348587	1566721.849	4509445.535	1994	45.10283415	4149536.142	8417638.619
1967	30.29978852	1673974.193	4808930.78	1995	44.79691367	4270944.732	8494735.09
1968	30.84424928	1817652.793	5232388.199	1996	45.54787052	4439930.117	8708493.713
1969	31.72330127	1987612.019	5673121.288	1997	45.81170904	4454172.799	8820762.161
1970	32.98823455	2075284.598	6510868.375	1998	46.50115353	4483282.681	8898866.91
1971	31.84789271	2231486.009	6896107.115	1999	46.51967917	4695608.629	9044143.584
1972	32.46947895	2350296.911	7432506.554	2000	47.07546555	4827174.822	9274895.74
1973	33.34389543	2428529.962	7957675.007	2001	47.40626705	4855798.648	9337217.626
1974	33.81893368	2459300.411	7914673.268	2002	47.83935858	4990227.147	9251973.974
1975	33.62811846	2467434.203	7854782.739	2003	48.39678562	5188889.052	9504281.937
1976	34.23301721	2612520.876	8268777.735	2004	47.77862022	5336288.716	9762400.277
1977	34.62053886	2655363.767	8602793.769	2005	48.14885208	5496794.564	9789612.268
1978	34.59481497	2792921.231	8939417.067	2006	48.56315522	5621251.566	9826007.546
1979	34.87726041	2943150.714	9084065.873	2007	48.81699634	5841716.04	9765944.269
1980	36.19786509	3030954.655	8760877.847	2008	48.4321324	5997793.075	9889653.017
1981	36.53524067	3083024.356	8388591.031	2009	48.29077413	5889266.339	9779347.171
1982	36.85776297	3022264.514	8229330.259	2010	48.76675082	6348233.053	9986727.157
1983	37.27455841	3068544.012	8182065.017	2011	49.28578326	6480915.636	9955128.286
1984	37.21752129	3322459.675	8217724.504	2012	49.46727464	6587834.083	10133811.41
1985	37.68464184	3464304.667	8216531.69	2013	49.3747327	6695602.946	10206649.22
1986	37.99850146	3403900.751	8436267.31	2014	49.04019652	6757742.725	10367135.39
1987	38.27875578	3681832.784	8410674.203	2015	..	6887191.687	10475563.03
				2016	..	7056781.134	10482497.57

Source: World Development Indicators

Sustainability and Consumerism

Table 2. Other environmental pollutants

Year	Total greenhouse gas emissions (% change from 1990)	Total greenhouse gas emissions (kt of CO ₂ equivalent)	Agricultural methane emissions (thousand metric tons of CO ₂ equivalent)	Agricultural nitrous oxide emissions (thousand metric tons of CO ₂ equivalent)	Methane emissions (kt of CO ₂ equivalent)	Methane emissions in the energy sector (thousand metric tons of CO ₂ equivalent)	Nitrous oxide emissions (thousand metric tons of CO ₂ equivalent)	Nitrous oxide emissions in the energy sector (thousand metric tons of CO ₂ equivalent)
1970	..	27057171.8	2874648.922	1269938.928	5294458.744	1484335.457	2202797.898	183981.5
1971	..	25652776.28	2840961.467	1199396.692	5133798.699	1475412.515	2065702.937	134451.2193
1972	..	27508882.46	2871562.418	1251832.918	5348885.159	1513688.803	2220995.225	142200.2945
1973	..	28423385.49	2911944.728	1290757.194	5409388.917	1578887.102	2265472.4	150908.9062
1974	..	27783247.44	2915398.218	1257337.91	5366478.598	1583765.917	2215856.853	153268.7838
1975	..	28245747.25	2979621.946	1338975.618	5490220.157	1602193.806	2306421.333	161613.0159
1976	..	29669095.51	2992540.357	1364746.832	5636322.636	1673322.319	2388852.137	170618.2971
1977	..	30900189.24	3022537.342	1427819.807	5783159.073	1705640.581	2500861.937	178235.0254
1978	..	31442011.28	3002825.727	1446191.645	5782389.024	1749072.52	2527994.656	186677.5021
1979	..	32923407.15	3039479.458	1538543.274	5959259.854	1801091.765	2685624.988	190916.3894
1980	..	32794095.69	3072596.43	1570804.161	5997921.796	1780131.379	2707871.068	190873.7091
1981	..	31746296.04	3027894.339	1523332.911	5858004.267	1728553.141	2612070.208	190622.1599
1982	..	33745859.07	3071454.176	1599160.904	6275398.892	1764397.284	2781256.607	192823.9445
1983	..	33241117.37	3062602.597	1615048.292	6126518.821	1794675.834	2756521.519	195460.9206
1984	..	31878367.24	3035226.338	1603189.724	5973200.541	1831118.345	2670803.622	199300.111
1985	..	31931144.34	3026622.056	1606894.309	6025375.248	1867528.818	2672022.144	201064.6018
1986	..	32849036.78	3043764.037	1624808.885	6184970.687	1911609.732	2722859.061	204864.7904
1987	..	34762053.68	3073432.281	1707141.46	6449419.461	1945150.698	2904171.498	205167.0178
1988	..	34184147.35	3044655.328	1668898.675	6276209.592	2022523.958	2675735.759	216277.649
1989	..	34792835.4	3102061.697	1708667.828	6416172.961	2072483.378	2815144.209	220617.8969
1990	..	29848570	3152440	1823710	6898360	2453950	2332460	229880
1991	0.929410466	30009210	3153420	1814950	6875120	2399150	2323020	233480
1992	4.164516244	29879100	3138050	1809580	6810430	2326160	2316620	235570
1993	-0.394433332	29970470	3123140	1794160	6789110	2293890	2302630	239020
1994	1.512173906	30152090	3146930	1814290	6763240	2222150	2394530	242350
1995	2.113817163	30839910	3164170	1854550	6773440	2213090	2449660	245930
1996	2.684585473	31379670	3156360	1880550	6790740	2239750	2492480	250360
1997	13.45212135	31691800	3112010	1855380	6749630	2250230	2463240	252210
1998	15.21258297	31860170	3134140	1889800	6758180	2248440	2475630	252720
1999	6.957003572	32018180	3165900	1915380	6808320	2271920	2477050	250650
2000	6.097657902	32781530	3170820	1908130	6859450	2317220	2485920	254550
2001	5.580386588	33235280	3169360	1923460	6913060	2388720	2498020	254220
2002	12.65532292	33702380	3190660	1960710	6973040	2435040	2536790	254160
2003	16.19090625	34882860	3189450	1956820	7062720	2532650	2542580	256260
2004	19.42533716	36252860	3243990	2016030	7168060	2597660	2613880	257210
2005	23.49824402	37346260	3272710	2023940	7225520	2638530	2625710	257480
2006	27.2226711	38444310	3301930	2053490	7359290	2734560	2658770	259340
2007	30.72077007	39738280	3335870	2105280	7473250	2808920	2710520	261060
2008	27.28663	40139260	3352150	2099790	7585770	2903010	2696680	263100
2009	25.94268428	39846770	3346350	2102300	7591370	2909880	2694510	261900
2010	33.16302371	41817500	3367470	2140800	7704390	2993520	2741480	267820
2011	38.07881404	43022060	3421190	2221570	7807040	3042050	2834570	270990
2012	40.00330807	43582450	3439240	2231950	7869970	3079330	2847630	272720
2013	..	44233530	3405660	2208840	7880460	3117610	2838990	278740
2014	..	44438190	3427420	2234500	7957650	3144320	2881840	281810
2015	..	44423270	3442060	2241760	8021410	3165590	2904970	286110
2016	..	44550150	3465770	2263530	8068580	3173140	2934600	286950
2017	..	45117640	3505600	2306980	8137390	3180470	2986520	288710
2018	..	45873850	3513570	2296270	8174420	3187680	2984340	290360

Source: World Development Indicators

Table 3. Environment before and after Brundtland Commission

	Before Brundtland commission (1960-1987)	After Brundtland commission (1987-2014)	Before Brundtland commission (1970-1987)	After Brundtland commission (1987-2004)
CO ₂ emissions from gaseous fuel consumption	277.60	83.54		
CO ₂ emissions from liquid fuel consumption	177.97	23.26		
Total greenhouse gas emissions			28.48	4.29
Agricultural methane emissions			6.92	5.55
Agricultural nitrous oxide emissions			34.43	18.09
Methane emissions			21.81	11.14
Methane emissions in the energy sector			31.05	33.55
Nitrous oxide emissions			31.84	-10.00
Nitrous oxide emissions in the energy sector			11.52	25.37

Source: Computed from Table I and II

However, a closer consideration of the data below will prove that the concerned commission was somewhat effective in reducing environmental pollution. For example, carbon dioxide emission from gaseous fuel was increased by almost 278% within the 27 years preceding the Brundtland committee and 84% following the next 27 years of the committee. Similarly, carbon dioxide emission from liquid fuel over the same pre and post Brundtland commission has decreased from 178% to 23%. The total growth of greenhouse gas emissions preceding the commission was 28% from 1970-87, which has been reduced to 4% from 1987-2004. The total agricultural methane gas emission was increased by 6.92 percent over the time frame 1970 to 1987 but reduced to 5.55 percent over 1987 to 2004. The Agricultural nitrous oxide emissions increased by 34.43 percent over the 17 years starting from 1970 and ending in 1987. The same has come down to 18.09 percent from 1987 to 2004. Methane emission has declined from around 22 percent to 11 percent in comparison to the two-time frame. However, methane emission in the energy sector has increased and so has nitrous oxide emission in the energy sector. But the silver line is the overall nitrous oxide emission has reached a negative growth rate. Table III depicts these developments.

However, none of these data reflect the plastic waste as mentioned earlier. Table IV illustrates the grim condition regarding plastic waste and it will lead to cumulative destruction of aquatic life. Because environmental pollution even if local in nature but global in effect; all humans existence is at a stake. The four mentioned rivers of China carry a sum of 1738546 tons of plastic garbage that is more than 80 percent of the total plastic garbage carried by the mentioned top 10 rivers. Moreover, the most important rivers for the countries like Pakistan (Indus), Bangladesh (Meghna), India (Brahmaputra and Ganges), Russia and North-east China (Amur), and continents like North-Eastern Africa (Nile), West Africa (Niger), East and southeast Asia (Mekong) are carrying alarming level of plastic waste.

Sustainability and Consumerism

Table 4. 10 Rivers alone carry more than 90% of the plastic waste

River Name	Plastic Garbage (tons)
Chang Jiang (Yangtze River)	14,69,481
Indus	1,64,332
Huang He (Yellow River)	1,24,249
Hai He	91,858
Nile	84,792
Meghna, Brahmaputra, Ganges	72,845
Zhujiang (Pearl River)	52,958
Amur	38,267
Niger	35,196
Mekong	33,431

Source: <https://www.unep.org/interactive/beat-plastic-pollution/>

CONCLUSION

The society is caught between two conflicting ideas, and neither can be ignored. Presently this is a capitalist world where consumerism is critical to fuel capitalist survival. On the other hand, sustainability cannot be ignored as once the resilience of Mother Nature gets destroyed; the future generations would be exposed to a series of maladies and would not be left with any natural resources that can make them sustain their lives. Hence, it is needed to make consumerism and sustainability, the two opposing forces into one factor named sustainable consumerism that will help to keep parity on both fronts. The question is how it is possible.

There are a few minor changes if adopted; can help to reach the goals mentioned above. These changes might be divided into the short run and long run. First, the malls need to opt for alternative packaging processes like recycled paper packs and jute bags instead of plastics. The packaging of fast-moving consumer goods needs to be reconsidered, and plastic needs to be replaced by some other bio-degradable materials. The weight segmentation of the fast-moving consumer goods has gone through unprecedented changes over the past few years, instead of several small packets of the goods, only the medium and large packets should be available, and that will reduce the presence of plastic to a great extent, however, will also lead to a certain level of choice restriction on behalf of the consumer but with the proper level of awareness development that can be overcome. The mineral water, soft drinks should be served in recycled paper packets. This is not new; some companies have already resorted to this kind of packaging other need to follow. This will turn the green sectors green.

Instead of centrally air-conditioned malls, district cooling offering to cool to more than one number of settlements within its vicinity should have opted. These district cooling systems are 50% more energy efficient than air conditioners and much more environmentally friendly. The possibilities of alternative energy sources like wind power, solar energy, hydroelectric, and bioenergy should be cultivated. It should be made mandatory that these alternative and renewable energy sources must occupy a certain percentage of total energy consumption. Further, there should be a phase-out plan with a timeline mentioning when they would entirely replace fossil fuel energy. Battery-driven cars are no longer a distant possibility; they are very much a reality nowadays. If a certain percentage of the total vehicle on the road can be replaced

by battery-driven vehicles, it will do much good for the environment. Finally, the people should be made aware of sustainable development and environment-friendly actions. Ground-level awareness regarding the same is very much lacking. Nowadays the necessities such as the common digital gadgets need to carry significant research and development to replace plastic with some other material and remain within the consumer-friendly price limit. The role of the government would be crucial; it should introduce an expenditure tax that will curb impulsive buying and competitive buying habits. Such tax regime should be carefully imposed, monitored and evictors must be subject to exemplary penalties.

The suggestions above are just a few minor changes that might make the dream of sustainable consumerism accurate. However, unless and until the idea of sustainability becomes spontaneous in ordinary people and a bottom-up approach develops spontaneously, any external intervention towards sustainability, sustainable development, or sustainable consumption will remain a daydream. This world belongs to its inhabitants and as the prime species human has excellent power and greater responsibility towards the other species and the future of the members of its species. It is never too late to correct the wrong. A meaningful calculative approach towards sustainable consumerism can still restore the world to its previous forms. The recent plantation drive in many parts of the world portrays the benign nature of some groups of people. The various approaches need to be replicated and adjusted to the present circumstances to have a better world for the future generations.

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

- Alrasheedi, M., Mardani, A., Mishra, A. R., Streimikiene, D., Liao, H., & Al-nefaie, A. H. (2021). Evaluating the green growth indicators to achieve sustainable development: A novel extended interval-valued intuitionistic fuzzy-combined compromise solution approach. *Sustainable Development*, 29(1), 120–142. doi:10.1002/d.2136
- Aresta, M., & Dibenedetto, A. (2021). The Atmosphere, the Natural Cycles, and the “Greenhouse Effect”. In *The Carbon Dioxide Revolution* (pp. 31–43). Springer. doi:10.1007/978-3-030-59061-1_3
- Ayres, R. U. (2021). Extensions of the Body. In *The History and Future of Technology* (pp. 33–56). Springer. doi:10.1007/978-3-030-71393-5_3
- Banerjee, S., Bhattacharya, S., Dave, S., & Koner, S. (2018). Impact of mobile phones on international trade: The experience of South and South East Asia. *International Journal Of Business And Development Research*, 7(1), 40–53.
- Barsky, D., Carbonell, E., Sala-Ramos, R., de Castro, J. M. B., & García-Vadillo, F. J. (2021). Late Acheulian multiplicity in the manufactured stone culture at the end of the Middle Pleistocene in Western Europe. *Quaternary International*, 601, 66–81. doi:10.1016/j.quaint.2021.04.017
- Baumeister, P., Tosi, N., MacKenzie, J., Grenfell, J., & Godolt, M. (2020). Shaping atmospheres of terrestrial planets with interior-atmosphere feedback processes. *Matter Under Extreme Conditions*, 117, 18264-18271.

Sustainability and Consumerism

- Bertrand, P., & Legendre, L. (2021). The Living Earth: Our Home in the Solar System and the Universe. In *Earth, Our Living Planet* (pp. 1–47). Springer. doi:10.1007/978-3-030-67773-2_1
- Borborah, P., & Das, J. (2021). Bringing the World Inside Home: Media, Advertisements and Changing Forms of Consumerism. In *Sociological Reflections on the Covid-19 Pandemic in India* (pp. 51–74). Springer. doi:10.1007/978-981-16-2320-2_4
- Brundtland, G. (1987). *Report of the World Commission on Environment and Development: Our Common Future*. Sustainabledevelopment.un.org
- Busher, P. E., Mayer, M., Ulevičius, A., Samus, A., Hartman, G., & Rosell, F. (2020). Food caching behavior of the Eurasian beaver in northern Europe. *Wildlife Biology*, 2020(3).
- Camprubí, E., de Leeuw, J., House, C., Raulin, F., Russell, M., Spang, A., Tirumalai, M. R., & Westall, F. (2019). The Emergence of Life. *Space Science Reviews*, 215(8), 56. Advance online publication. doi:10.1007/11214-019-0624-8
- Carter, B. (2008). Five- or six-step scenario for evolution? *International Journal of Astrobiology*, 7(2), 177–182. doi:10.1017/S1473550408004023
- Centobelli, P., Cerchione, R., & Esposito, E. (2020). Pursuing supply chain sustainable development goals through the adoption of green practices and enabling technologies: A cross-country analysis of LSPs. *Technological Forecasting and Social Change*, 153, 119920. doi:10.1016/j.techfore.2020.119920
- Chaouche, S. (2020). Consumer Credit Traps and Student Consumerism. In *Student Consumer Culture in Nineteenth-Century Oxford* (pp. 159–196). Palgrave Macmillan. doi:10.1007/978-3-030-46387-8_6
- Chiarenza, A. A., Farnsworth, A., Mannion, P. D., Lunt, D. J., Valdes, P. J., Morgan, J. V., & Allison, P. A. (2020). Asteroid impact, not volcanism, caused the end-Cretaceous dinosaur extinction. *Proceedings of the National Academy of Sciences of the United States of America*, 117(29), 17084–17093. doi:10.1073/pnas.2006087117 PMID:32601204
- Chow, P. K. Y., Uchida, K., von Bayern, A. M., & Koizumi, I. (2021). Characteristics of urban environments and novel problem-solving performance in Eurasian red squirrels. *Proceedings of the Royal Society B*, 288(1947), 20202832. 10.1098/rspb.2020.2832
- Class, B., Masoero, G., Terraube, J., & Korpimäki, E. (2021). Estimating the long-term repeatability of food-hoarding behaviours in an avian predator. *Biology Letters*, 17(7), 20210286. doi:10.1098/rsbl.2021.0286 PMID:34256584
- Cleuziou, S., & Tosi, M. (2021). *In the Shadow of the Ancestors: The Prehistoric Foundations of the Early Arabian Civilization in Oman: Second Expanded Edition*. Archaeopress Publishing Ltd. doi:10.2307/j.ctv1dwq0rp
- Codding, B. F., Brenner Coltrain, J., Louderback, L., Vernon, K. B., Magargal, K. E., Yaworsky, P. M., Robinson, E., Brewer, S. C., & Spangler, J. D. (2021). Socioecological dynamics structuring the spread of farming in the North American Basin-Plateau Region. *Environmental Archaeology*, 1–13. doi:10.1080/14614103.2021.1927480

- Cole, M. (2020). *Climate Change, The Fourth Industrial Revolution and Public Pedagogies: The Case for Ecosocialism*. Routledge. doi:10.4324/9781003051411
- Cowles, H. M. (2020). *The scientific method: An evolution of thinking from Darwin to Dewey*. Harvard University Press. doi:10.4159/9780674246843
- Crutzen, P. J., & Stoermer, E. F. (2000). *The Anthropocene*. *IGBP Newsletter*, 41.
- Dartnell, L. (2019). *Origins: How the Earth shaped human history* (1st ed.). Basic Books.
- Darwin, C. (1964). *On the origin of species: A facsimile of the* (1st ed.). Harvard University Press.
- de Paula, G. T., Menezes, C., Pupo, M. T., & Rosa, C. A. (2020). Stingless bees and microbial interactions. *Current Opinion in Insect Science*. PMID:33271364
- Department of Agriculture, Water and the Environment. (2021). *Montreal Protocol on Substances that Deplete the Ozone Layer*. Retrieved 26 September 2021, from <https://www.environment.gov.au/protection/ozone/montreal-protocol>
- Diamond, C. W. (2021). *Animals, Oxygen, and the Mid-Proterozoic Earth System* (Doctoral dissertation). UC Riverside.
- Dogaru, L. (2020). The main goals of the fourth industrial revolution. renewable energy perspectives. *Procedia Manufacturing*, 46, 397–401. doi:10.1016/j.promfg.2020.03.058
- Dornhaus, A., & Chittka, L. (2005). Bumble bees (*Bombus terrestris*) store both food and information in honeypots. *Behavioral Ecology*, 16(3), 661–666. doi:10.1093/beheco/ari040
- Egawa, R., Sharma, S., Nadaoka, K., & MacKenzie, R. A. (2021). Burrow dynamics of crabs in subtropical estuarine mangrove forest. *Estuarine, Coastal and Shelf Science*, 252, 107244. doi:10.1016/j.ecss.2021.107244
- Elheddad, M., Benjasak, C., Deljavan, R., Alharthi, M., & Almabrok, J. M. (2021). The effect of the Fourth Industrial Revolution on the environment: The relationship between electronic finance and pollution in OECD countries. *Technological Forecasting and Social Change*, 163, 120485. doi:10.1016/j.techfore.2020.120485
- Ellerhoff, S. G. (2020). *Mole*. Reaktion Books.
- Folger, T. (2021). *This new technology could help cool people down—without electricity*. Environment. Retrieved 21 September 2021, from <https://www.nationalgeographic.com/environment/article/this-new-technology-could-help-cool-people-down-without-electricity>
- Fu, R. R., Volk, M. W., Bilardello, D., Libourel, G., Lesur, G. R., & Ben Dor, O. (2021). The fine-scale magnetic history of the Allende meteorite: implications for the structure of the solar nebula. *AGU Advances*, 2(3), e2021AV000486.
- Gayahan, G., & Tschinkel, W. (2008). Fire Ants, *Solenopsis invicta*, Dry and Store Insect Pieces for Later Use. *Journal of Insect Science*, 8(39), 1–8. doi:10.1673/031.008.3901

Sustainability and Consumerism

- Glikson, A. (2013). Fire and human evolution: The deep-time blueprints of the Anthropocene. *Anthropocene*, 3, 89–92. doi:10.1016/j.ancene.2014.02.002
- Glikson, A. Y. (2021). Fire and Human Intelligence. In *The Event Horizon: Homo Prometheus and the Climate Catastrophe* (pp. 23–30). Springer. doi:10.1007/978-3-030-54734-9_4
- Glikson, A. Y. (2021). River Empires and Divine Rulers. In *The Fatal Species* (pp. 27–33). Springer. doi:10.1007/978-3-030-75468-6_5
- Green, A. S. (2020). Debt and inequality: Comparing the “means of specification” in the early cities of Mesopotamia and the Indus civilization. *Journal of Anthropological Archaeology*, 60, 101232. doi:10.1016/j.jaa.2020.101232
- Grossman, K., & Paulette, T. (2020). Wealth-on-the-hoof and the low-power state: Caprines as capital in early Mesopotamia. *Journal of Anthropological Archaeology*, 60, 101207. doi:10.1016/j.jaa.2020.101207
- Gupta, S., & Pokharel, S. (2019). *New Delhi is choking on smog and there's no end in sight*. CNN. Retrieved 16 September 2021, from <https://edition.cnn.com/2019/11/04/india/delhi-india-smog-pollution-intl-hnk/index.html>
- Hafeez, M., Yuan, C., Shah, W. U. H., Mahmood, M. T., Li, X., & Iqbal, K. (2020). Evaluating the relationship among agriculture, energy demand, finance, and environmental degradation in one belt and one road economies. *Carbon Management*, 11(2), 139–154. doi:10.1080/17583004.2020.1721974
- Hajian, M., & Kashani, S. J. (2021). Evolution of the concept of sustainability. From Brundtland Report to sustainable development goals. In *Sustainable Resource Management* (pp. 1–24). Elsevier. doi:10.1016/B978-0-12-824342-8.00018-3
- Halkin, S. L., & Bray, A. M. (2021). Are smart foraging squirrels shoppers? choices and may How ants meet current and future needs. *Exploring Animal Behavior in Laboratory and Field*, 192.
- Harari, Y. (2015). *Sapiens: A Brief History of Humankind* (1st ed.). Penguin Random House.
- Harari, Y. (2018). *Homo Deus: A Brief History of Tomorrow*. Harper Perennial.
- Herberz, T., Barlow, C. Y., & Finkbeiner, M. (2020). Sustainability assessment of a single-use plastics ban. *Sustainability*, 12(9), 3746. doi:10.3390/s12093746
- Hobsbawm, E., & Wrigley, C. (1999). *Industry and empire*. New Press.
- Hoffmann, M. P., Koplinka-Loehr, C., & Eiseman, D. L. (2021). Our Changing Climate. In *Our Changing Menu* (pp. 14–24). Cornell University Press. doi:10.1515/9781501754647-005
- Hofmann, D., Butler, J., & Tans, P. (2009). A new look at atmospheric carbon dioxide. *Atmospheric Environment*, 43(12), 2084–2086. doi:10.1016/j.atmosenv.2008.12.028
- Hopewell, K. (2020). Power, Multilateralism, and Neoliberalism at the WTO. In *Breaking the WTO* (pp. 42–76). Stanford University Press. doi:10.1515/9781503600027-005

- House, C. (2015). Penciling in details of the Hadean. *Proceedings of the National Academy of Sciences of the United States of America*, 112(47), 14410–14411. doi:10.1073/pnas.1519765112 PMID:26564166
- Hsu, F. (2021). Harnessing the Sun: Embarking on Humanity's Next Giant Leap. *Online Journal of Space Communication*, 9(16), 2. <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf> doi:10.1093/beheco/ari040
- Hung, Y. T., & Toney, A. M. (2020). Greenhouse Gases. In *Handbook of Environment and Waste Management* (pp. 531–554). Acid Rain and Greenhouse Gas Pollution Control. doi:10.1142/9789811207136_0014
- Hyndman, H. M. (2020). The Approaching Catastrophe in India (London: Twentieth Century Press, 1897). In *Contemporary Thought on Nineteenth Century Socialism* (pp. 389-405). Routledge.
- Ialenti, V. (2020). *Deep time reckoning: How future thinking can help Earth now*. MIT Press. doi:10.7551/mitpress/12372.001.0001
- Igwe, I. O. (2021). WTO, A Multilateral Trade Institution or a Parallel Organisation: Reform Initiatives Addressing the WTO Agricultural Trade Distortions to Developing Countries. *Athens JL*, 7(1), 65–90. doi:10.30958/ajl.7-1-4
- Joseph, R., & Duvall, D. (2021). Fungi on Mars and Extraterrestrial Civilizations. Genetics, Evolution, Alien Megastructures and Ancient Stars. *Journal of Cosmology*, 103.
- Jovanović, M. (2010). Is Globalisation Taking us for a Ride? *Journal of Economic Integration*, 25(3), 501–549. doi:10.11130/jei.2010.25.3.501
- Kang, S. (2021). Microbes' Many Roles in Climate Change: Contribution, Consequence, Mitigation, and Model System. *Microbes: The Foundation Stone of the Biosphere*, 187-194.
- Kaswan, M. S., & Rathi, R. (2020). Green Lean Six Sigma for sustainable development: Integration and framework. *Environmental Impact Assessment Review*, 83, 106396. doi:10.1016/j.eiar.2020.106396
- Kaushal, G. (1979). *Economic history of India, 1757-1966*. Kalyani Publishers.
- Khalife, A., & Peeters, C. (2020). Food storage and morphological divergence between worker and soldier castes in a subterranean myrmicine ant, *Carebara perpusilla*. *Journal of Natural History*, 54(47-48), 3131–3148. doi:10.1080/00222933.2021.1890851
- Kim, T. W. (2010). Food storage and carrion feeding in the fiddler crab *Uca lactea*. *Aquatic Biology*, 10(1), 33–39. doi:10.3354/ab00264
- Kimura, M. (2020). Tracing the Course of Evolution. In *My Thoughts on Biological Evolution* (pp. 35–48). Springer. doi:10.1007/978-981-15-6165-8_3
- Kirch, P. V. (2021). The impact of the prehistoric Polynesians on the Hawaiian ecosystem. In *A Natural History of the Hawaiian Islands* (pp. 425–438). University of Hawaii Press.
- Klahr, H., & Schreiber, A. (2015). Linking the Origin of Asteroids to Planetesimal Formation in the Solar Nebula. *Proceedings of the International Astronomical Union. International Astronomical Union*, 10(S318), 1–8. doi:10.1017/S1743921315010406

Sustainability and Consumerism

- Ksepka, D. T. (2018). Mystery of the Lost Reptiles: A diverse group of Mesozoic aquatic reptiles survived the Cretaceous extinction but then dwindled during the Age of Mammals. *American Scientist*, 106(4), 222. <https://link.gale.com/apps/doc/A546025755/AONE?u=anon~8b108479&sid=googleScholar&xid=032bd71c>
- Kumar, A. (2020). Anthropocene: The recent age of man. *Earth Science India*, 13(4).
- Kwok, S. (2021). Evolution of the Earth Through the Ages. In *Our Place in the Universe-II* (pp. 223–234). Springer. doi:10.1007/978-3-030-80260-8_21
- Lee, T. (2002). Feeding and hoarding behaviour of the Eurasian red squirrel *Sciurus vulgaris* during autumn in Hokkaido, Japan. *Acta Theriologica*, 47(4), 459–470. doi:10.1007/BF03192470
- Li, W., Xiao, J. X., & Huang, J. (2021, July). Advertising and Lifestyle: A Brief History of Contemporary Chinese Advertising and Lifestyle Transition. In *International Conference on Applied Human Factors and Ergonomics* (pp. 506–513). Springer. doi:10.1007/978-3-030-80094-9_60
- Li, Y. R., Wang, Z. W., Yu, Z. R., & Corlett, R. T. (2021). Species diversity, morphometrics, and nesting biology of Chinese stingless bees (Hymenoptera, Apidae, Meliponini). *Apidologie*, 1–17. doi:10.1007/13592-021-00899-x
- Magee, A. F., & Höhna, S. (2021). Impact of K-Pg Mass Extinction Event on Crocodylomorpha Inferred from Phylogeny of Extinct and Extant Taxa. bioRxiv. doi:10.1101/2021.01.14.426715
- Marlowe, F. (2005). Hunter-gatherers and human evolution. *Evolutionary Anthropology*, 14(2), 54–67. doi:10.1002/evan.20046
- Martinsen, D. L. (1969). Energetics and activity patterns of short tailed shrews (*Blarina*) on restricted diets. *Ecology*, 50(3), 505–510. doi:10.2307/1933910
- Masoero, G. (2020). *Food hoarding of an avian predator under food limitation and climate change* (Doctoral dissertation). Universidad de Turku, Turku, Finland.
- Matsuo, S. (1978). The oxidation state of the primordial atmosphere. *Origin of Life*, 21–27.
- Mavroidis, P. C. (2021). Trade integration in turbulent times. *The Kansas Journal of Law & Public Policy*, 30(3).
- McMenamin, M. A. (2020). Bradoriids (Arthropoda) and the Cambrian diversification. *Geosciences*, 10(4), 119. doi:10.3390/geosciences10040119
- Mieth, A., & Bork, H. R. (2003). Diminution and degradation of environmental resources by prehistoric land use on Poike Peninsula, Easter Island (Rapa Nui). *Rapa Nui Journal: Journal of the Easter Island Foundation*, 17(1), 34–41.
- Mohanty, T. R. (2021). Man-Forest Interaction in a Metropolis: Perspectives from Hermeneutics. *Environment, Development and Sustainability in India: Perspectives, Issues and Alternatives*, 89.

- Morrison, S. M., & Hazen, R. M. (2020). An evolutionary system of mineralogy. Part II: Interstellar and solar nebula primary condensation mineralogy (> 4.565 Ga). *American Mineralogist: Journal of Earth and Planetary Materials*, 105(10), 1508–1535. PMID:33958805
- Nagai, K. (2020). Kangaroo Notebook: Abe's Metatherian Journey. In *Imperial Beast Fables* (pp. 121-153). Palgrave Macmillan.
- Netchitailo, V. S. (2021). From the Beginning of the World to the Beginning of Life on Earth. *Journal of High Energy Physics, Gravitation, and Cosmology*, 7(4), 1503–1523. doi:10.4236/jhepgc.2021.74092
- Neubauer, D. (2008). The historical transformation of public good. *Journal of Asian Public Policy*, 1(2), 127–138. doi:10.1080/17516230802094528
- Norton, M. G. (2021). Flint—The Material of Evolution. In *Ten Materials That Shaped Our World* (pp. 7–23). Springer. doi:10.1007/978-3-030-75213-2_2
- O'Keefe, N., Zhang, Z., Augustin, M., & Payne, J. (2011, December). Body size evolution in the Phylum Brachiopoda throughout the Phanerozoic Eon. In *AGU Fall Meeting Abstracts* (Vol. 2011, pp. ED41A-0494). Academic Press.
- Ou, Q., Vannier, J., Yang, X., Chen, A., Mai, H., Shu, D., Han, J., Fu, D., Wang, R., & Mayer, G. (2020). Evolutionary trade-off in reproduction of Cambrian arthropods. *Science Advances*, 6(18), eaaz3376. doi:10.1126ciadv.aaz3376 PMID:32426476
- Panizzut, N., Rafi-ul-Shan, P. M., Amar, H., Sher, F., Mazhar, M. U., & Klemeš, J. J. (2021). Exploring relationship between environmentalism and consumerism in a market economy society: A structured systematic literature review. *Cleaner Engineering and Technology*, 100047.
- Petit, V. (2021). *The Age of Fire Is Over: A New Approach to the Energy Transition*. Academic Press.
- Praskievicz, S. (2021). How the environment became global. *Anthropocene*, 35, 100305. doi:10.1016/j.ancene.2021.100305
- Prothero, D. (2018). The Iridium Layer. The Death of the Dinosaurs. In *The Story of the Earth in 25 Rocks: Tales of Important Geological Puzzles and the People Who Solved Them* (pp. 216–228). Columbia University Press. doi:10.7312/prot18260-022
- Richards, J., & Van Buren, M. (2000). *Order, legitimacy, and wealth in ancient states*. Cambridge University Press.
- Rougier, G. W., Martinelli, A. G., & Forasiepi, A. M. (2021). The Fossil Record of South American Mesozoic Mammals and Their Close Relatives. In *Mesozoic Mammals from South America and Their Forerunners* (pp. 25–126). Springer. doi:10.1007/978-3-030-63862-7_2
- Roy, T. (2020). *The Economic History of India, 1857–2010*. Oxford University Press. doi:10.1093/oso/9780190128296.001.0001
- Rupke, N. A. (2009). *Richard Owen: Biology without Darwin*. University of Chicago Press. doi:10.7208/chicago/9780226731780.001.0001

Sustainability and Consumerism

- Rusu, R. C. V., Neculiță, M., Cristea, D., Mogodan, A., Petrea, Ș., & Simionov, I. (2020). Sustainable development of rural areas of South-East Region of Romania. *Sustainable Development*, 20(2).
- Rychlik, L., & Jancewicz, E. (2002). Prey size, prey nutrition, and food handling by shrews of different body sizes. *Behavioral Ecology*, 13(2), 216–223. doi:10.1093/beheco/13.2.216
- Sánchez-Baracaldo, P., Bianchini, G., Wilson, J. D., & Knoll, A. H. (2021). Cyanobacteria and biogeochemical cycles through Earth history. *Trends in Microbiology*. Advance online publication. doi:10.1016/j.tim.2021.05.008 PMID:34229911
- Sánchez-Baracaldo, P., & Cardona, T. (2019). On the origin of oxygenic photosynthesis and Cyanobacteria. *The New Phytologist*, 225(4), 1440–1446. doi:10.1111/nph.16249 PMID:31598981
- Scarre, C., Fagan, B. M., & Golden, C. (2021). *Ancient civilizations*. Routledge. doi:10.4324/9780429401008
- Schmidly, D. J., & Bradley, R. D. (2021). Order Soricomorpha—Shrews and Moles. In *The Mammals of Texas* (pp. 93–109). University of Texas Press.
- Siddiqui, K. (2020). The Study of Economic History and the Importance of Understanding the Past. *WORLD (Oakland, Calif.)*.
- Spencer, J. (2021). The Sustainable Development Goals. In *Design for Global Challenges and Goals* (pp. 12–25). Routledge. doi:10.4324/9781003099680-3
- Swain, M. R., Estrela, R., Roudier, G. M., Sotin, C., Rimmer, P. B., Valio, A., West, R., Pearson, K., Huber-Feely, N., & Zellem, R. T. (2021). Detection of an Atmosphere on a Rocky Exoplanet. *The Astronomical Journal*, 161(5), 213. doi:10.3847/1538-3881/abe879
- Tragust, S., Herrmann, C., Häfner, J., Braasch, R., Tilgen, C., Hoock, M., Milidakis, M. A., Gross, R., & Feldhaar, H. (2020). Formicine ants swallow their highly acidic poison for gut microbial selection and control. *eLife*, 9, e60287. doi:10.7554/eLife.60287 PMID:33138912
- UNEP. (2018). *Our planet is drowning in plastic pollution—it's time for change!* Retrieved 18 September 2021, from <https://www.unep.org/interactive/beat-plastic-pollution/>
- UNIDO Green Industry - Policies for supporting Green Industry. (2011). Retrieved 16 September 2021, from https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Policies%20for%20supporting%20green%20industry_UNIDO.pdf
- Weiss, B. P., Bai, X. N., & Fu, R. R. (2021). History of the solar nebula from meteorite paleomagnetism. *Science Advances*, 7(1), eaba5967. doi:10.1126/sciadv.aba5967 PMID:33523830
- William, H., Jr. K. (2017). *Moles*. Retrieved 22 September 2021, from https://sfyl.ifas.ufl.edu/media/sfylifasufledu/sfyl-assets/lawn-amp-garden/pdfs/Moles-Revision_May-2017.pdf
- Yavuz, R. A. (2021). From GATT to WTO, Where to Now? The World Economic Order in the Midst of the Trade Wars. *The Trade Wars of the USA, China, and the EU: The Global Economy in the Age of Populism*, 27.

Yong, A. Y., & Lim, S. S. (2021). Plasticity of foraging strategies adopted by the painted ghost crab, *Ocypode gaudichaudii*, in response to in situ food resource manipulation experiments. *Zoological Studies (Taipei, Taiwan)*, 60.

Zhang, Z., & Payne, J. (2012). *Modes of Brachiopod Body Size Evolution throughout the Phanerozoic Eon*. NASA/ADS. Retrieved 17 September 2021, from <https://ui.adsabs.harvard.edu/abs/2012AGUFM.B11A0409Z/abstract>

Zhongming, Z., Linong, L., Wangqiang, Z., & Wei, L. (2020). *Asteroid impact killed dinosaurs while volcanism shaped life in the aftermath*. Academic Press.

Chapter 11

Recycling Behaviour of Urban Households in the Vietnamese Mekong Delta

Huynh Thi Dan Xuan

Can Tho University, Vietnam

Tien Dung Khong

Can Tho University, Vietnam

Huynh Viet Khai

Can Tho University, Vietnam

ABSTRACT

This chapter is aimed at providing new insights into the perception and determinants of municipal solid waste behaviour. A quantitative data set was obtained and analyzed by directly interviewing 579 urban households in the Vietnamese Mekong Delta stratified by urban-type level. Binary Probit model and OLS regression indicate the significant influences of urbanization level, organization membership, the concern to environmental status, and education level of households. Finally, results reveal that the municipal solid waste recycling level can be significantly increased by motivating urban households' incentives; therefore, policymakers in Vietnam as well as in developing countries should also provide more incentive to households by subsidizing the recycled materials (i.e., paper and unusable metal) and well-managed informal recycling systems including itinerant waste buyers.

INTRODUCTION

Local governments in Vietnam and many other developing countries are responsible for the generation and recycling of municipal solid waste (MSW), as well as the implementation of management laws (Schubeler et al., 1996). MSW recycling, however, is a complex undertaking that demands institutional capabilities as well as engagement and collaboration from a diverse spectrum of business and public

DOI: 10.4018/978-1-7998-9664-7.ch011

sector stakeholders. Despite the fact that improper MSW management is harmful to public health and the environment, it is currently inadequately managed in most developing-country cities due to a lack of government resources, financial investment, and inadequate technology and motivation. Furthermore, as a result of population growth and consumer demand, local governments are facing a huge challenge, notably in terms of waste management, with negative effects on the environment today and in the future.

The majority of previous research has been on policies in place to manage MSW generation and recycling. Institutional and control structures, for example, set MSW regulations and have punishments in place to deal with infractions (Slack et al., 2009). Several institutional measures, on the other hand, have been implemented but have not resulted in higher compliance or improved environmental quality (Stafford, 2002). Because they generate incentives for people, market-based techniques are more successful than institutional alternatives (Driesen, 2006). Sales taxes, the “pay as you throw” policy and fees based on the volume of MSW disposed of are all negative incentives; positive incentives include subsidies or tax reductions for people and organizations whose activities reduce waste generation (Gellynck and Verhelst, 2007). Many countries have implemented policies that combine positive and negative incentives, such as deposit return systems (DRS) (Wagner and Arnold 2008; Mckerlie et al., 2006) and voluntary suggestions (for example, voluntary participation in recycling) (Werner et al., 1995; Palatnik et al., 2005). According to Zhuang et al. (2008), MSW segregation at the source is a good way to cut down on rubbish. The classification of MSW has been established as part of the waste management systems in Germany, the United States, and Japan. Japan’s overall amount of MSW decreased by 69 percent when it installed a waste separation system (Japan’s Ministry of Environment, 2014).

Despite the fact that different MSW management strategies have been enacted, the effectiveness of these regulations varies per country. A “pay as you throw” strategy, for example, in some underdeveloped nations may fail due to an inability to estimate the amount of MSW generated by families (Longe and Ukpebor, 2009). As a result, policies, and activities focused on lowering household MSW should be customized to the demands of specific countries. At-source MSW (reusing and recycling a major fraction of rubbish), according to the research, has reduced the amount of MSW discharged into the environment. Although MSW at-source classification in Vietnam in general, and the VMD in particular, has not been widely implemented and must still be based on several rules, several households have classified MSW in their way by recycling and selling scrap from the garbage, creating a favorable environment for recycling activities and reducing MSW in Vietnam. However, particularly in poor countries like Vietnam, there is a scarcity of research on recycling behavior and the factors that drive it. As a result, our research addressed the problem and offered suggestions to help local governments better manage rubbish and increase recycling. Furthermore, residences with MSW source separation are projected to increase the effectiveness of the program.

STATE OF THE ART

Because the existing landfills are all congested, recycling is a crucial method to minimize the growing volume of garbage. In Vietnam, there are around 660 landfills that receive 20,200 tons per day. However, only 30% of them are classified as sanitary landfills (World Bank, 2018). The recycling goal is outlined in Management Strategy Decision 2149/2009/QD-TTg, issued on December 7th, 2009. The Prime Minister of Vietnam issued Decision 491/QD-TTg on May 7th, 2018, requiring all cities categorized in a specified level and urban-level 1 cities to have recycling facilities adequate for household categoriza-

tion. The said Decision also mentioned that the remaining 85% of cities offer recycling centers to sort recyclables at home. Moreover, 90% of total daily-life generated in urban areas is collected and treated to meet environmental protection requirements; increase the ability to recycle, reuse, treat with energy recovery, or produce organic fertilizers; and reduce the proportion of MSW treated by direct burial to less than 30% of the collected waste. However, only around 10% of MSW is recycled, and only about 4% of MSW is composted, with the informal sector handling this portion through itinerant junk buyers. As a result, meeting the government's target is challenging.

This research is based on Fishbein and Ajzen's famous theory of reasoned action (TRA) (1975), which proposes an intention-behaviour link, referred to as the "intent-action gap." TRA assumes that people's actions are dictated by their desire to carry out the behaviour, which is impacted by their attitude toward the act and subjective standards. Because the contrast between action intention and behaviour should be stressed, the Fishbein–Ajzen model argues that the intention-behaviour link is critical when addressing environmental action. As a result, environmental policymakers will always have to ensure that people do what they say. Previous research has employed one of the two rational choice theories including the Theory of Planned Behavior (TPB) (Ajzen, 1991) and the Theory of Reasoned Action (TRA) (Fishbein, 1979). Knowledge, attitudes, subjective standards, and perceived behavioral control all have a role in recycling behavior, according to these studies. Among them, the importance of attitude to recycling behaviour such as attitude to important of recycling, subjective norms and warm glow were emphasised (Nguyen & Lobo, 2017)

Environmental values, situational characteristics, and psychological factors are the three primary groupings of elements identified by Barr (2017) as influencing the decision to engage in trash environmental behaviour. Environmental values are a person's perception of the environment; they constitute a fundamental perspective of the natural world, and environmentalists are more environmentally conscious. The second factor is situational features, which indicate a person's current circumstances and are crucial in determining their environmental activities. Furthermore, access to appropriate services (Ball and Lawson, 1990; Derksen and Gartell, 1993; Guagnano et al., 1994) or demographic parameters such as age, gender, education, and income are examples of situational characteristics (Hines et al., 1987; and Schultz et al., 1995).

Finally, while contemplating environmental action, psychological considerations are also taken into account. This broad term refers to an individual's personality and perceptual qualities as they relate to their behavior. Intrinsic incentives to engage (such as behavioural gratification; De Young, 1986) and environmental dangers are examples of this element (threat to welfare from environmental problems, Baldassare & Katz, 1992). Contextual factors, personal capacities, attitudinal factors, and habitual factors, according to Söderholm et al. (2010), are four kinds of elements that influence environmental behaviour. Technical-organizational circumstances (external factors), socio-demographic (e.g., age, gender, income), and socio-psychological variables are among the three kinds of factors identified by Miafodzyeva & Brandt (2013). (e.g., attitude, motivation).

When looking at the socio-economic determinants of households' behavior for recycling activities, several studies have been carried out in developing countries have shown that willingness to pay, age, income, household size, occupation, and education level affect willingness to pay for solid waste management services (Alta & Deshazo, 1996; Niringiye & Omotor, 2010; Niringiye (2010); Rahji & Oloruntoba, 2009; Yusuf et al., 2007). For example, Rahji and Oloruntoba (2009) applied the Contingent Valuation Method (CVM) to predict the determinants of households' willingness to pay for solid waste management services in Ibadan, Nigeria. Research indicates that several factors such as income, assets

owned, occupation, and payment amount affect willingness to pay. Research by Alta and Deshaz (1996) applied CVM to identify the needs of households for improved solid waste management in Gujarwala, Pakistan. In addition, household size and age affect willingness to pay. Similarly, in the study by Niringiye and Omortor (2010) on the determinants of willingness to pay for solid waste management in Uganda, using CVM, the results indicate that age affects the extent willing to pay. Yusuf et al. (2007) also used CVM to estimate the economic value of improved household waste management in Oyo State, Nigeria having determined the cost of waste management services, age, education level, income, and household size affect willingness to pay.

In summary, past research has identified some characteristics that influence recycling behavior, including convenience, knowledge, moral standards, and environmental concern (Becker, 2014), and socioeconomic characteristics in recycling activity engagement level.

Therefore, this study is expected to contribute to the existing literature on the application of TRA in collecting information on the perception of households for MSW management services. In addition, the determined recycling rate, recycling quantity, and recycling decision. The most interesting point is that this research included and compared the determinants from three regression models while previous research has not mentioned or analyzed them without the comparison.

DATA COLLECTION AND RESEARCH METHODOLOGY

The research utilized a direct interview with householders in different Vietnamese Mekong Delta (VMD) cities on their plans to recycle or classify MSW at the source. Can Tho, Long Xuyen, Vi Thanh, and Vinh Long were studied using a stratified random sample approach. The demographic characteristics of the respondents, information regarding the respondents' recycling behaviour and goals, and the respondents' understanding of the MSW sorting program at the source were all included in the questionnaire's content.

According to Becker (2014), household recycling behaviour is frequently included in models by either the recycling rate variable (Miafodzyeva et al., 2013; Hage & Söderholm, 2008) or the decision to engage in recycling behaviour (Miafodzyeva et al., 2013; Hage & Söderholm, 2008) or the decision to engage in recycling behaviour (Miafodzyeva et al., 2013; Hage (De Feo and De Gisi, 2010). As a result, two variables were chosen as dependent variables in this study: *recycl_rate* and *recycl_decision*, representing recycling rate and recycling decision, respectively. In addition, *recycl_qty*, or the amount of recycled, was used to provide a broader picture of home recycling activities. To our best knowledge, this variable has rarely been employed in previous research because of lacking recycling data, then it is expected to contribute to the emerging literature on this topic. Thus, two OLS models and Probit regression were used to investigate the determinants influencing home recycling behaviour. All three models were analysed and combined as a foundation for comparison and to provide more relevant and feasible policy responses in this study. First, a linear regression model is used to analyze the factors affecting the recycling amount of *Recycl_qty* household as following:

$$\begin{aligned} \text{Recycl_qty} = & z_0 + z_1 \text{Dothi2} + z_2 \text{Urban_level3} + z_3 \text{Assoc_Ps} \\ & + z_4 \text{Envi_care} + z_5 \text{Age} + z_6 \text{Male} + z_7 \text{Education} + z_8 \text{Income} + u_1 \end{aligned} \quad (1)$$

Regression model analyzing factors affecting household recycling rate as below:

Recycling Behaviour of Urban Households in the Vietnamese Mekong Delta

$$\begin{aligned} \text{Recycl_rate} = & \alpha_0 + \alpha_1 \text{Urban_level2} + \alpha_2 \text{Urban_level3} + \alpha_3 \text{Assoc_Ps} \\ & + \alpha_4 \text{Envi_care} + \alpha_5 \text{Age} + \alpha_6 \text{Male} + \alpha_7 \text{Education} + \alpha_8 \text{Income} + u_2 \end{aligned} \quad (2)$$

And then Probit regression model analyses the factors affecting the decision to implement recycling behaviour of households as follows:

$$\Pr(\text{Recycl_decision} = 1) = F(x_i' \beta) = \int_{-\infty}^{x_i'} \frac{1}{\sqrt{2\pi}} e^{-x_i' \beta / 2} dx \quad (3)$$

Where the dependent variable Recycl_qty is the amount of scrap that households collect (grams/day), Recycl_rate is the household's recycling rate calculated by the amount of recycling of the household. Household (grams/day/household) divided by the household's amount of MSW (grams/day/household) and Recycl_decision is a dummy variable that takes two values, Recycl_decision = 1, the household does recycling, and otherwise.

The independent variables included in the model are urban_level2, urban_level3, assoc_Ps, Envi_care, age, male, education, and income. Variables urban_level2 and urban_level3 are variables representing convenience factors. An MSW management system (Miafodzyeva & Brandt, 2013) or a manifestation of improved garbage collection capacities can provide convenience (Becker, 2014). The infrastructure in Vietnam's grade 1 cities makes MSW collection easier. The MSW management system's collecting capacity is also higher in grade 1 cities than in the rest of the cities (Ministry of Natural Resources and Environment, 2020). Therefore, the urban-level element was used to represent the convenience element. In addition, the urban-level criteria were also used to describe the information element together with the variable Assoc_Ps. Social organizations and associations in Vietnam play an essential role in propagating and disseminating government programs. The Ministry of Natural Resources and Environment (2020) indicates that organizations are vital to providing information to households. Envi_care is a variable representing environmental concern, a dummy variable with two values, Envi_care = 1, if the household belongs to the group that recycles for environmental protection, and Envi_care = 0, if the household is not in the recycling group. Age, sex, education, and income are respondent's age (year), respondent's gender, respondent's years in school, and respondent's income per month.

RESULTS AND DISCUSSION

Descriptive Statistics of Rural Households in Survey Areas

The program to improve management service quality was founded on the recycling principle, one of the most important ideas used to improve management quality in developed and developing nations. In order to recycle successfully, households should segregate rubbish at the source. According to the survey, around 82 percent of homes have MSW ranging from 2.5 kg per day to 1.83 kg per day on average and 0.49 kg per person per day. The city sanitation company collects this amount regularly, once a day, except in congested areas; the collection period is every two days, three days, or four days.

Recycling Behaviour of Urban Households in the Vietnamese Mekong Delta

Table 1. Factors influencing households' recycling practices

	Reasons	Most Important	Second Important	Third Important
Households carrying recycling activities	It does not take too much time	101 (23.33%)	80 (18.56%)	101 (23.60%)
	It doesn't occupy much space	58 (13.39%)	79 (18.32%)	74 (17.29%)
	It provides additional income	121 (27.94%)	85 (19.72%)	94 (21.96%)
	It helps improve environment quality	84 (19.40%)	112 (25.99%)	70 (16.36%)
	It does not affect health	66 (15.24%)	75 (17.40%)	86 (20.09%)
Households not carrying recycling activities	It takes time to collect	33 (24.26%)	17 (12.59%)	32 (23.88%)
	It takes up storage space	26 (19.12%)	35 (25.93%)	30 (22.39%)
	I do not have storage containers	11 (8.09%)	31 (22.96%)	23 (17.16%)
	I think money from scrap selling is not much	51 (37.50%)	31 (22.96%)	27 (20.15%)
	I don't think scrap can be sold	1 (0.47%)	6 (4.44%)	7 (5.22%)
	It affects my health when recycling	3 (2.21%)	14 (10.37%)	10 (11.19%)

Source: Surveyed data, 2020

The collecting duration varies depending on the ease with which the areas can be circulated. Usually, the region with the more frequent collection period is on the main road and vice versa. The collection period is less frequent in alleys away from the main road, and there are times when there is no collection service. Even though MSW management services are supplied to 98.5% of households, 1.5% do not get involved in this service.

Perception of Recycling Activities among Households

Although local authorities in the VMD have not adopted a program of source classification, the study found that 64.71% undertake self-classification before local authorities collect the garbage. The majority of individuals do MSW separation at the source to sift and collect recyclable MSW components for the sale of household scrap. Recycling is done by 76.26% of households by collecting scrap to be sold to scrap collectors or scrap yards. Recycling is an excellent way to decrease the quantity of waste discharged into the environment, decreasing the negative impacts on human health. However, aside from those who recycle, 23.74 percent of the households have yet to conduct recycling operations. Table 1 shows the reasons why households were recycling or not recycling.

According to Table 1, 76.26% of the households are driven to recycle because it generates additional income, which respondents rank as the most significant reason for recycling, which includes classification, collection, storage, and scrap selling. Furthermore, separating and storing recyclable components

Recycling Behaviour of Urban Households in the Vietnamese Mekong Delta

Table 2. Scrap materials types and proportion from recycling activities

Type of scrap	Number of obs.	Unit	Mean
Scrap sale period	578	Day/time	28.08
Amount of scrap metal	578	Gram/day	6.84
Amount of scrap glass	578	Gram/day	2.59
Amount of scrap plastic	578	Gram/day	18.12
Amount of scrap fabric	578	Gram/day	0.11
The amount of scrap paper	578	Gram/day	14.37
Total amount of scrap	578	Gram/day	42.06
Recycle ratio ¹	578	%	2.91
Potential recycling rate ²	417	%	22.99

Source: Surveyed data, 2020

Note: ¹Calculated by [total waste (grams/day)/generated (grams/day)*100] and ²Estimated by households

from MSW is a short process. The respondents claim that if they can organize the garbage, the amount of scrap held does not take up much storage space. At the same time, if the scrap is cleaned before being kept, it does not pollute the environment. Furthermore, some responders engage in scrap collection because it helps to protect the environment.

Contrary to the views of those who currently recycle, 23.74% of non-recycling households say that, while collecting and sorting MSW takes much time and is carried in a larger residential area, the money earned from scrap sales is not significant. These considerations may be utilized to develop solutions to increase household recycling activities, thereby improving the quality of the VMD's recycling-oriented bio-waste management system. Table 2 shows the percentage of households that recovered materials through recycling activities.

According to Table 2, the average family sells junk once a month. Scrap is traded in a wide variety of forms. Because scrap is made up of components recovered from MSW, the amount collected and exchanged fluctuates depending on the scrap that makes up more or less of the MSW. Plastic and paper, for example, account for a bigger proportion of garbage than other components and are frequently generated in the household; therefore, the amount of trash in plastic and paper is larger than that of the other groups, scrap metal, glass, and fabric.

This data is consistent with the World Bank's (2018) survey, which shows that the proportion of plastic components ranges from 3.4% to 10.6%, while the ratio of plastic components ranges from 3.4% to 10.6%, metal parts range from 1.4% to 4.9%, and glass composition ranges from 0.5% to 2.0%.

Interestingly, the study's estimated recycling rate is 2.9%, whereas the estimated potential recycling rate for households is 22.99%. In other words, families are aware that MSW may be recycled in greater quantities than their existing recycling activities. This result and the reasons listed in Table 1 serve as a basis for proposing methods to increase MSW recycling rates in households, in accordance with the goals of the central government's national policy for increasing recycling rates. If adopted, the suggested policy based on this research will significantly influence reducing present VMD environmental pollution.

Table 3. Regression results of the determinants of households' recycling behavior

Variables	Model 1 (OLS)	Model 2 (OLS)	Model 3 (Probit)
urban_level2	-3.655*** (0.962)	-78.807*** (14.813)	0.225 ^{ns} (0.195)
urban_level3	-2.491*** (0.847)	-72.889*** (13.157)	0.177 ^{ns} (0.172)
Assoc_Ps	0.418 ^{ns} (0.752)	13.220 ^{ns} (11.682)	0.403*** (0.159)
Envi_care	2,395*** (0.703)	24.193*** (10.913)	2.625*** (0.365)
Age	-0.018 ^{ns} (0.029)	-0.397 ^{ns} (0.448)	-0.003 ^{ns} (0.006)
Male	-0.101 ^{ns} (0.754)	8.669 ^{ns} (11.721)	-0.075 ^{ns} (0.156)
Education	-0.297*** (0.091)	-6.376 ^{ns} (5.692)	-0.040** (0.018)
Income	-0.040 ^{ns} (0.099)	0.776 ^{ns} (1.538)	0.007 ^{ns} (0.020)
Constant	7.401*** (1.974)	107.092*** (30.970)	0.362*** (0.408)
Dependent variable	Recycl_rate (%) Number of obs = 569 Prob>F = 0.0001 R-squared = 0.0534	Recycl_qty (gram/day) Number of obs = 566 Prob>F = 0.0000 R-squared = 0.0764	Recycl_decision Number of obs = 569 Log likelihood = -211,09955 LR chi2(8) = 201.31 Prob>chi2 = 0.0000 Pseudo R2 = 0.3229

Source: Surveyed data, 2020

Note: *, **, and *** are statistically significant at 10%, 5%, and 1%, respectively, and ^{ns} are not statistically significant; The number in parenthesis is the standard error

The Determinant of Recycling Behaviour of Households in the Vietnamese Mekong Delta

Factors that were influencing recycling behaviour are presented in Table 3. The estimation of models 1, 2, and 3 with Prob>chi2 = 0.000 less than 1% indicates that these modes are statistically significant and independent variables explain the dependent variable well.

The investigation results show that respondents who identify as environmentally conscious recycle more, have a higher recycling rate, and are more likely to engage in recycling behaviour. This result contradicts the claim of Miafodzyeva et al. (2013), who found that environmental concerns have little influence on recycling decisions. Instead, environmental concern is a crucial aspect in defining households' efforts in MSW recycling programs according to Becker (2014) and the theory of this study. Moreover, households in urban-type 2 and 3 cities recycle less MSW and recycle at a lower rate than households in urban-type 1 cities. Using urban-type criteria as a measure of convenience, infrastructure in level 1 cities is often more convenient than in other urban areas. As a result, families in urban-type 1 locations recycle at a faster rate and in greater quantities. However, because the variable in Model 3 is not statistically significant, there is insufficient evidence to conclude that urbanization influences the likelihood of engaging in recycling activities.

Recycling Behaviour of Urban Households in the Vietnamese Mekong Delta

Furthermore, just one element connected to the respondent's demographic characteristics, education level, impacts the volume, rate, and likelihood of recycling activity. The coefficients of this variable are negative, indicating that respondents with lesser education had a larger volume of MSW recycling and a higher chance of recycling. Table 1 shows that respondents cited "not requiring much time" and "additional income" as reasons for recycling. Those with a higher education who can make a larger salary spend their time working to generate money rather than recycle with a small amount of money compared to their income. In this study, the information component is the union membership. Respondents who join the union have a higher likelihood of recycling. As a result, the association factor should be considered in recycling programs (Ministry of Natural Resources and Environment, 2020). As a result, mass communication and organization have a significant impact on SWM recycling behaviour in households. Therefore, any form of implementation of direct media, i.e. television, radio, propaganda, and participation in the local association, increases recycling behaviour.

CONCLUSION AND RECOMMENDATIONS

The objectives of this paper was to understand more about households' recycling behaviors in VMD Vietnam regions, as well as the variables that impact their recycling behaviors. The study uses the idea of recycling behavior to create regression models with three dependent variables: recycling rate, and recycling decision. In addition, the amount of recycling is used, which is different from previous research. According to the results, more than 75% of respondent households engage in recycling activities.

It is important to note that, although households estimated a possible recycling rate of more than 22%, the quantity of recycling measured from this study is only approximately 3%. The disparity between actual and prospective recycling quantities shows that authorities should increase incentives and propaganda to encourage recycling, especially in developing countries like Vietnam. As a result, the government's implementation of policies to improve recycling incentives will have a significant impact on increasing recycling activities and, as a result, reducing pollution. The results of OLS and Probit model analysis are similar in certain ways.

Environmental concerns, degree of urbanization, education level, and participation in an organization are all factors that influence the recycling rate, quantity, and behaviour of responders. Joining the union and having a favourable attitude about environmental preservation increases recycling rates, quantity, and the likelihood of recycling. As a result, the Vietnamese government may strengthen MSW classification at the source through various forms of propaganda, such as mass media, leaflets, associations, and propaganda by sanitation workers collecting MSW locally to understand how to implement and realize the rewards of this program. In addition, the government can strengthen the implementation of projects supporting recycling by subsidizing the agencies involved in recycling collection, from increased prices for recycled materials, encourage low-income and low-educated people to recycle more. This is proved by the results from the analysis of the reasons for selling scrap. The results show that economic reasons or other income generation are the primary motivation for people to collect, sort, and sell scrap (i.e. when there is a government subsidy policy on scrap such as plastic bags, then if the price of the scrap is higher, the household may sell more). Thus, the policymakers may formulate guidelines to motivate people to recycle besides investing in modern technology and related recycling activities. Financial assistance to local informal scrap collectors, such as itinerant garbage purchasers and back-bottle (a Vietnamese term for garbage company), to help them stabilize their livelihoods, sustain and develop their operations, and

boost recycling efficiency through scrap sales. The study researchers are undertaking another analysis that will look into the scrap collectors' role and livelihood to make policy recommendations for this sector.

ACKNOWLEDGMENT

This study is funded in part by the Can Tho University Improvement Project VN14-P6, supported by a Japanese ODA loan. This chapter is based on an article originally published in the *ACADEMICIA: An International Multidisciplinary Research Journal* (ISSN: 2249-7137) in 2021. This material is reprinted with the permission of *ACADEMICIA: An International Multidisciplinary Research Journal*.

REFERENCES

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. doi:10.1016/0749-5978(91)90020-T
- Altaf, M. A., & Deshazo, J. R. (1996). Household demand for improved solid waste management: A case study of Gujranwala, Pakistan. *World Development*, 24(5), 857–868. doi:10.1016/0305-750X(96)00006-X
- Barr, S. (2017). *Household waste in social perspective: values, attitudes, situation and behaviour*. Taylor & Francis. doi:10.4324/9781315253206
- Becker, N. (2014). *Increasing High Recycling Rates: Socio-demographics as an additional layer of information to improve waste management*. IIIIEE.
- De Feo, G., & De Gisi, S. (2010). Public opinion and awareness towards MSW and separate collection programmes: A sociological procedure for selecting areas and citizens with a low level of knowledge. *Waste Management (New York, N.Y.)*, 30(6), 958–976. doi:10.1016/j.wasman.2010.02.019 PMID:20223647
- Driesen, D. (2006). Economic instruments for sustainable development. *Environmental Law for Sustainability*, 19, 277-308.
- Fishbein, M., & Ajzen, I. (1977). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Academic Press.
- Fishbein, M. A. (1979). Theory of reasoned action: Some applications and implications. *Nebraska Symposium on Motivation*, 27, 65–116. PMID:7242751
- Gellynck, X., & Verhelst, P. (2007). Assessing instruments for mixed household solid waste collection services in the Flemish region of Belgium. *Resources, Conservation and Recycling*, 49(4), 372–387. doi:10.1016/j.resconrec.2006.05.003
- Hage, O., & Söderholm, P. (2008). An econometric analysis of regional differences in household waste collection: The case of plastic packaging waste in Sweden. *Waste Management*, 28(10), 1720-1731.

Recycling Behaviour of Urban Households in the Vietnamese Mekong Delta

- Kuo, Y. L., & Perrings, C. (2010). Wasting time? Recycling incentives in urban Taiwan and Japan. *Environmental and Resource Economics*, 47(3), 423–437. doi:10.1007/10640-010-9386-1
- Longe, E. O., & Ukpabor, E. F. (2009). Survey of household waste generation and composition in Ojo local government area, Lagos state, Nigeria. *Int. J. of Geotech. & Env*, 1(1), 41–54.
- McKerlie, K., Knight, N., & Thorpe, B. (2006). Advancing extended producer responsibility in Canada. *Journal of Cleaner Production*, 14(6-7), 616–628. doi:10.1016/j.jclepro.2005.08.001
- Medina, M. (2000). Scavenger cooperatives in Asia and Latin America. *Resources, Conservation and Recycling*, 31(1), 51–69. doi:10.1016/S0921-3449(00)00071-9
- Miafodzyeva, S., Brandt, N., & Andersson, M. (2013). Recycling behaviour of householders living in multicultural urban area: A case study of Järva, Stockholm, Sweden. *Waste Management & Research*, 31(5), 447–457. doi:10.1177/0734242X13476746 PMID:23435616
- Nguyen, H. V., & Lobo, A. (2017). Encouraging Vietnamese household recycling behavior: Insights and implications. *Sustainability*, 9(2), 179. doi:10.3390/u9020179
- Niringiye, A. (2010). Determinants of willingness to pay for solid waste management in Kampala City. *Current Research Journal of Economic Theory*, 2(3), 119–122.
- Niringiye, A., & Omortor, D. G. (2010). Determinants of willingness to pay for solid waste management in Kampala city. *Current Research Journal of Economic Theory*, 2(3), 119–122.
- Rahji, M. A. Y., & Olorunfoba, E. O. (2009). Determinants of households' willingness-to-pay for private solid waste management services in Ibadan, Nigeria. *Waste Management & Research*, 27(10), 961–965. doi:10.1177/0734242X09103824 PMID:19470546
- Schübeler, P., Christen, J., & Wehrle, K. (1996). Conceptual framework for municipal solid waste management in low-income countries (Vol. 9). St. Gallen: SKAT (Swiss Center for Development Cooperation).
- Slack, R. J., Gronow, J. R., & Voulvoulis, N. (2009). The management of household hazardous waste in the United Kingdom. *Journal of Environmental Management*, 90(1), 36–42. doi:10.1016/j.jenvman.2008.03.007 PMID:18423843
- Stafford, S. L. (2002). The effect of punishment on firm compliance with hazardous waste regulations. *Journal of Environmental Economics and Management*, 44(2), 290–308. doi:10.1006/jeem.2001.1204
- Vietnam Ministry of Natural Resources and Environment. (2020). *Report on the current state of the national environment in 2019*. Dan Tri Publishing House.
- Wagner, T., & Arnold, P. (2008). A new model for solid waste management: An analysis of the Nova Scotia MSW strategy. *Journal of Cleaner Production*, 16(4), 410–421. doi:10.1016/j.jclepro.2006.08.016
- Werner, C. M., Turner, J., Shipman, K., Twitchell, F. S., Dickson, B. R., Brusckhe, G. V., & Wolfgang, B. (1995). Commitment, behavior, and attitude change: An analysis of voluntary recycling. *Journal of Environmental Psychology*, 15(3), 197–208. doi:10.1016/0272-4944(95)90003-9

Recycling Behaviour of Urban Households in the Vietnamese Mekong Delta

World Bank. (2018). *Assess the management of domestic solid waste and hazardous industrial waste, options and actions to implement the national strategy*. Hong Duc Publishing House.

Yusuf, S. A., Ojo, O. T., & Salimonu, K. K. (2007). Households' willingness to pay for improved solid waste management in Ibadan North local government area of Oyo state, Nigeria. *Journal of Environmental Extension*, 6(1), 57–63. doi:10.4314/jext.v6i1.2766

Chapter 12

How Responsible Are Consumers?

Analysis of Food Waste Behavior of Households

Namita Kapoor

 <https://orcid.org/0000-0001-9661-1700>

Amity University, Noida, India

ABSTRACT

One of the most important concern the economies are facing is food security amidst the growing population. The population growth has exerted tremendous pressure on food security and has raised concerns over food sustainability. The sustainability of food waste is an environmental, economic, and social issue, which has useful policy implications. The issue has been studied through the analysis of responsible consumption and food waste. The literature has emphasised improving the efficiency in supply chain to reduce food waste, but researches on food waste at the consumer level are still in the natal stage. It is important to understand to develop the framework for responsible consumption and to assess the factors that may contribute to reduction in food waste at the household level. The study aims to examine the scope of responsible consumption to attain environmental sustainability.

INTRODUCTION

Food security requires that all its people have access to safe and nutritious food in sufficient amounts in line with their dietary requirements. Food waste is the global and complex issue which has impact on three pillars of sustainable development -Social, Economic and Environmental and nearly 1.3 billion tonnes of food is wasted annually which is around the third part of total food supply (Skaf et al., 2021). In India, the trend in food waste has been positive and significant in the last few decades. Food is being wasted in every stage of supply chain from first stage of agricultural producers to the last stage of retailers, restaurants, or households. The food waste also results in resource waste as the number of inputs

DOI: 10.4018/978-1-7998-9664-7.ch012

in the production of food like irrigated water, pesticides, fertilizers are also wasted, which is not just morally wrong has negative impact on the environment. Food security has direct relationship with food loss and food waste. Food loss happens in the upstream of supply chain and food waste more frequent in the downstream of supply chain especially at the consumption stage.

The issue of food security has attracted global attention and UN (United Nations) in 2015 has adopted SDG (Sustainable Development Goal) as 50% reduction in food waste at the downstream of supply chain by 2030 through initiatives focussing on research, education and other platforms and policies. The global institutions are supplying effective solutions through research and practice to reduce the food waste. The problem of food wastage is not just an issue for people in certain areas, or people of certain income levels, but a substantial problem across all income levels. With household on average creating 60 kilogrammes of waste every year. Households take the majority in producing food waste among the agents of the latter parts of the supply chain at 11 percent. With wastage of food not only being a critical problem on its own but also causing other widespread problems of damaging environment, using resources, and having the option to feed the millions of people that are famished, but since that is not happening, it brings into question, the role of responsible consumption of food to reduce food waste.

A major part of food waste includes household waste and various research have been conducted on understanding the food waste behaviour of individuals with respect to underlying factors like food preferences, social influence, and planned shopping. The study aims at understanding food waste behaviour and decide the important determinants of food waste from the country that have the learning of not wasting food, treating the produce of land as pure, divine, and believing that wasting food would bring ill luck to them. The chapter focus on consumption, putting forward the arguments that affect food waste and help in understanding the food waste behaviour in all three phases right from obtaining to the end of use, so that policy implications can be made for achieving food security.

The study, through multi criteria decision making technique R-SWARA aims to understand what variables are most important in food waste production by consumers who are the major contributors, and the solution also needs to come from them. The study also suggests strategies based on consumer behaviors and categorization to reduce food waste to promote responsible consumption and thus environmental sustainability in India.

The data was collected using depth interviews of consumers living in the National Capital Region but are natives of different regions of India, to understand decisions they make, thus internal ones, rather than external ones such as the role of marketing, availability of food delivery etc. and how those might influence their decisions.

REVIEW OF LITERATURE

Sachs (1994) emphasised that Food waste has affected all the three pillars, economic, social and environmental pillars of sustainability. For evaluation of the sustainable practices, it is important to evaluate and analyse the population's quality of life, however in literature this aspect is not being studied. There are some studies considering the impact of outside home food on economy, environment and health. (Dhir et al, 2020) prepared a systematic review of studies having direct relationship between food waste and profitability in the hospitality and service sector. But the similar kind of study to assess the behaviour and benefits for household has not been carried out. It is therefore necessary to find and assess ways to

How Responsible Are Consumers?

Table 1. Profile of respondent's family

Respondent	Gender	Age	Number of Members in the family	Native -State	Not of adult members less than 25 years	Number of Children
R1	FEMALE	49	5	Punjab	2	1
R2	FEMALE	63	4	Delhi	2	-
R3	FEMALE	75	3	West Bengal	-	-
R4	FEMALE	57	8	Bihar	3	1
R5	FEMALE	25	2	Haryana	-	-
R6	FEMALE	37	4	Rajasthan	-	2
R7	FEMALE	39	6	Gujrat	-	2
R8	FEMALE	50	5	Maharashtra	2	-
R9	MALE	65	2	Jharkhand	-	-
R10	MALE	35	3	Tamil Nādu	-	1

minimise food waste considering that the consumers are aware of the social, economic and environmental impacts of food waste.

Mozos et al. 2020) reiterates the need for a more comprehensive approach to food waste in the hotel industry and suggests that it is necessary to address the problem from a holistic perspective. Thus, food waste from the perspective of sustainable dimensions, assessing the impact of food waste in the food supply to explain the variables affected by food waste in the three dimensions of sustainability, and emphasized the importance of developing tools that make it possible to measure it and help households minimize food waste and its impact.

In addition to the economic impact of food waste, the environmental issue is usually the most discussed about sustainability. It refers to the reduction of pollutant gases, the minimization of waste and the reuse of surplus production. One of the most important methods of verifying the impact generated by the waste in this dimension is the amount wasted in volume or weight. This Waste can reduce the soil and the greenhouse effect with environmentally harmful gases due to organic waste accumulation. The accumulated environmental damage can be irreversible and harm several future generations (Mourad et al.2006, Coral et al, 2002, Padua et al. 2015)

Moreover, food wasted during production/distribution, that is, residual intake, distribution of leftovers and production remnants, there is more to consider. The excess of discarded food, often discharged to landfills, produces polluting gases and heavy metals that can remain in the environment up to 100 years after the extinction of these waste deposits. These consumed resources have an impact on the environment, with data showing that about 3.3 billion tons of carbon are emitted(Papargyropoulou et al. 2019, Araujo et al. 2014, Reynolds et al 2020) In addition to the economic impact of food waste, the environmental issue is usually the most discussed about sustainability. It refers to the reduction of pollutant gases, the minimization of waste and the reuse of surplus production. One of the most important methods of verifying the impact generated by the waste in this dimension is the amount wasted in volume or weight. This Waste can reduce the soil and the greenhouse effect with environmentally harmful gases due to organic waste accumulation. The accumulated environmental damage can be irreversible and harm several future generations (Mourad et al.2006, Coral et al, 2002, Padua et al. 2015)

Moreover, food wasted during production/distribution, that is, residual intake, distribution of leftovers and production remnants, there is more to consider. The excess of discarded food, often discharged to landfills, produces polluting gases and heavy metals that can remain in the environment up to 100 years after the extinction of these waste deposits. These consumed resources have an impact on the environment, with data showing that about 3.3 billion tons of carbon are emitted (Papargyropoulou et al 2019). Most important for waste management is the correct disposal of waste, secondly, the preference should be to donate food to hungry people, and if it is not possible, the food should be used to feed animals instead of supplying energy for industrial purposes. Composting and disposal have the least importance. Food preservation can also lead to less wastage. Environmentally, the damage is caused by the accumulation of garbage in landfills can result in the scarcity of natural resources, emphasizing water and reducing biodiversity. It is evident that consumers play a significant role in contributing to food waste therefore it is necessary to investigate and understand their behaviour and underlying dimensions. Majority of work done in the area food waste and food loss has been on the upper stream of the supply chain. The research on understanding consumer's behaviour with respect to food waste has gauged the attention in the recent past. There are number of studies carried out for understanding the food waste behaviour using the framework of the "Theory of Planned Behaviour."

The approaches used by scholars and practitioners to measure food waste has been interviews and questionnaires Survey using rating and ranking scales. ((Parizeau et al. 2015, Russel et al. 2017), and diary writing (Richeter and Boklemann 2017)

One of the crucial factors affecting the tendency of millennials is their health consciousness explaining their irresponsible behaviour. The younger generation may open the product but may not finish it and may not wish to or could not store for future consumption aggravating the food waste problem (Bravi et al. 2019) as compared to the elderly generation is more capable of handling and storing food (Quested et al. 2013). Although the younger generation is more inclined towards environmental sustainability and are more participative in activities towards waste management and reduction in food waste. Another important demographic factor is age, females are more concerned about the responsible consumption and in avoiding food waste as compared to me (Cantaragiu et al 2019) Food waste is common among all age groups however it was more prevalent among higher income groups.

One of the most crucial factors influencing food waste behaviour is the perception of individuals towards wasting food, which is the reflection of their beliefs, religion, and upbringing. (Abdelradi et al 2018) The societal norm perceived behavioural control and attitudes are the most influence on food waste behaviour. While the feeling of guilt was the reason for reducing food waste (Soorani and Ahmadvand 2019) and season, as shown by a study in South Korea, showed that seasonality was a factor in describing quantity of food waste, where it was greatest in summer and least in spring, Adelodun et al 2021. Marketing has been an import factor affecting consumer behaviour and waste behaviour as well. Promotional strategies can indulge individuals in spontaneous buying or over buying the product.

The COVID 2019 pandemic has sprung major changes to our lives, including our food behaviour. It was noticed that there were huge changes in food behaviour due to the notion of need for feeling secure and ready, thus leading to overstocking of food, which more than often went to waste (Brizi and Biraglia 2020). This situation was seen in India. Overstocking played a role during the pandemic, for a sense of stability and security during a crisis even if it was wasted or left less for other people (Cosgrove et al. 2021). This led to more waste as there was a minor change in their food basket during the pandemic, thus buying food stuff with shorter shelf life. In another study on impact of Covid-19 in Italy (Pappalardo et al 2020,) the opposite was found where the pandemic restricted the frequency and places household

How Responsible Are Consumers?

Table 2. Framework for responsible food consumption

<p>ACQUISITION</p> <ol style="list-style-type: none">1. Preparing shopping list of food products2. Check my stock before going to buy3. Avoid stocking items during extreme climates/stocking things I cannot manage <p>PREPARING/USAGE/CONSUMPTION</p> <ol style="list-style-type: none">1. Make deliberate attempts not to throw food- especially during get togethers, festivals or unplanned visitors /trips.2. Plan my meals in advance and keep to my plan3. Try to prepare in right proportion to avoid surplus. <p>DISPOSING</p> <ol style="list-style-type: none">1. Make efforts towards preparing food from leftovers.2. Store properly any left out and Giving it to someone needy and not throwing in dust bin3. Not to have unplanned last-minute decisions on food which means I throw away food
--

Source: Author

could shop thus limiting food waste, an increase in frequency in shopping was balanced with food basket to food items with longer shelf- life leading to less waste. Many respondents reported a decrease in the food waste, as again their change in food basket, of switching to food items with longer shelf life.

The literature review highlights the key factors that influence food waste behaviour, and the assessment of factors suggesting strategies /policies based on consumer behaviors and categorization to reduce food waste to promote responsible consumption and thus environmental sustainability in India.

Framework for Understanding Responsible Food Consumption

The study uses the exploratory research design for understanding the underlying dimensions of responsible food consumption. To have complete understanding about responsible consumption, it was necessary to investigate the factors mentioned in table 1, that consumers feel important in the three main stages of consumption- Acquisition, Usage and Disposal. It was believed that while purchasing food items if they resort to preparing shopping list of food products or check their stock before going to buy or avoiding stocking items during extreme climates/stocking things they cannot manage they show the responsible food consumption behaviour. Similarly if they make deliberate attempts not to throw food- especially during get togethers, festivals or unplanned visitors /trips, plan their meals in advance and keep to their plans or try to prepare in appropriate proportion, rather less to avoid surplus they show responsible consumption behaviour and finally with what -ever is not used they make efforts towards preparing food from leftovers, store properly any left out and giving it to someone needy timely and not throwing in dust bin, not to have unplanned last-minute decisions on food which means I throw away food. It is also believed that segregation of waste is also a crucial factor deciding responsible consumption. During the interview the information on number of individuals in the family, their respective age, and the method they adopt for minimising waste, the technique used for handling the surplus was also discussed.

The primary data collected through Delphi technique has been analysed to understand the food consumption decision variables and their relative importance in the decision-making process. In the consumption process knowledge of several factors and their later interactions to make valid decisions which result in meeting the desired goals. MCDM (Multi Criteria decision making Process) helps in the decision-making process considering a set of criteria and alternatives. One such approach is R SWARA (Rough Step Wise Weight Assessment Ratio Analysis) developed by Edmundas Kazimieras et al (2018). R SWARA technique is widely used for assessing the importance or criteria by using rough

numbers that tries to decrease the subjectivity in complex problems. Several studies based on MCDM techniques have used R SWARA for analysis (Vasiljevic et al.2018, Sremac et.al 2018, Stefanovic et al. 2019, Ulutas 2020). This method is less complicated and simple for capturing domain expert's information and judgement in rating the relative importance of weights.

The R SWARA approach has been used to assign weight to the selected nine activities considered important and imperative for responsible consumption. The Rough Best Worst method (BWM) is also used to verify the creditability and stability of the R SWARA approach.

This multi-criterion decision-making approach allows for better management of issues such as uncertainties and subjectivity that occurs during the process of assessing importance of factors in any process. With the help of these responses, the weightage of each criterion and the importance of it compared to other criteria's that contribute to responsible consumption can be measured. This is a much easier approach than others as it allows us to make a weightage assessment of multiple criterions through a small number of experts and a more straightforward interview.

The R SWARA approach has been used to assign weight to the selected nine activities considered important and imperative for responsible consumption.

The following steps were followed for the construction of weights using R SWARA:

1. Nine Criteria were selected that are important for responsible food consumption.
2. Ten consumers from diverse cultural background and regions were selected who were asked to assess the significance of criteria. They were asked to give ranks to the criteria as per their importance from the most to least significant.
3. The individual responses were converted first into the group rough matrix, Normalization of the matrix, decide the matrix of recalculated weights and finally the calculation of the matrix of relative weight values.

To carry this method, first, the criteria need to be arranged based on most important to least important. From the interview, all the responses were summed up for a particular criterion and this was done for all the criteria. The criteria with the lowest sum meant that it was more likely to be important, while the one with the largest sum was most likely the least important to the respondents. Thus, the criterions were given a ranking. Next the relative importance was calculated, where the comparative importance of one criterion from the previous one is measured. Next the determination of the coefficient k_j then q_j , the recalculated weight is obtained and thus, w_j , the relative weights of the criteria's importance are determined

The formulas used include:

1. Coefficient k_j ,

$$k_j = \begin{cases} 1 & j = 1 \\ s_j + 1 & j > 1 \end{cases}$$

How Responsible Are Consumers?

2. Recalculated weight, q_j ,

$$q_j = \begin{cases} 1 & j = 1 \\ \frac{k_{j-1}}{k_j} & j > 1 \end{cases}$$

3. Relative weight, w_j ,

$$w_j = \frac{q_j}{\sum_{k=1}^n q_k}$$

Finally, the Rough Best Worst method (BWM) is also used to verify the creditability and stability of results.

RESULT AND DISCUSSION

The comparison of weights through R SWARA technique (Table 3) and later sensitivity analysis through BWM (Table 4 and Figure1) reveal that the consumers believe that the most crucial factor for responsible food consumption is their shopping behaviour. They reported that they could minimise the waste if they prepared in advance the list they would like to buy and stick to the same without been affected by the marketing promotional campaigns.

DISCUSSION

Consumers are not aware that they are wasteful, they do not feel the responsibility as it is happening on daily basis in very less amount. Majority of the consumers believe that their behaviour is not harming environment as it is biodegradable. The consumers are aware of the social impact of food waste, they know that a large part of population suffers from under nourishment, but they believe that food waste is inevitable

The study highlights the responsibility of Government and institutions in raising awareness levels as people believe that food waste is not an issue as it is biodegradable. Segregation of waste, food recycled into compost should be promoted. In India segregation of food waste as- packed, fresh food, non -edible is not being done but several non -government organisations have set up channels to collect the surplus food the household has. In some regions community refrigerators have been set up for storing the edible food surplus which could be taken up by anyone who needs it. There are tentative plans in the pipeline (e.g., budget allocation for subsidized land rates for food sorting initiatives) to encourage business establishments to undertake food sorting and recycling activities. There are business opportunities in reverse logistics food sorting and recycling activities (Grandhi et al 2016).

Table 3. Weight value of criteria for responsible consumption behaviour obtained using R SWARA

C1	Preparing shopping list of food products	0.1617	0.1321
C2	Check my stock before going to buy	0.1094	0.0981
C3	Avoid stocking items during extreme climates/stocking things I cannot manage	0.1071	0.1322
C4	Make deliberate attempts not to throw food- especially during get togethers, festivals or unplanned visitors /trips.	0.1072	0.0928
C5	Plan my meals in advance and keep to my plan	0.1314	0.1244
C6	Try to prepare in proper proportion less to avoid surplus	0.1065	0.0949
C7	Make efforts towards preparing food from leftovers.	0.1109	0.08861
C8	Store properly any left out and Giving it to someone needy promptly and not throwing in dust bin	0.0776	0.0777
C9	Not to have unplanned last-minute decisions on food which means I throw away food	0.0947	0.0878

Source: Author's Calculation

The respondents agree that they throw the leftover although in not much significant amounts in the dust bin as they are health-conscious, and they generally don't want to stock up as the quantity is not sufficient for even a single person and hence the leftovers are a crucial factor in the food waste (Aleshaiwiet al 2021). Creating awareness about environmental hazards of throwing food in the bin should be taken up by government and institutions to change the social norm as leftover as unclean. The issue of space and storage, inability to store and have a check on stock, not piling up of products in fridge or cupboard, reducing the amount of shopping and most important remembering to use the product before expiry has been seen to responsible consumption. Although many respondents try to adopt to this pattern, but they are not able to follow it and they feel guilty about it. The importance of storage is being regarded as the key to responsible food consumption pattern.

Table 4. Weight value of criteria for responsible consumption behaviour obtained BWM

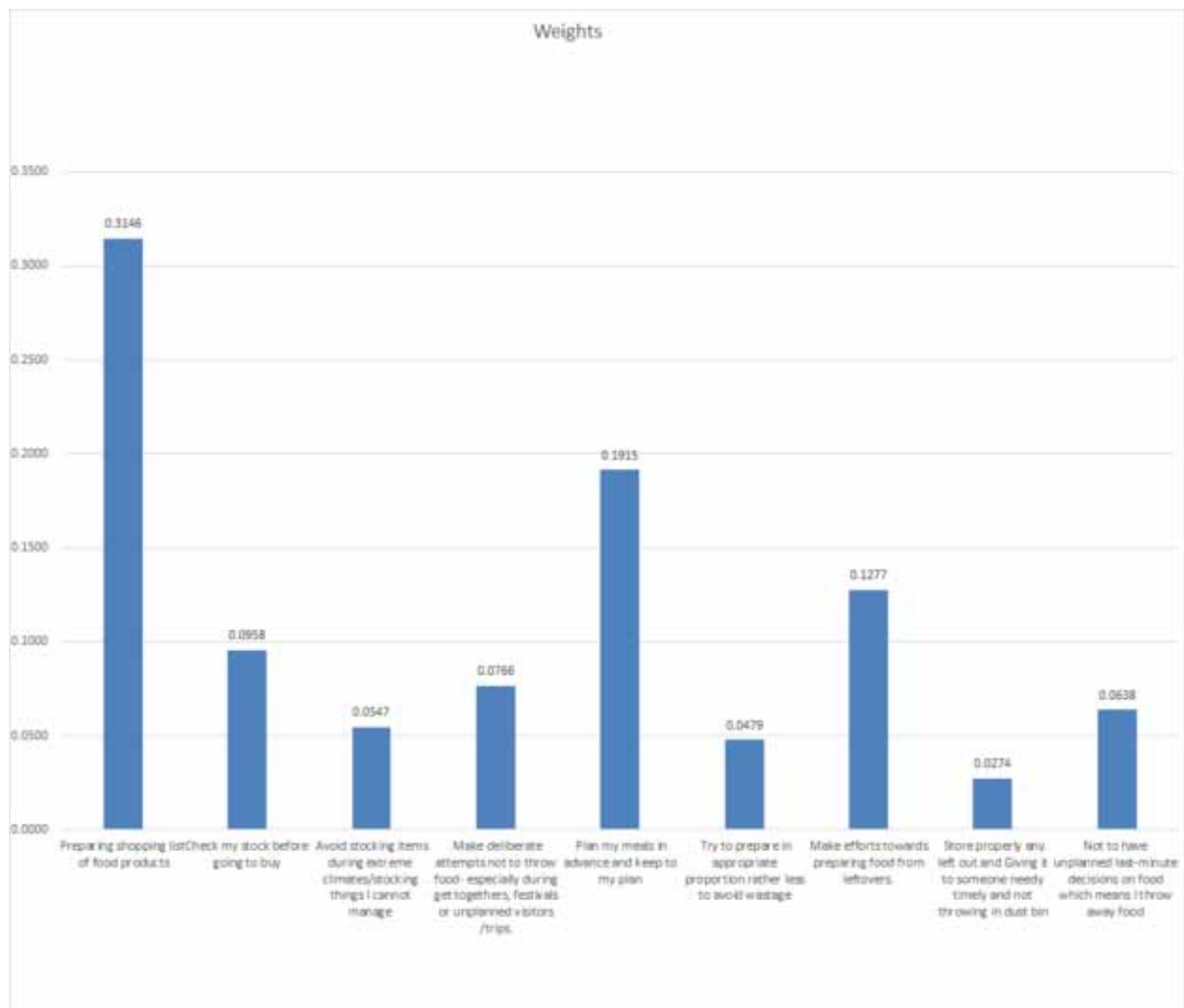
Weights	Preparing shopping list of food products	Check my stock before going to buy	Avoid stocking items during extreme climates/ stocking things I cannot manage	Make deliberate attempts not to throw food- especially during get togethers, festivals or unplanned visitors / trips.	Plan my meals in advance and keep to my plan	Try to prepare in proper proportion to avoid surplus	Make efforts towards preparing food from leftovers.	Store properly any left out and Giving it to someone needy promptly and not throwing in dust bin	Not to have unplanned last-minute decisions on food which means I throw away food
	0.3146	0.0958	0.0547	0.0766	0.1915	0.0479	0.1277	0.0274	0.0638
Ksi*	0.03839945								

Source; Authors Compilation

How Responsible Are Consumers?

The respondents had stronger intentions to reduce waste, but the situation is not same all the time and hence certain quantity of food gets wasted. The frequency and the amount depended on the family size, having children and age (Giordano, et al. 2019). Childless household had reported lesser waste although, household with smaller and older children and young adults all reported to waste certain amount of food because they have inconsistent, unpredictable diet, eating pattern and preferences (Evan, 2011, Visschers et al 2015). Households with young adults often face the problem that members change their plans regarding what to eat at a short notice as well as eating at home. The older people said that they try to recycle the leftovers and food, this may be because they have experience and more skills to use the leftovers. The most important aspect is that the intention is not to waste but the situation is as such that they end up wasting food. Health concern is a crucial factor for discarding the perishable especially fruits and vegetables leftovers. Everyone reported that ready to eat food and milk products were not wasted.

Figure 1. Weight value of criteria for responsible consumption behaviour obtained BWM



CONCLUSION

The study highlights the significant role households play managing food waste. The study tried to investigate the factors that contribute to household food waste and what measures can be adopted in reducing it because of the concerns around food security and the interlinkage between the resources and food security. The study focussed on all the aspects of food consumption pattern from purchasing, cooking till the disposal of surplus if any. The framework for responsible consumption was identified and then weightage to each factor in responsible consumption was identified. The assessment of weights through R SWARA technique indicate that the most important factor for reducing food waste and promoting responsible consumption is proper planning and routine for shopping (Emel Akta et al 2018, Visschers et al 2015), second important is prior plan for cooking and sticking to it and third important is making efforts to prepare food from leftovers. The study shows that there is significant impact of changing food habits especially of the younger population on food waste behaviour. Changing lifestyle and marketing strategies play a vital role in shaping up the consumption pattern, although the study did not aim at understanding them. Everyone seems to have intension of not wasting food, moral values attached to wasting food but the approach to deal with environmental issues is individualistic. For achieving environmental sustainability, it is important that to inform citizens especially to young and children and policy makers to adopt responsible and sustainable food consumption pattern and alert them regarding the loss of resources and the environmental hazards (Skaf et al 2021) of throwing leftovers in landfills. For changing the behaviour, recent practices and research are showing that nudging can be a suitable tool and for reducing the household waste it can also prove effective (Kallbekken et al 2013, Kameke and Fischer 2018). This would result in the spur of responsible consumption, which was always there in Indian society but was missed in between in the era of materialistic and societal change. The intension and moral values are with reducing food waste a nudge may just result in mass responsible food consumption and prepare us to achieve Sustainable Development Goals by 2030.

REFERENCES

- Abdelradi, F. (2018). Food waste behaviour at the household level: A conceptual framework. *Waste Management (New York, N.Y.)*, 71, 485–493. doi:10.1016/j.wasman.2017.10.001 PMID:29037881
- Adelodun, B., Kim, S. H., & Choi, K. S. (2021). Assessment of food waste generation and composition among Korean households using novel sampling and statistical approaches. *Waste Management (New York, N.Y.)*, 122, 71–80. doi:10.1016/j.wasman.2021.01.003 PMID:33486305
- Aktas, E., Sahin, H., Topaloglu, Z., Oledinma, A., Huda, A. K. S., Irani, Z., ... Kamrava, M. (2018). A consumer behavioural approach to food waste. *Journal of Enterprise Information Management*.
- Araújo, W. M., Montebello, N. P., Botelho, R. B. A., & Borgo, L. A. (2014). *Alquimia dos Alimentos*. SENAC.
- Bravi, L., Murmura, F., Savelli, E., & Viganò, E. (2019). Motivations and Actions to Prevent Food Waste among Young Italian Consumers. *Sustainability*, 11(4), 1110. doi:10.3390u11041110

How Responsible Are Consumers?

- Brizi, A., & Biraglia, A. (2021). “Do I have enough food?” How need for cognitive closure and gender impact stockpiling and food waste during the COVID-19 pandemic: A cross-national study in India and the United States of America. *Personality and Individual Differences, 168*, 110396. doi:10.1016/j.paid.2020.110396 PMID:32982000
- Cadario, R., & Chandon, P. (2018). Which healthy eating nudges work best? A meta-analysis of field experiments. *Appetite, 130*, 300–301. doi:10.1016/j.appet.2018.05.170
- Cantaragiu, R. (2019). The Impact of Gender on Food Waste at the Consumer Level. *Studia Universitatis, “Vasile Goldis” Arad – Economics Series, 29(4)*, 41-57.
- Coral, E. (2002). Modelo de Planejamento Estratégico Para a Sustentabilidade Empresarial. Florianópolis.
- Cosgrove, K., Vizcaino, M., & Wharton, C. (2021). COVID-19-Related Changes in Perceived Household Food Waste in the United States: A Cross-Sectional Descriptive Study. *International Journal of Environmental Research and Public Health, 18(3)*, 1104. doi:10.3390/ijerph18031104 PMID:33513709
- De los Mozos, E. A., Badurdeen, F., & Dossou, P. E. (2020). Sustainable consumption by reducing food waste: A review of the current state and directions for future research. In *Procedia Manufacturing* (Vol. 51, pp. 1791–1798). Elsevier B.V.
- Dhir, A., Talwar, S., Kaur, P., & Malibari, A. (2020). Food waste in hospitality and food services: A systematic literature review and framework development approach. *Journal of Cleaner Production, 270*, 122861.
- Grandhi, B., & Singh, J. A. (2016). What a Waste! A Study of Food Wastage Behavior in Singapore. *Journal of Food Products Marketing, 22(4)*, 471–485. doi:10.1080/10454446.2014.885863
- Kallbekken, S., & Sælen, H. (2013). “Nudging” hotel guests to reduce food waste as a win-win environmental measure. *Economics Letters, 119(3)*, 325–327. doi:10.1016/j.econlet.2013.03.019
- Keršulienė, V., Zavadskas, E. K., & Turskis, Z. (2010). Selection Of Rational Dispute Resolution Method by Applying New Step-Wise Weight Assessment Ratio Analysis (Swara). *Journal of Business Economics and Management, 11(2)*, 243–258. doi:10.3846/jbem.2010.12
- Mourad, M. (2016). Recycling, recovering and preventing “food waste”: Competing solutions for food systems sustainability in the United States and France. *Journal of Cleaner Production, 126*, 461–477.
- Pádua, S. I. D., & Jabbour, C. J. C. (2015). Promotion and evolution of sustainability performance measurement systems from a perspective of business process management: From a literature review to a pentagonal proposal. *Business Process Management Journal, 21*, 403–418.
- Pappalardo, G., Cerroni, S., Nayga, R. M., & Yang, W. (2020). Impact of Covid-19 on Household Food Waste: The Case of Italy. *Frontiers in Nutrition, 7*. doi:10.3389/fnut.2020.585090
- Parizeau, K., von Massow, M., & Martin, R. (2015). Household-level dynamics of food waste production and related beliefs, attitudes, and behaviours in Guelph, Ontario. *Waste Management (New York, N.Y.)*, 35, 207–217. doi:10.1016/j.wasman.2014.09.019 PMID:25445261

- Quested, T., Marsh, E., Stunell, D., & Parry, A. (2013). Spaghetti soup: The complex world of food waste behaviours. *Resources, Conservation and Recycling*, *79*, 43–51. doi:10.1016/j.resconrec.2013.04.011
- Reynolds, C., Soma, T., Spring, C., & Lazell, J. (2020). *Routledge Handbook of Food Waste* (1st ed., Vol. 1). Routledge.
- Richter, B., & Bokelmann, W. (2017). Explorative study about the analysis of storing, purchasing and wasting food by using household diaries. *Resources, Conservation and Recycling*, *125*, 181–187. doi:10.1016/j.resconrec.2017.06.006
- Russell, S. V., Young, C. W., Unsworth, K. L., & Robinson, C. (2017). Bringing habits and emotions into food waste behaviour. *Resources, Conservation and Recycling*, *125*, 107–114. doi:10.1016/j.resconrec.2017.06.007
- Sachs. (1994). Estratégias de transição para o século XXI—Desenvolvimento e Meio Ambiente. *Rev. Adm. Empres.*, *1*, 29–56.
- Skaf, L., Franzese, P. P., Capone, R., & Buonocore, E. (2021). Unfolding hidden environmental impacts of food waste: An assessment for fifteen countries of the world. *Journal of Cleaner Production*, *310*, 127523. doi:10.1016/j.jclepro.2021.127523
- Soorani, F., & Ahmadvand, M. (2019). Determinants of consumers' food management behavior: Applying and extending the theory of planned behavior. *Waste Management (New York, N.Y.)*, *98*, 151–159. doi:10.1016/j.wasman.2019.08.025 PMID:31446255
- Sremac, S., Stević, Ž., Pamučar, D., Arsić, M., & Matić, B. (2018). Evaluation of a third-party logistics (3PL) provider using a rough SWARA–WASPAS model based on a new rough dombi aggregator. *Symmetry*, *10*(8), 305. doi:10.3390ym10080305
- Vesković, S., Stević, Ž., Stojić, G., Vasiljević, M., & Milinković, S. (2018). Evaluation of the railway management model by using a new integrated model DELPHI-SWARA-MABAC. *Decision Making: Applications in Management and Engineering*, *1*(2), 34–50. doi:10.31181/dmame1802034v
- Visschers, V. H., Wickli, N., & Siegrist, M. (2016). Sorting out food waste behaviour: A survey on the motivators and barriers of self-reported amounts of food waste in households. *Journal of Environmental Psychology*, *45*, 66–78.
- von Kameke, C., & Fischer, D. (2018). Preventing household food waste via nudging: An exploration of consumer perceptions. *Journal of Cleaner Production*, *184*, 32–40. doi:10.1016/j.jclepro.2018.02.131

Chapter 13

Recovery of Energy and Materials From Small-Scale Tofu Processing Industries in Indonesia

Neni Sintawardani

*Research Unit for Clean Technology, National
Research and Innovation Agency (BRIN),
Indonesia*

Widyarani

*Research Unit for Clean Technology, National
Research and Innovation Agency (BRIN),
Indonesia*

Umi Hamidah

*Research Unit for Clean Technology, National
Research and Innovation Agency (BRIN),
Indonesia*

Diana Rahayuning Wulan

*Research Unit for Clean Technology, National
Research and Innovation Agency (BRIN),
Indonesia*

Dewi Nilawati

*Research Unit for Clean Technology, National
Research and Innovation Agency (BRIN),
Indonesia*

ABSTRACT

Tofu factories are spread across Indonesia as tofu is a cheap source of protein and favorite food for almost all population groups. Most tofu producers are micro/small business owners. In addition to soybeans, clean water is the most important input to produce tofu curd. It will generate a large amount of wastewater and solid waste, which still contains significant amounts of easily biodegradable organic matter. There are often complaints and protests from the public about the pollution in air and water in the area from the discharged waste. Tofu producers know about this, but their limited income and capital force them to ignore the environmental issues. The potential of tofu waste treatment technologies to produce new products or clean materials that can be fed back into the production process is discussed and reviewed to ensure all input materials in the tofu process can be used optimally and efficiently in a closed-loop production process. And it could be implemented easily and economically by the factories.

DOI: 10.4018/978-1-7998-9664-7.ch013

INTRODUCTION

After five years of implementing Sustainable Development Targets (SDGs), Indonesia still has some work to do. For example, with Indonesia's population in 2020 reaching 270 million, the annual waste generated has also increased to more than 68 million tonnes. In addition, the exploitation of natural resources has not been matched by efforts to implement sustainable production chains for the environment, economy and society by all sectors. This situation adds to the environmental burden and contributes to climate problems which are increasingly widespread and have an even more significant impact.

Global Carbon Atlas (2019) reported that Indonesia's carbon emission level in 2019 reached 618 MtCO₂ or about 1.7% of total global emission. Various, integrated strategies are needed so that Indonesia can contribute positively to reducing world carbon emissions through methods that also ensure the welfare of the Indonesian population. The Government of Indonesia has already adopted the Circular Economy concept into its vision and development strategy to achieve national economic growth targets and promoting environmental sustainability. The concept must encourage businesses to strongly consider the concept of green economy to reduce the environmental burden caused by excessive material and energy consumption. A paradigm shift is needed so that the current linear economy that tends to be highly extractive and resource- and CO₂-emission intensive, becomes a circular economy. This concept is needed to ensure that all input materials are utilised optimally, and is described as a closed-loop production process through the principles of: Reduce, Reuse, Recycle, Recover, and Revalue (Residual Management/Repurpose). Indonesia is very serious about implementing the circular economy concept in an effort to successfully achieve the SDGs target in 2030. In 2019 the Ministry of National Development Planning/BAPPENAS has launched a roadmap as a framework for all stakeholders to participate in achieving the SDGs by emphasizing the linkages between one goal to another, as well as the role of stakeholders and finance.

A study from BAPPENAS, UNDP, and the Government of Denmark (2021) showed that Indonesia's economy can grow up to USD 45 billion by 2030 through the full adoption of a zero-waste circular economy model. As one of the five studied key sectors, food and beverage industries can reduce up to 50% of waste 59 million tonnes of annual carbon emission, as well as saving up to 4,000,000,000 m³ of water.

An essential industry in the food and beverage sector that can reach the majority of the Indonesian population is the tofu making industry. Tofu, a food product originating from China, has been a staple in South-East Asia for centuries. This product is a cheap and popular protein-source and can be made locally throughout Indonesia. While 80% of demanded soybean is still imported, Indonesia's annual tofu consumption averages 8.1 kg/person [BPS-Statistic Indonesia, 2019]. Provinces in Java island make up the greatest tofu and soybean consumers. As an example, the annual tofu consumption in West-Java province reached 9.84 kg/person (Hakiki, 2020). Additionally, the population density on Java island is also the highest, meaning that the island produces the highest volume of waste.

The tofu industry in Indonesia is people's industry, characterized by workers of less than five people for micro scales and 5-19 people for small scales. The Ministry for Research and Technology of Indonesia in 2010 reported that there were around 84,000 micro-and-small-scale (MSS) tofu factories and a total production capacity of 2.56 million tons/year of soybean (Indriyati & Diyono, 2012). It reflects the business structure in Indonesia, which is 99% dominated by MSS to medium-sized enterprises, and involves 95% of workers (Capri, 2017). However, it only contributes to 56% of the Indonesian GDP.

Based on direct observations of the tofu industry in Bandung and Sumedang, known as tofu producer cities, this industry is characterized by low production efficiency and high pollution due to limited capital.

They typically do not have the facilities or management skills to solve these problems. MSS tofu factories are labour-intensive, requiring significant amounts of water and energy, and producing wastewater in significant quantities and concentrations. Moreover, the locations of tofu factories are usually scattered and often integrated into residential areas. Untreated waste will potentially cause negative impacts on residents and the environment, especially in populated areas.

A study of an urban slum in Bandung with an area of less than 0.2 km² reveals the existence of six medium-scale tofu factories, each processing up to 7,000 kg of soybeans per day, and 16 MSS tofu factories, each processing 300 kg soybeans per day (Sintawardani, Thye, & Hamidah, 2013). All factories discharge their wastewater to the small channel that will flow to a major river in Bandung. All MSS tofu factories do not have any wastewater treatment plant (WWTP), and the medium-scale factories use simple temporary tanks without specific treatments. The inhabitants and workers in the area are aware of existing environmental conditions. They listed the following issues: high population density, restricted living space, low income, lack of clean water, high energy consumption, poor sanitation, lack of wastewater treatment, and lack of solid waste management. They showed their desire for improvements in clean water, cheaper sources of energy and fresh air even though they stated that they had grown accustomed to the smell and poor environment and could not do anything about it.

Indonesia has had a program called 'Clean River Program' (PROKASIH) since 1995 based on the Regulation of the Ministry of Environment (Kepmen LH No.Kep-35/Menlh/7/1995), which aims to improve the quality of polluted rivers while taking into account the function of the river for the community and development, as well as the capacities of implementing organizations in the affected areas. This program is sympathetic enough to encourage the community to be more concerned with river cleanliness, with the government's role being very significant. For MSS and medium-scale tofu factories, the problem of river pollution due to the wastewater they produce is still not a major concern.

The Government also encourages industries to be responsible in their production processes to improve the efficiency of used resources, so that energy consumption, water, and waste disposal as well as the resulting emissions can be measured. The PROPER program, launched by the Ministry of Environment and Forestry of the Republic of Indonesia, pushes entrepreneurs to implement business/production processes that prioritise environmental health from planning, implementing, self-assessment, reporting and improving steps. MSS factories are generally owned and managed by less educated people (Tambunan, 2019), who lack the capability to do such comprehensive steps. This fact can be an obstacle in the implementation of PROPER for the tofu industry that mostly are MSS factories. However, their environmental awareness can be increased by supporting them and providing extensive information regarding the dangers of pollution, reducing costs through the efficient use of available resources, and the possibility of earning money from the valorisation of their waste.

From an economic point of view, tofu production is simple manufacture, but the income is considered profitable for the entrepreneur. The total daily revenue of a tofu industry in big cities (e.g., Jakarta) is 1.4 times higher than in a small city (Salatiga), respectively IDR 769,800 and IDR 548,000 per 100 kg of processed soybean (Ammatillah et al., 2018; Nugroho et al., 2019). In this case, the environmental costs are not even considered since most MSS tofu factories directly discharge their untreated waste into the environment. Only solid waste, known as okara, has economic value and is in great demand to be sold as animal feed or processed into food products. Therefore, the discussion in this chapter focuses on several alternative technologies which are expected to reduce the negative environmental impact of the tofu industry and provide additional benefits to the tofu factories or surrounding communities.

TOFU PROCESSING AND GENERATED WASTE STREAMS

To take into account the efficiency of raw materials uses and the potential for recycling or upgrading waste generated in tofu production, precise measurements and analysis of the mass balance of incoming and outgoing materials is crucial. Although the tofu production process may differ depending on the desired end product, it always includes washing, soaking, grinding, cooking, filtering, coagulating, pressing or moulding (Rekha & Vijayalakshmi, 2013; Shurtleff & Aoyagi, 2013). Figure 1 shows the general process of tofu production. The order of processes, amount of water added, and the types of coagulants used vary depending on countries and factories, resulting in different yields, textures, shapes, tastes, flavours and volumes of waste.

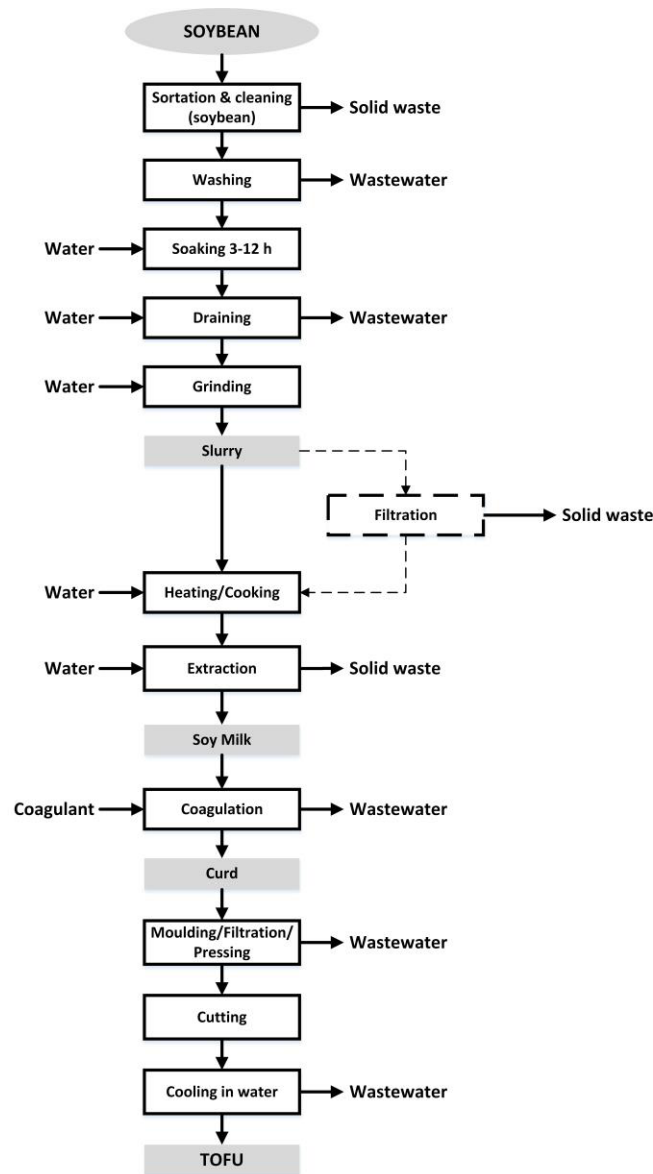
The choice of coagulants which coagulates soy milk to curd/tofu play an important role in tofu production. The most commonly used coagulants are chloride type salts or nigari salts ($MgCl_2$, $CaCl_2$), sulfate type ($CuSO_4$, $CaSO_4 \cdot 2H_2O$, $MgSO_4 \cdot 7H_2O$, Glucono-Delta-Lactone (GDL or Lactone), and acids (citrus juice, vinegar, acetic acid, lactic acid). Most MSS tofu factories in Indonesia use natural acidic coagulants made from fermented tofu whey (Shurtleff & Aoyagi, 2013). This type of coagulant is also used in China, tofu's country of origin. The dominant natural microbial community (95%) in fermented tofu whey are *Lactobacillus* and *Acetobacter*, which respectively produce lactic and acetic acid. The change of acidic concentrations depends on the fermentation period and pH levels (Fei et al., 2018; Xu et al., 2018).

Tofu whey as wastewater from the coagulation and pressing process in tofu production contains several valuable soluble nutrients that can easily be used as a microbial growth medium. A part of whey is left to ferment for half a day as coagulants and contains large amounts of various microorganisms. The experimental result from Qiao et al. (2010) using fresh whey inoculated with previously fermented whey showed a rapid decrease in pH from 6.3 to 3.8 in 16-18 hours. In the first 12 hours the lactic acid dominates, after 24 hours the acetic acid reaches its peak, but is still below the lactic acid concentration. The observed tofu industrial sites in Sumedang, reveals a shorter fermentation time to reach pH 4 compared to the above study, meaning that factories can use the fermented tofu whey from the morning shift for the night shift (Lubis et al., 2021).

The range of mass balances in tofu processing varies widely. For every tonne of soybean as raw material in tofu production, clean water in the range of 5-25 m³ are needed to produce 1-4 tonnes of tofu (Djayanti, 2015; Jaya et al., 2019; Jaya & Lestari, 2019; Kurniawati et al., 2019; Romli & Suprihatin, 2009; Septifani et al., 2021; Setiawan et al., 2021; Lubis et al., 2021) The process also generates several residual streams that can potentially be recovered as energy or valuable materials. The broader values for the required water consumption depends heavily on the habits of the workers in each factory, which are normally obtained from generation to generation, and the type of desired tofu texture. The duration process of each step and variation of input water also affects the concentration of the produced waste. One tonne of input soybeans generates a wide range of waste volumes: 1-12 m³ of relatively low concentrated wastewater, 0.4-2.5 tonnes of solid waste (known as okara, tofu residue, soybean residue, soy pulp, or tofu dregs), and 1.3-21.4 m³ of tofu whey that contains a high concentration of the organic compound.

Based on direct measurements in MSS in Sumedang, West-Java, the material balance for each step of tofu process shows in Figure 2 (Lubis et al., 2021). On average, one tonne of soybean can produce four tonnes of tofu (soy curd). Around 24.6 tons of clean water are required, with 4.4 tons of fermented whey being added as a coagulant. It produces 2 tonnes of light-concentrated wastewater, 2.5 tonnes of solid

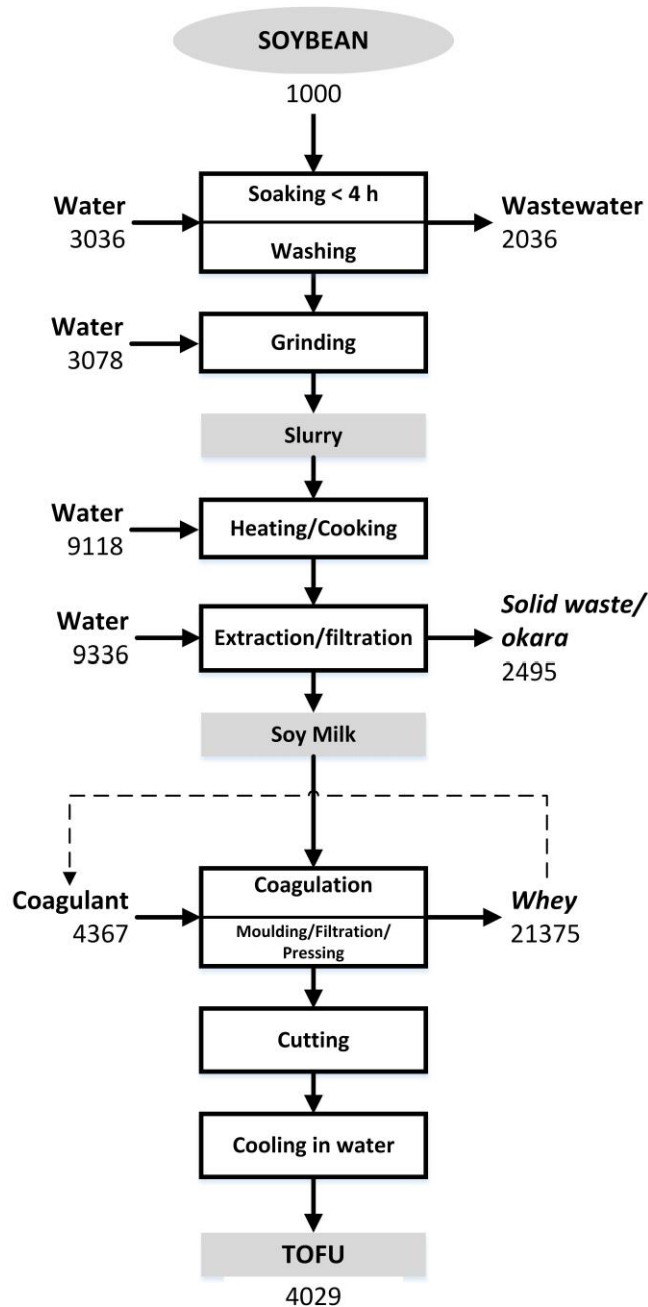
Figure 1. General steps of tofu production



waste (okara) and 21.4 tonnes of concentrated wastewater (Figure 2). Due to the higher concentration and quantity, the treatment of tofu whey must be taken into a serious concern.

The potential of waste streams from the tofu processing industry can be evaluated using the principles of reduce, reuse, recycle, recovery, and repair/revalue (5-R principles). Furthermore, waste handling should be performed more economical and environmentally friendly, which is in line with the Government of Indonesia's policy to transform the national economy to be more sustainable.

Figure 2. Material balance in micro- and small-scale tofu production in Indonesia (in kg)



RECYCLING TECHNOLOGY OPTIONS FOR VALUABLE PRODUCTS POTENTIAL

Considering a large amount of wastewater and solid waste in tofu production, the recycling process has great potential to create products that have economic value and reducing overall production costs.

The processing and recovery of waste are crucial for the environment as they can prevent pollution and reduce CO₂ emissions. The simplest option is filtration of the light-polluted wastewater, so it can be directly returned and used for production. Several valuable products can be obtained from tofu whey using various technology, i.e.: biogas for cooking purposes or converted into electrical energy; treated water for watering the fields or for fish ponds; bacterial cellulose; biomass production of microalgae.

Water Recycling System

Figure 2 shows the ratio between soybean and input water 1:25 to produce 2 tonnes of relatively lightly polluted wastewater and 21 tonnes of tofu whey. In Indonesia, tofu whey has high organic content, COD of 7,000–14,000 mg/L, BOD of 1,070–2,600 mg/L, and pH of 4–6 (Ajijah et al., 2020; Septifani et al., 2021; Wagiman & Suryandono, 2014; Widyarani et al., 2019). Therefore, adverse effects to the environment are experienced if the wastewater directly discharges into the water body without prior treatment. In addition, the high organic content in the water body could decrease the dissolved oxygen (DO) level, further disrupting the aquatic ecosystem (Thomas, 2004).

The Ministry of the Environment Republic of Indonesia has established the effluent standard for soy-based industries, focusing on the organic content, total suspended solids (TSS) and pH as parameters of concern (KepmenLH no.5/2014). The limit BOD and COD are 150 and 300 mg/L, respectively, whereas TSS 200 mg/L and pH 6-9 are expected to be achieved by every industry. This regulation is made to avoid massive organic pollutants entering the environment. On the other hand, the tofu MSS industry does not prioritise wastewater treatment since no direct benefit could contribute to the factory's profit margin (Faisal et al., 2016a; Seroja et al., 2018).

The technology to lower pollution levels from tofu wastewater has been studied and developed extensively. The proposed system to treat the wastewater varies between physical, chemical, and biological treatments, depending on the volume, organic concentration, pH and cost availability. Several systems have been applied to treat tofu wastewater in Indonesia. Unfortunately, scientific reports about the detailed performance of these systems are scarce, many are in small scale, despite the fact that the technology has already been researched and is available for the public. The main challenge is the sustainability of the application of a technology, especially those related to the ability to operate and maintain the system (Budiarto et al., 2013). Often the project status reduces the sustainability of applying a technology, especially if it is not accompanied by capacity building for local operators. Table 1 shows some studies on developing the technology for tofu wastewater treatment and the potential reuse of the treated water.

Although the wastewater from the washing and soaking steps is often viewed as lightly polluted wastewater, it still needs to be handled carefully. This waste can contain organic material affected by the soaking process and duration. By soaking the soybean for more than five hours, the COD concentration in the wastewater could reach 10,000-19,000 mg/L, with the pH value dropping to 4.7 (Guu et al., 1997; Hang et al., 2015). However, the soaking process in most MSS tofu factories in Indonesia is less than 3 hours, resulting in a COD concentration of 456-798 mg/L at a pH value of 5.5-6.5 (Lubis et al., 2021) and it will be a challenge to utilise it.

Physical treatment using an advanced oxidation process can be implemented to reduce the organic content in tofu wastewater in a shorter time, but this process requires the activation energy of COD reduction by approximately 0.0138 J mol⁻¹ (Pontas & Muslim, 2015). Nanofiltration technology is more efficient in reducing COD concentration in tofu wastewater compared to microfiltration and ultrafiltration technology, and the permeated water can be reused safely for the tofu process, while the concentrate can

Recovery of Energy and Materials From Small-Scale Tofu Processing Industries in Indonesia

Table 1. Various technologies for tofu wastewater treatment in Indonesia and their performances

Treatment, Location	Treated wastewater ^a	Hydraulic Retention Time (HRT)	Removal efficiency	Effluent utilization	References
Physical treatment					
Advanced Oxidation Process (AOP) H ₂ O ₂ /UV, Banda Aceh	Tofu whey	240 min(50°C)	COD 42.21%	n.a.	(Pontas & Muslim, 2015)
Filtered and sterilised tofu wastewater, Mrican	Tofu wastewater		Rapid growth in 10% tofu wastewater	Cultivation of <i>Chlorella sp.</i>	(Widayat et al., 2018)
Biological treatment					
Anaerobic Baffled Reactor (ABR)– Activated Sludge	Mixed of whey, soaking and washing water, tap water adjusted to 5,000-10,000 mg/L	11-12 days	COD 97% for influent < 4,000mg/L	n.a.	(Wagiman & Suryandono, 2014)
Two-stage anaerob-aerob (filter media)	Tofu wastewater	24-30 days	COD 90%, TSS 45-50%	n.a.	(Hidayat et al., 2016)
Upflow Anaerobic Sludge Blanket (UASB), Bandung	Tofu whey	5 days	COD 38%	Biogas 1.56 mL/ min	(Adisasmito et al., 2018)
Anaerobic-aerobic (bio ball media), Jakarta	Tofu wastewater	24 hours	COD 90.3% (organic loading rate is 15.1 kg COD/m ³ .day)	n.a.	(Astuti & Ayu, 2019)
Sequencing Batch Reactor (SBR)	Tofu wastewater	13 days	COD 81% TSS 94%	n.a.	(Sakinah et al., 2019)
Vetiver grass and Zeliac	Tofu wastewater (40%)	15 days	COD (76%), BOD (71.78%), TSS (75.28%), pH to 7.8	n.a.	(Seroja et al., 2018)
Multistage anaerobic fixed-bed reactor, Sumedang	Tofu whey			3% WW for cultivation of <i>C. vulgaris</i> and 5% WW for <i>A. platensis</i>	(Ajjiah et al., 2020)
Anaerobic Fixed-bed-reactor	Tofu whey	55 hours	TOC >80%		(Nilawati et al., 2021)
Photobioreactor	Sterilised tofu wastewater (20%)	batch	n.a	Cultivation of <i>C. vulgaris</i>	(Dianursanti et al., 2014)
Hydroponic system, Bandar Lampung	Fermented tofu wastewater (5%)	batch	n.a	Liquid nutrient for <i>Brassica Juncea L.</i>	(Telaumbanua et al., n.d.)
Dual-chamber Microbial Fuel Cell (MFC) with <i>S. saprophyticus</i> isolate, Bogor	Tofu wastewater	batch	n.a	n.a	(Dewi et al., 2020)
3-staged anaerobic fixed-bed reactor, Bandung	Tofu whey	3.75	50-80% COD	n.a.	(Sriwuryandari et al., 2019)

^aTofu whey refers to wastewater from coagulation and pressing processes. The term tofu wastewater is used when the process generating wastewater is not identified in the report.

n.a. = data not available

be used as input in production (Chai et al., 1999). Physical processes are typically powerful and fast, so almost all separated components can be fed back into the production system and resource savings can be carried out efficiently. However, with the high energy requirements for the operation of the devices and the relatively high price of the devices, implementation in MSS factories is generally not feasible.

The biological process normally requires a longer retention time. Constructed wetland system, e.g. using vetiver grass, needs 15 days to reach 76% COD reduction (Seroja et al., 2018). In addition, the system requires substantial area for implementation.

Multistage biological treatment shows better performance than single-stage, either in anaerobic-aerobic or aerobic-anaerobic systems. The removal efficiency reaches up to 80-90% (Table 1). Anaerobic processing, especially fixed-bed systems, increases the pH from 4-5 in tofu whey to 7.2–8.4 in the tofu wastewater-anaerobic digestion effluent (TW-ADE) (Ajijah et al., 2020; Widyarani et al., 2018).

The improved quality of TW-ADE makes it potential for use in agriculture. The agricultural sector consumes 70% of global water consumption (Stephan et al., 2018), and the global challenge in managing water resources in the agricultural sector is to ensure sustainable water supply to meet crop irrigation needs and face global food demand by 46% in 2050 (Keating et al., 2014). One solution to solve the problem of water availability for crop irrigation is the use of treated wastewater. Treated wastewater is a reliable alternative water resource in drought and water scarcity and can be used in agricultural irrigation (Ayaz et al., 2015; Khanpae et al., 2020; Libutti et al., 2018).

Energy Generation from Tofu Wastewater

One of the most promising technological solutions for tofu whey treatment is the anaerobic process. Anaerobic digestion is the process of breaking down organic matter to CH_4 (methane) and CO_2 (carbon dioxide) with the help of microbes that grow strictly without oxygen. Compared with the conventional (aerobic) process for wastewater treatment, the anaerobic process has the advantage of requiring less energy for degradation of organic content since no aeration is required in the process. In practice, a technological challenge that must be answered is the relatively slow growth of anaerobic microbes to enable a highly efficient process (Mao et al., 2015; Van Lier et al., 2001). A high-performance anaerobic digestion system can degrade up to 95% of dissolved COD in wastewater, resulting in an effluent that can be discharged to the environment (Mao et al., 2015).

Table 1 shows that anaerobic reactor technology can be applied for the treatment of tofu whey. Instead of consuming energy for aeration, energy can be recovered from the anaerobic digestion of tofu whey in the form of biogas in a mixture of CH_4 and CO_2 gases that can be used further for cooking or electricity. Theoretically, from 5 m³ tofu whey containing 8 g-COD/L, 14 m³ CH_4 (0 °C, 1 atm) can be generated, with a heating value of 555 MJ.

MSS usually have limited capital, so they do not own land and cannot finance wastewater treatment plants. To overcome these barriers, technology with a small footprint, short retention time, and ease to operate is promising. The low pH of tofu whey is an obstacle because anaerobic digestion optimally occurs at a pH of 6.8 to 7.4 (Mao et al., 2015). But, despite the low pH, tofu whey has a sufficient buffering capacity to enable the anaerobic process to produce CH_4 (Widyarani et al., 2018). Therefore, a multistage reactor system is proposed to treat wastewater with fluctuating organic content and pH (Van Lier et al., 2001). The two or more stages enable hydrolysis-acidogenesis, and methanogenesis steps of anaerobic digestion occurring in different stages, optimising each process's conditions.

Figure 3. A six-staged fixed-bed anaerobic wastewater treatment plant of tofu wastewater in Sumedang, Indonesia



A fixed-bed reactor system enables contact between the wastewater and microorganisms at the interface between wastewater and biofilm instead of in a suspension. It can behave as a mixed reactor in the suspension for a shorter hydraulic retention time (HRT), therefore, the HRT can be shortened without damaging the performance of anaerobic bacteria (Kreutz et al., 2018; Tomczak & Ferrasse, 2018). The attachment media, as a place for microbial biofilm growth, strongly influences the performance of a fixed-bed bioreactor. However, media with inaccurate dimensions can cause fluid flow disturbances in increased pressure drop or disturbances in the accumulation of sludge from decaying bacteria. Ideally, the criteria for the media should have a high specific surface area and porosity, inert to acids and bases, not easily degraded and oxidized, and not toxic (Gong et al., 2011). In addition, the media should be relatively inexpensive and easy to obtain locally with a simple manufacturing process. For example, a multistage fixed-bed reactor (Figure 3) is already developed and implemented in Sumedang to treat tofu whey from nine MSS tofu factories. The reactor uses bamboo, a locally available resource, as the fixed-bed media. It currently operates continuously and provides biogas for cooking for 88 households in the village (Mutaqin et al., 2019). This process is environmentally and economically effective as it simultaneously treats the wastewater and produces energy in the form of biogas (Pan et al., 2015). Treated wastewater can be used for watering crops (Figure 3). The utilisation of energy from tofu industrial wastewater is one of the potential options to be applied technically and provides various benefits. With the right technology, the anaerobic process is fast, stable, and arguably the most feasible choice for MSS factories.

Tofu production requires approximately 32,000–53,000 MJ per tonne of soybean, mainly for cooking/boiling the slurry (Faisal et al., 2014). Biogas from tofu whey (estimated at 555 MJ/tonne soybean) cannot meet all the energy requirements for tofu production, but it can be used as a substitute (a part of) energy source to reduce production costs. Alternatively, it can be used for domestic purposes such as cooking (Mutaqin et al., 2019). Based on experience in the field, the integration of tofu waste from several factories to be processed together will make it easier to manage and distribute the biogas to those in need. Economically, the sale of biogas for cooking energy is still very relevant in Indonesia, especially since the price can compete with Liquefied Petroleum Gas (LPG). If the locations of tofu production are far from each other, anaerobic tofu whey treatment can still be carried out at the right scale on-site.

Table 2. Physicochemical properties of influent and effluent of anaerobic WWTP in Giriharja-Sumedang Indonesia

Parameter	Unit	Anaerobic WWTP	
		Influent (Tofu whey)	Effluent (TW-ADE)
pH	-	5.1	7.1 – 8.4
Turbidity	NTU	680.5	362
TDS (Total dissolved solids)	mg/L	1,184	1,916
TS (Total Solids)	mg/L	6,422	4,001
OTS (Organic total solids)	mg/L	4,188	1,546
Ash	mg/L	2,234	2,455
COD (Chemical oxygen demand)	mg/L	7,676	532
BOD ₅ (Biological oxygen demand)	mg/L	4,349	301
Macronutrient			
Nitrate	mg/L	192	128
Phosphate	mg/L	19	13

Processing of tofu whey using an anaerobic process is an important solution in developing a recycling method that is relatively inexpensive in investment and operation. It is also environmentally friendly and can replace a part of energy need in production or be managed as an energy source for the community. Some of the positive impacts of anaerobically utilizing tofu industrial wastewater include: (1) Reduction of local environmental problems (rotten odors) and disturbances of insects, flies, and mosquitoes; (2) Reduction of greenhouse gas emissions due to the use of biogas (CH₄); (3) Reuse of treated water to enter parts of the production process, and; (4) Utilisation of treated water for the production of microalgae.

Integrating Anaerobic Digestion with Microalgae Cultivation

Fresh tofu whey can be utilised directly as the cultivation medium for microalgae. Since tofu production does not include toxic compounds, it becomes advantageous to follow the utilisation process, but it requires some adjustments to make the whey suitable as microalgae growing medium, exp: pH adjustment and added nutritions (S. K. Wang et al., 2018).

Anaerobic WWTP reduces tofu whey’s COD by more than 90% but kept the nitrogen and phosphate contents (Ajijah et al., 2020). Table 2 shows influent (tofu whey) and effluent (TW-ADE) characteristics from anaerobic WWTP in Giriharja-Hamlet, Indonesia.

In waste valorisation, a multi-purpose treatment will be a better solution from the environmental and economic perspectives. For example, in wastewater treatment, the main purpose of reducing the chemical compounds must be in line with the need to harvest microalgae biomass in a significant amount (Garbowski et al., 2020). Wastewater can be a cost-effective medium for microalgae cultivation due to its abundance and richness in nutrients. The fat content of microalgae grown in wastewater is found to increase swiftly from 10% to 25-30%, which then can be used for biodiesel production (Chen et al., 2015). Many types of microalgae can be grown in wastewater, but *Chlorella* sp. and *Scenedesmus* sp. are the most common microalgae used for cultivation because of their rapid cell growth compared to

other microalgae cells (Bohutskyi et al., 2019). Moreover, it can remove ammonia, total nitrogen, total phosphate and produce a significant amount of biomass under a condition with high carbon dioxide levels (Mathimani & Pugazhendhi, 2019). Therefore, *Chlorella vulgaris* and *Scenedesmus* sp. can manage waste, produce environmentally friendly and economical renewable energy, and manage CO₂ emission better than other plants (Rajalakshmi et al., 2020).

Microalgae can utilize inorganic carbon, predominantly CO₂, in photoautotrophic mode as their primary carbon source. In aqueous solutions, gaseous CO₂ dissociates into bicarbonate (HCO₃⁻) and carbonate (CO₃²⁻) ions depending on the pH, with the precise equilibrium subject to the temperature, cation concentration and salinity (Hill et al., 2014). Microalgae can utilize N from various inorganic compounds (NH₄⁺, NO₃⁻, and NO₂⁻) and organic sources (amino acids, urea, purines and nucleosides) (Cai, Park, & Li, 2013). Concerning inorganic N, microalgae express a clear preference for NH₄⁺ if available because its assimilation and incorporation are energetically more efficient (Perez-garcia et al., 2010).

Phosphate removal can be achieved by cultivating and harvesting microalgae from ADE (Cai, Park, & Li, 2013). Microalgal species, such as *Chlorella*, *Scenedesmus*, *Arthrospira*, *Phaeodactylum*, *Oscillatoria*, and *Neochloris*, have been studied to remove and recover P from various types of wastewater, with 70%–100% P removal efficiency (Xu et al., 2018). Reusing P can be achieved by direct use of microalgae biomass as fertilizer. *Chlorella sorokiniana* is successfully used to remove 100% of P from anaerobically treated black water and using microalgae biomass as fertilizer (Fernandes et al., 2015). P recovery-reuse can also be achieved by using the microalgal biomass as a high-protein animal feed (Shilton et al., 2012).

In addition to using tofu whey or TW-ADE for growth media, microalgae can also use CO₂ in the biogas as a C source for its growth. In anaerobic digestion using tofu whey, the produced biogas can contain CH₄ in a range of 55-79%, the rest is CO₂ and a trace amount of H₂S, N₂ and other trace gas compounds and H₂O (Sriwuryandari et al., 2019). Although ambient air has been commonly used as a source of CO₂ in microalgal growth studies, bubbling additional CO₂ can increase biomass productivity. Flue gas from the combined heat and power unit of an anaerobic digestion project can be a cheap CO₂ source for microalgae growth on a commercial scale (Cai, Park, Racharaks, et al., 2013). Microalgae's photosynthetic ability also can be used to purify or improve biogas quality and remove the impurities present in biogas (Ramaraj & Dussadee, 2015). A couple of process system for biogas purification and biomass production has some advantages: (1) high efficiency, (2) low operating cost, (3) microalgal biomass production, (4) decreasing cultivation cost (Budiyono & Syaichurrozi, 2020). However, some obstacles to operating the system must be considered, such as a drop in pH due to excessively high CO₂ content in biogas, flow rate, the increase of oxygen in the purified biogas and limited light availability for continuous or intermittent photosynthesis.

Consideration must be taken on CO₂ dissociation in water that influences changes of pH in the liquid system and further assimilation by the biomass (Cea-barcia & López-caamal, 2018). For example, *Spirulina platensis* could not grow well in a culture that was aerated by using biogas continuously because the pH in a culture that was aerated by using biogas had decreased (Sumardiono et al., 2014). Another researcher reported that *C. vulgaris* enhanced CO₂ removal from biogas up to 7% (Hadinnata, 2019). Microalgae cultivation with the integration of TW-ADE intake and biogas/flue gas is interesting to study by observing the previous research results.

Table 3. Amino acid composition of soybean processing fractions

Amino acid	Concentration (% of total protein)			
	Whole soybean	Soybean meal	Tofu solid residue (okara)	Tofu whey
Essential:				
• Histidine		2.6–2.7	2.7–3.1	3.2–6.3
• Isoleucine	2.6	4.5–4.8	4.5–7.1	2.9–3.0
• Leucine	3.5	7.6–7.9	8.3–11.0	3.2–3.9
• Lysine	7.9	5.6–6.3	5.5–6.4	5.4–8.6
• Methionine	6.2	1.2–1.4	1.7	1.3–2.6
• Phenylalanine	1.3	5.0–5.4	5.2–9.9	4.8–2.5
• Threonine	4.8	3.9–4.1	3.8–4.4	3.1–4.5
• Tryptophan	4.1	1.3–1.4	NA	11.5
• Valine	3.7	4.7–4.9	4.7–5.3	2.6–4.2
Semi-essential:	8.6	7.3–7.6	6.1–8.6	9.7–10.5
• Arginine	4.5	4.2–4.4	4.0–4.6	3.4–4.9
• Glycine	5.7	5.0–5.2	5.2–5.5	2.3–4.2
• Serine	12.6	11.5–11.9	10.2–11.6	2.4–12.5
Non-essential:	19.8	18.0–18.6	16.2–17.7	21.4–23.6
• Aspartic acid	4.5	4.4–4.6	4.4	4.4–6.3
• Glutamic acid	0.8	1.3–1.5	trace	2.4–2.8
• Alanine	5.5	5.1–5.3	4.1–5.7	4.0–4.1
• Cysteine	3.9	3.4–3.7	3.5–3.7	3.4–4.2
• Proline				
• Tyrosine				
Crude protein (%DM)	35–44	51–56	15–35	-

Source: Anggraeni et al., 2013; Kumar et al., 2016; Ma et al., 1996; van der Riet et al., 1989; H. L. Wang & Cavins, 1989; Frikha et al., 2012; Vong & Liu, 2016

Extraction of Protein from Tofu Waste

Soybean processing to make tofu relies on extraction and coagulation of protein fraction in soybean. Upon heating and adding a coagulant, high molecular weight proteins in soymilk could form filamentous gel structures that encapsulate the native (non-aggregated) proteins and are further pressed into tofu (Kao et al., 2003). On a dry weight basis, the whole soybean contains 35–44% crude protein and, after processing, is distributed into tofu (71%), okara (20%), and whey (5%) (H. L. Wang & Cavins, 1989).

Soybean proteins have favourable amino acid composition and functional properties, still present in the whey and okara (Romli & Suprihatin, 2009; Septifani et al., 2021). Depending on soybean cultivar and extraction efficiency, okara contains 15–35% crude protein. It also contains up to 90% moisture (Anggraeni et al., 2013), which makes okara highly perishable. The simplest way to reuse fresh okara is to feed farm animals. A disadvantage, however, is that only farmers around the tofu factory can use the okara because this waste stream can easily be changed and degraded by the time, and through transportation and can become foul-smelling through the uncontrolled fermentation process. Further processing can produce soybean protein isolate with comparable properties to commercial isolates, while the remaining residues still can be used for feed.

Table 3 shows that the amino acid profile of okara is similar to soybean meal, which is one of the main protein sources for animal feed. Indonesia annually imports 4 million tonnes of soybean meal for feed ingredients (Meylinah et al., 2020). Dry matter digestibility and nitrogen retention of okara are similar to soybean meal, while fibre digestibility is lower (Farhat et al., 1998). Fermentation of okara

can increase protein content, enrich amino acids, refine texture, and increase the digestibility of okara (Anggraeni et al., 2013; Y. Jiang et al., 2018). Currently, okara is used as such or as a soybean meal replacement in poultry and ruminant feed. Optimization of okara for animal feeds can reduce dependency on imported soybean meal.

For biomass with protein contents of 15–35%, valorisation by processing into different fractions potentially increases the overall value of the biomass (Sari et al., 2021). Protein can be isolated from okara by alkaline extraction followed by isoelectric precipitation or membrane filtration (Ma et al., 1996; Vishwanathan et al., 2011). The product is a soybean protein isolate containing up to 83% protein with 37% essential amino acids. Due to the processing method, the soybean protein isolate from okara has lower solubility compared to commercial isolates. However, emulsifying, binding and foaming properties are similar. Functional properties of soybean protein isolate from okara can be modified by a mild acid or enzymatic treatment (W.-M. Chan & Ma, 1999; Fierens et al., 2016). After protein isolation, the remaining residues still contain 16–24% crude protein; therefore, it can still be used as ruminant feed (Ma et al., 1996).

Another alternative to utilising and increasing the quality of the proteins in okara is through fermentation. In Indonesia, the fermentation of okara is widely applied to make traditional food called oncom. There are two types of oncom commonly produced: red oncom, fermented with *Neurospora intermedia*, and black oncom, fermented with *Rhizopus oligosporus* (Andayani et al., 2020). Fermentation increases protein concentration to 24% in red oncom and 41% in black oncom. Other fermented okara products, including traditional foods and products with bioactive compounds or prebiotics, are obtained using *Aspergillus* sp. and bacteria, such as *Bacillus subtilis* and *Lactobacillus* sp. (Vong & Liu, 2016).

Tofu whey is generated at up to 21 tonne/tonne-soybean (Figure 2) and contains 978–3,700 mg/L protein (Chua & Liu, 2020; H. L. Wang & Cavins, 1989). Proteins in tofu whey mostly consist of low molecular weight and soluble proteins (Kao et al., 2003; Widyarani et al., 2019). Table 2 shows that tofu whey has 31–43% essential amino acids and high glutamic acid content that might give a favourable umami taste. The addition of cheese whey to animal feed or drinking water has been studied and practised with varying results (Palmieri et al., 2017; Shariatmadari & Forbes, 2005). In Indonesia, some farmers already use tofu whey for the same purpose, but there is a lack of systematic studies to confirm the effects on animals' diets.

Several methods have been investigated to separate and recover protein from tofu whey. Using gravity settlement, 9% of protein from tofu whey can be recovered to yield a protein product with 43% protein content on a dry weight basis (Widyarani et al., 2019). Other processes have been applied to recover proteins from tofu whey, and whey wastewater from soybean protein isolate production, including coagulation-flocculation, ultrafiltration, electrodialysis, and foaming. To increase protein recovery, a coagulant with a high specificity toward protein can be applied. Chitosan has been used as a coagulant to recover protein from soybean processing wastewater (Jun et al., 1994). Foaming is applied for protein separation, and up to 82% protein recovery is achieved (Liu et al., 2015). Protein recovery can be increased by using a two-stage foaming reactor or baffled reactor (C. Jiang et al., 2011). The recovery method will influence the amino acid composition and functional properties of proteins recovered from tofu whey (Jun et al., 1994). Further purification processes can also recover peptides with specific bioactive functionalities (Nieto-Veloza et al., 2021).

Another alternative to the valorisation of protein fraction from tofu whey is by separating the specific amino acid(s). As shown in Table 2, tofu whey has a high glutamic acid content (21–24%) that can be separated at pH 3.2, the isokinetic point of glutamic acid. In addition, tofu whey also contains 22.6

mg/L gamma-aminobutyric acid (GABA) (Chua & Liu, 2020). Glutamic acid and GABA are potential feedstock for nitrogenous bio-based chemicals (Lammens et al., 2012).

Developing Bacterial Cellulose from Tofu Waste

Bacterial cellulose (BC) is an exocellular polymer produced by many microorganisms, such as *Gluconacetobacter* (previously classified *Acetobacter*), *Aerobacter*, *Agrobacterium*, *Pseudomonas*, *Rhizobium*, and *Sarcina* (Cacicedo et al., 2016; Jonas & Farah, 1998). Bacterial cellulose has attracted attention due to its specific and excellent properties, such as high degree of polymerization, cellulose purity, excellent biocompatibility, biodegradability, high crystallinity and high mechanical strength (Klemm et al., 2005; Mohite & Patil, 2014). In addition, it has a high aspect ratio, with a fibre diameter of 20–100 nm (Dahman, 2009). These properties have made BC a potential application in electronics, cosmetics, medicine, food, and related products (Lin et al., 2020; Poddar & Dikshit, 2021; Rajwade et al., 2015; Zhong, 2020). However, the industrialisation and commercialisation of BC production at a commercial scale is relatively expensive due to the high cost of culture medium, representing approximately 30% of the production cost (Revin et al., 2018). Therefore, identifying a cost-effective culture medium to replace preferential commercial carbon sources in producing high yield BC is challenging in BC production.

The optimum pH in the range of 4–7 pH, C-sources and C-quantity of the culture medium are important factors for BC productivity and formation (Jonas & Farah, 1998). Revin et al. (2018) utilised acidic waste streams from thin wheat stillage and cheese whey in pH 4-6 media using strain *Gluconacetobacter sucrofermentans* B-11267 to reduce the cost of bacterial cellulose biosynthesis. 5.45 g/L and 6.19 g/L BC can be obtained from using stillage and cheese whey as media, respectively.

Tofu whey has similarity in pH and organic content as an acidic waste stream and also has a good potential as a substrate for obtaining BC. Biosynthesis of BC using tofu whey through the fermentation process using *Komagataibacter xylinus* bacteria have been investigated. The main constituents of tofu whey are protein, carbohydrate, and low pH (4-6). The use of tofu whey as a nutrient medium reaches a maximum yield of 10.6 g/L (dry weight) bacterial cellulose with 15 days of incubation time. The yield is higher than the previous study using wheat stillage and cheese whey as media. From the structure analysis, the produced BC from tofu whey media consists of the functional group found in standard cellulose (Andriani et al., 2020).

Tofu whey has great potential as a cheap source of economically feasible BC. In addition, it can positively impact the corresponding industry by decreasing the environmental problems associated with waste disposal. However, the practical applicability on the pilot scale is another important prospect. The relatively long incubation period in making BC makes it less attractive for the micro- to medium-scale tofu factories to produce BC as side-activities in the tofu production, because it needs space and is time-consuming. Communal management can be built to collect the harvested BC from each industry and semi-refining the BC to increase the economic value and sell it to the BC factory. Furthermore, the wastewater from BC production has a higher biodegradability compared to whey, and it can be fed to the biogas plant to increase biogas production.

DISCUSSIONS

Based on the waste streams generated in tofu processing, thorough waste management by taking into account the circular economy principle will be able to maintain the sustainability of the tofu production itself. Figure 4 shows the possibilities to implement 5-R principles to reduce the use of resources efficiently.

The wastewater from washing-soaking-steps can be filtered to be re-used back in the process or easily treated using constructed wetland technology to be safely discharged into the water body.

Okara is highly sought after by farmers to get a cheap feed source with good nutritional value. Consumers will come to pick up or buy directly from the tofu maker, so the okara will not have time to accumulate and cause a bad odour. However, if the location of the tofu factory is too far from the farmers, then valorisation to get valuable protein isolate can be an option.

Tofu whey has a large portion in volume as well as its pollutant content, so the prospect of anaerobic waste treatment can be feasible to reduce the average pollutant by up to 90% and produce biogas as alternative energy for the community. Effluent from anaerobic processes that still contain nutrients can be further processed to produce algae biomass or treated over constructed wetland so that the output can be used for agricultural land or safely discharged into river bodies. The low pH of tofu whey also has the potential to support the BC production process. Considering that the fermentation process to get the BC layer/sheet still takes several days in batch, it is necessary to have good production management to be able to get an adequate amount of BC. After harvesting BC, the remaining liquid that still contains lactic acid must be processed first through anaerobic digestion. Valorisation of tofu whey into protein isolate requires pre-treatment to remove water content so that it can be more feasible in the production process.

Table 4 shows the development status of various potential products that come from recycling waste streams from the tofu industry. It includes analysing the above exposures, their potential, usage, and current restrictions. It is expected that further research and development of the existing potential will accelerate the realisation of its implementation in areas in which the benefits are directly tangible for the relevant stakeholders.

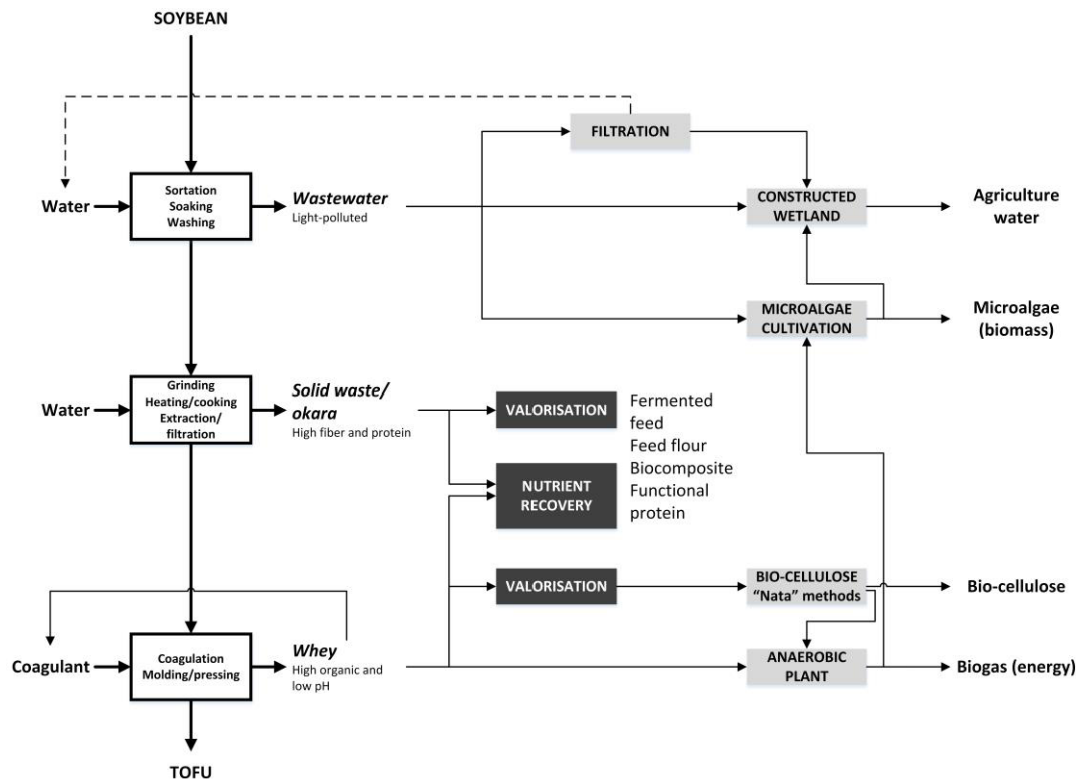
Some applications are already in the mature phase and the others are still in the theoretical or development phase. The use of fermented tofu whey as coagulant and okara as animal feed is the most straightforward process and is already applied. To control the quality of tofu products for the correct pH level and extend the shelf life of okara, application-oriented research is required to obtain the correct technical parameters. Examples of the simplest implementation for use in an MSS factory is regularly checking the pH to reduce fermentation time and drying or cold storage of okara. With these two actions, the factory will be able to save storage coagulant and control the price of the okara.

Anaerobic treatment of tofu whey has been established as a potential source of energy (biogas). For MSS tofu factories, technical assistance and subsidy for the development, operation, and maintenance of an anaerobic plant are often required. Further analysis is needed regarding possible obstacles that must be overcome, among others: constraints related to the availability of technology, business scale problems, capital and technical capabilities, as well as the production habits of the tofu industry. The results of the analysis can be used as a reference for future research and development.

For other applications such as microalgae cultivation and BC production, further studies are required to make these technologies more feasible. When aiming for high-value applications such as medical-grade BC, cooperation with related industries is required to ensure quality control and establish the potential market.

Recovery of Energy and Materials From Small-Scale Tofu Processing Industries in Indonesia

Figure 4. Concept of material and energy recovery from tofu industry waste streams



The consistent application of the circular economy concept can be started from MSS Tofu factories by using the various waste recycling technologies mentioned above. Given the significant number of these industries, with their significant amounts of waste, there is economic potential in efforts to reduce waste through recycling and the safe reuse of treated waste. It will contribute significantly to the achievement of 3 goals of SDGs namely: 1). SDG-6 (Clean Water and Sanitation) by supporting and empowering MMS and local communities to improve water and sanitation management; 2). SDG-7 (Affordable and clean energy) from the use of biogas for cooking or lighting purposes is also an effort to reduce CO₂ emissions. Anaerobic treatment of tofu waste can replace fossil fuels, which are often difficult to obtain in rural areas for daily community energy needs; 3). SDG-12 (Responsible Consumption and Production) through waste management with the concept of a zero-waste circular economy (prevention, reduction, recycling, reuse) as well as the possibility of rationalizing inefficient subsidies for fossil fuels.

CONCLUSION

The circular economy concept is very applicable in tofu processing by paying attention to or considering the type of handling the waste and the technology used. The party in charge can be the tofu entrepreneur himself or a third party who can make the processing as an integrated business unit.

Recovery of Energy and Materials From Small-Scale Tofu Processing Industries in Indonesia

Table 4. Level of development of potential products from tofu industry waste streams

Products	Waste stream	Technology	Development level	Constraints
Process water	Light-polluted wastewater	Microfiltration, nanofiltration	Mature	High capital and operational cost
Agricultural water	Light-polluted wastewater	Constructed wetland	Mature	Land requirement
	TW-ADE	Anaerobic digestion	Under development	Quality control, infrastructure, socialization
Microalgae biomass	TW-ADE	Anaerobic digestion, photobioreactor	Under development	Nutrient composition
Coagulant	Tofu whey	Fermentation	Mature, widely applied (by tradition)	Only applicable onsite, control pH
Biogas	Tofu whey	Anaerobic digestion	Mature (varied)	Land requirement, reactor type vs performance, infrastructure, separation of light-polluted wastewater and only for tofu whey, Capacity building to O&M
Animal feed	Okara	No treatment or simple drying	Mature, widely applied	Easily degraded. Drying can increase shelf life but requires land/technology or capital
	Tofu whey	No treatment	Application not documented	Need further research
Soybean protein isolate	Okara	Extraction, precipitation/ membrane filtration	Under development	Balancing separation cost and product value
	Tofu whey	Precipitation/ membrane filtration	Under development	Balancing separation cost and product value
Fermented okara	Okara	Fermentation	Mature, commercial	Market/demand
Bacterial cellulose	Tofu whey	Fermentation	Under development	Low yield, long incubation time, reactor design, high price

To enable optimum material and energy recoveries, a techno-economic study is required to properly calculate the volume or ratio of the waste used for valorisation or treatment and their economic value. In addition, the principal aim of the processes should be to optimize resource use and minimize the negative impact of the tofu industry on the environment. An established form of incentive is needed to help micro- and small-scale entrepreneurs understand the processing options, efficiency, reuse and recycling of input and output materials, and the benefits that can be obtained from the selected modification steps. This can increase their competitiveness and strengthen the sustainability of their business. The role of the government is still very significant as the initial trigger for incentives.

REFERENCES

- Adisasmito, S., Rasrendra, C. B., Chandra, H., & Gunartono, M. A. (2018). Anaerobic reactor for Indonesian tofu wastewater treatment. *IACSIT International Journal of Engineering and Technology*, 7(3), 30–32. doi:10.14419/ijet.v7i3.26.17456
- Ajjah, N., Tjandra, B. C., Hamidah, U., Widyarani, & Sintawardani, N. (2020). Utilization of tofu wastewater as a cultivation medium for *Chlorella vulgaris* and *Arthrospira platensis*. *IOP Conference Series: Earth and Environmental Science*, 483(1), 0–9. doi:10.1088/1755-1315/483/1/012027
- Andayani, S. N., Lioe, H. N., Wijaya, C. H., & Ogawa, M. (2020). Umami fractions obtained from water-soluble extracts of red oncom and black oncom—{Indonesian} fermented soybean and peanut products. *Journal of Food Science*, 85(3), 657–665. doi:10.1111/1750-3841.14942 PMID:32052448
- Andriani, D., Apriyana, A. Y., & Karina, M. (2020). The optimization of bacterial cellulose production and its applications: A review. *Cellulose (London, England)*, 27(12), 6747–6766. doi:10.1007/10570-020-03273-9
- Anggraeni, A., Hasibuan, S., Malik, B., & Wijaya, R. (2013). Improving the quality of tofu waste as a source of feed through fermentation using the *Bacillus amyloliquefaciens* culture. *Int J Adv Sci Eng Inf Technol*, 3, 285–288. doi:10.18517/ijaseit.3.4.305
- Astuti, A. D., & Ayu, D. I. (2019). Treatment of Tofu Industry Wastewater using Bioreactor Anaerobic-Aerobic and Bioball as Media with Variation of Hydraulic Retention Time. *Reaktor*, 19(1), 18–25.
- Ayaz, S. T., Aktaş, Ö., Akça, L., & Findik, N. (2015). Effluent quality and reuse potential of domestic wastewater treated in a pilot-scale hybrid constructed wetland system. *Journal of Environmental Management*, 156, 115–120. doi:10.1016/j.jenvman.2015.03.042
- Bohutskyi, P., Keller, T. A., Phan, D., Parris, M. L., & Li, M. (2019). *Co-digestion of Wastewater-Grown Filamentous Algae With Sewage Sludge Improves Biomethane Production and Energy Balance Compared to Thermal, Chemical, or Thermochemical Pretreatments*. doi:10.3389/fenrg.2019.00047
- Budiarto, R., Kholid, M., & Haryoko, A. (2013). The 3 rd International Conference on Sustainable Future for Human Security Sustainability challenge for small scale renewable energy use in Yogyakarta. *Procedia Environmental Sciences*, 17, 513–518. doi:10.1016/j.proenv.2013.02.066
- Budiyono, B., & Syaichurrozi, I. (2020). A review: Biogas production from tofu liquid waste. *IOP Conference Series. Materials Science and Engineering*, 845(1), 012047. Advance online publication. doi:10.1088/1757-899X/845/1/012047
- Cacicedo, M. L., Castro, M. C., Servetas, I., Bosnea, L., Boura, K., Tsafrakidou, P., Dima, A., Terpou, A., Koutinas, A., & Castro, G. R. (2016). Progress in bacterial cellulose matrices for biotechnological applications. *Bioresource Technology*, 213, 172–180. doi:10.1016/j.biortech.2016.02.071 PMID:26927233
- Cai, T., Park, S. Y., & Li, Y. (2013). Nutrient recovery from wastewater streams by microalgae : Status and prospects. *Renewable & Sustainable Energy Reviews*, 19, 360–369. doi:10.1016/j.rser.2012.11.030

- Cai, T., Park, S. Y., Racharaks, R., & Li, Y. (2013). Applied Energy Cultivation of *Nannochloropsis salina* using anaerobic digestion effluent as a nutrient source for biofuel production. *Applied Energy*, *108*, 486–492. doi:10.1016/j.apenergy.2013.03.056
- Capri, A. (2017). *Micro and Small Businesses in Indonesia's Digital Economy*. Academic Press.
- Cea-barcia, G., & López-caamal, F. (2018). *Biogas Purification Via Optimal Microalgae Growth: A Literature Review*. doi:10.1002/btpr.2686
- Chai, X., Mi, Y., Yue, P., & Chen, G. (1999). *Bean curd wastewater treatment by membrane separation*. Academic Press.
- Chan, W., & Liu, S. (2016). Trends in Food Science & Technology Biovalorisation of okara (soybean residue) for food and nutrition. *Trends in Food Science & Technology*, *52*, 139–147. doi:10.1016/j.tifs.2016.04.011
- Chan, W.-M., & Ma, C.-Y. (1999). Acid modification of proteins from soymilk residue (okara). *Food Research International*, *32*(2), 119–127. doi:10.1016/S0963-9969(99)00064-2
- Chen, G., Zhao, L., & Qi, Y. (2015). Enhancing the productivity of microalgae cultivated in wastewater toward biofuel production : A critical review. *Applied Energy*, *137*, 282–291. doi:10.1016/j.apenergy.2014.10.032
- Chua, J.-Y., & Liu, S.-Q. (2020). Effect of single amino acid addition on growth kinetics and flavor modulation by *Torulaspora delbrueckii* in soy (tofu) whey alcoholic beverage fermentation. *Food Research International*, *135*, 109283. doi:10.1016/j.foodres.2020.109283 PMID:32527478
- Dahman, Y. (2009). Nanostructured biomaterials and biocomposites from bacterial Cellulose nanofibers. *Journal of Nanoscience and Nanotechnology*, *9*(9), 5105–5122. doi:10.1166/jnn.2009.1466 PMID:19928189
- Dewi, A. K., Djajakirana, G., & Santosa, D. A. (2020). Potensi Limbah Tahu untuk Menghasilkan Listrik pada Tiga Model Sistem Microbial Fuel Cell (MFC). *Jurnal Ilmu Tanah Dan Lingkungan*, *22*(1), 29–34. doi:10.29244/jitl.22.1.29-34
- Dianursanti, R., Rizkytata, B. T., Gumelar, M. T., & Abdullah, T. H. (2014). Industrial tofu wastewater as a cultivation medium of microalgae *Chlorella vulgaris*. *Energy Procedia*, *47*, 56–61. doi:10.1016/j.egypro.2014.01.196
- Djayanti, S. (2015). Kajian Penerapan Produksi Bersih di Industri Tahu di Desa Jimbaran, Bandungan, Jawa Tengah. *Jurnal Riset Teknologi Pencegahan Pencemaran Industri*, *6*(2), 75–80. doi:10.21771/jrtppi.2015.v6.no2.p75-80
- Faisal, M., Gani, A., Mulana, F., & Daimon, H. (2016a). Treatment and utilization of industrial tofu waste in Indonesia. *Asian Journal of Chemistry*, *28*(3), 501–507. Advance online publication. doi:10.14233/ajchem.2016.19372
- Faisal, M., Gani, A., Mulana, F., & Daimon, H. (2016b). Treatment and utilization of industrial tofu waste in Indonesia. *Asian Journal of Chemistry*, *28*(3), 501–507. doi:10.14233/ajchem.2016.19372

Recovery of Energy and Materials From Small-Scale Tofu Processing Industries in Indonesia

Farhat, A., Normand, L., Chavez, E. R., & Touchburn, S. P. (1998). Nutrient digestibility in food waste ingredients for Pekin and Muscovy ducks. *Poultry Science*, 77(9), 1371–1376. doi:10.1093/ps/77.9.1371 PMID:9733125

Fei, Y., Li, L., Chen, L., Zheng, Y., & Yu, B. (2018). *High-throughput sequencing and culture-based approaches to analyze microbial diversity associated with chemical changes in naturally fermented tofu whey, a traditional Chinese tofu-coagulant*. doi:10.1016/j.fm.2018.04.004

Fierens, E., Brijs, K., & Delcour, J. A. (2016). Emulsifying and Foaming Properties of Okara Protein Hydrolysates. *Cereal Chemistry*, 93(1), 71–76. doi:10.1094/CCHEM-02-15-0031-R

Frikha, M., Serrano, M. P., Valencia, D. G., Rebollar, P. G., Fickler, J., & Mateos, G. G. (2012). Correlation between ileal digestibility of amino acids and chemical composition of soybean meals in broilers at 21 days of age. *Animal Feed Science and Technology*, 178(1–2), 103–114. doi:10.1016/j.anifeedsci.2012.09.002

Garbowski, T., Pietryka, M., Pulikowski, K., & Richter, D. (2020). The use of a natural substrate for immobilization of microalgae cultivated in wastewater. *Scientific Reports*, 10(1), 1–9. doi:10.103841598-020-64656-3 PMID:32404871

Global Carbon Atlas. (2019). <http://www.globalcarbonatlas.org/en/CO2-emissions>

Guu, Y., Chiu, C., & Young, J. (1997). Processing of Soybean Soaking Water with a NF - RO Membrane System and Lactic Acid Fermentation of Retained Solutes. *Figure*, 1(10), 4096–4100. doi:10.1021/jf970155z

Hadinnata, S. (2019). *Anaerobic Digestion of Slaughterhouse Wastewater : CO 2 Capture of Biogas Using Chlorella vulgaris*. doi:10.22146/ijc.25129

Hakiki, G. (2020). *Consumption of Calorie and Protein of Indonesia and Province - Based on the September 2019 Susenas* (N. Sahrizal & I. Sahara, Eds.). Badan Pusat Statistik.

Hang, X., Cao, W., Luo, J., Chen, X., Yin, J., Wang, Q., Luo, W., & Wan, Y. (2015). *Resource Recovery from Soybean Soaking Water by Ultrafiltration and Reverse Osmosis*. doi:10.1007/s11947-015-1531-y

Hidayat, N., Anggarini, S., & Sunyoto, N. M. S. (2016). Evaluation of two-stage biological treatment with attached filter media on treatment of tofu-processing wastewater. *International Journal of Applied Environmental Sciences*, 11(4), 1067–1076. <http://www.ripublication.com>

Hill, P. S., Tripathi, A. K., & Schauble, E. A. (2014). ScienceDirect Theoretical constraints on the effects of pH, salinity, and temperature on clumped isotope signatures of dissolved inorganic carbon species and precipitating carbonate minerals. *Geochimica et Cosmochimica Acta*, 125, 610–652. doi:10.1016/j.gca.2013.06.018

Indriyati & Diyono. (2012). Reaktor tipe fixed bed dan penerapannya pada industri tahu. *Jurnal Teknik Lingkungan*, 89–94.

Jaya, J. D., Ariyani, L., & Hadijah, H. (2019). Designing clean production of tofu processing industry in {UD}. Sumber Urup Pelaihari. *Jurnal Agroindustri*, 8(2), 105–112. doi:10.31186/j.agroind.8.2.105-112

- Jaya, J. D., & Lestari, E. (2019). Designing Clean Production in UD. Usaha Berkah Pelaihari Using 5R Approach. *Jurnal Ilmiah Inovasi*, 19(2). Advance online publication. doi:10.25047/jii.v19i2.1139
- Jiang, C., Wu, Z., Li, R., & Liu, Q. (2011). Technology of protein separation from whey wastewater by two-stage foam separation. *Biochemical Engineering Journal*, 55(1), 43–48. doi:10.1016/j.bej.2011.03.005
- Jiang, Y., Zhao, P.-F., Lin, S.-M., Tang, R.-J., Chen, Y.-J., & Luo, L. (2018). Partial substitution of soybean meal with fermented soybean residue in diets for juvenile largemouth bass. *Aquaculture Nutrition*, 24(4), 1213–1222. doi:10.1111/anu.12659
- Jonas, R., & Farah, L. F. (1998). Production and application of microbial cellulose. *Polymer Degradation & Stability*, 59(1–3), 101–106. doi:10.1016/S0141-3910(97)00197-3
- Kao, F.-J., Su, N.-W., & Lee, M.-H. (2003). Effect of Calcium Sulfate Concentration in Soymilk on the Microstructure of Firm Tofu and the Protein Constitutions in Tofu Whey. *Journal of Agricultural and Food Chemistry*, 51(21), 6211–6216. doi:10.1021/jf0342021 PMID:14518946
- Keating, B. A., Herrero, M., Carberry, P. S., Gardner, J., & Cole, M. B. (2014). Food wedges: Framing the global food demand and supply challenge towards 2050. *Global Food Security*, 3(3–4), 125–132. doi:10.1016/j.gfs.2014.08.004
- Khanpae, M., Karami, E., Maleksaeidi, H., & Keshavarz, M. (2020). Farmers' attitude towards using treated wastewater for irrigation: The question of sustainability. *Journal of Cleaner Production*, 243, 118541. doi:10.1016/j.jclepro.2019.118541
- Klemm, D., Heublein, B., Fink, H. P., & Bohn, A. (2005). Cellulose: Fascinating biopolymer and sustainable raw material. *Angewandte Chemie International Edition*, 44(22), 3358–3393. doi:10.1002/anie.200460587 PMID:15861454
- Kreutz, C., Carvalho, K. Q. De, Passig, F. H., Belini, A. D., Cordovil, C. S. D. C. M. S., & Gomes, S. D. (2018). Impact of the hydraulic loading rate on the hydrodynamic characteristics of an anaerobic fixed bed reactor treating cattle slaughterhouse wastewater. The hydrodynamic behavior of an anaerobic fixed bed reactor (AFBR) was evaluated in the treatment of cat. 4430.
- Kumar, V., Rani, A., & Husain, L. (2016). Investigations of {Amino} {Acids} {Profile}, {Fatty} {Acids} {Composition}, {Isoflavones} {Content} and {Antioxidative} {Properties} in {Soy} {Okara}. *Asian Journal of Chemistry*, 28(4), 903–906. doi:10.14233/ajchem.2016.19548
- Kurniawati, S. D., Supartono, W., & Suyantohadi, A. (2019). Life cycle assessment on a small scale tofu industry in Baturetno village – Bantu District - Yogyakarta. *IOP Conference Series. Earth and Environmental Science*, 365(1), 12066. doi:10.1088/1755-1315/365/1/012066
- Lammens, T. M., Gangarapu, S., Franssen, M. C. R., Scott, E. L., & Sanders, J. P. M. (2012). *Techno-economic assessment of the production of bio-based chemicals from glutamic acid*. doi:10.1002/bbb
- Libutti, A., Gatta, G., Gagliardi, A., Vergine, P., Pollice, A., Beneduce, L., Disciglio, G., & Tarantino, E. (2018). Agro-industrial wastewater reuse for irrigation of a vegetable crop succession under Mediterranean conditions. *Agricultural Water Management*, 196, 1–14. doi:10.1016/j.agwat.2017.10.015

Recovery of Energy and Materials From Small-Scale Tofu Processing Industries in Indonesia

- Lin, D., Liu, Z., Shen, R., Chen, S., & Yang, X. (2020). Bacterial cellulose in food industry: Current research and future prospects. *International Journal of Biological Macromolecules*, *158*, 1007–1019. doi:10.1016/j.ijbiomac.2020.04.230 PMID:32387361
- Liu, W., Wu, Z., Wang, Y., Li, R., & Huang, D. (2015). Isolation of soy whey proteins from isoflavones in the concentrated solution using foam fractionation. *Separation and Purification Technology*, *149*, 31–37. doi:10.1016/j.seppur.2015.05.010
- Lubis, D. M., Hamidah, U., Dwiartama, A., & Sintawardani, N. (2021). *Water footprint of tofu production: a case study in Giriharja, West Java, Indonesia*. Unpublished manuscript.
- Ma, C.-Y., Liu, W.-S., Kwok, K. C., & Kwok, F. (1996). Isolation and characterization of proteins from soymilk residue (okara). *Food Research International*, *29*(8), 799–805. doi:10.1016/0963-9969(95)00061-5
- Mao, C., Feng, Y., Wang, X., & Ren, G. (2015). Review on research achievements of biogas from anaerobic digestion. *Renewable & Sustainable Energy Reviews*, *45*, 540–555. doi:10.1016/j.rser.2015.02.032
- Mathimani, T., & Pugazhendhi, A. (2019). Biocatalysis and Agricultural Biotechnology Utilization of algae for biofuel, bio-products and bio-remediation. *Biocatalysis and Agricultural Biotechnology*, *17*(December), 326–330. doi:10.1016/j.bcab.2018.12.007
- Meylinah, S., Wright, T., & Meylinah, S. (2020). *Indonesia {Grain} and {Feed} {Annual} {Report} 2020*. <https://www.fas.usda.gov/data/indonesia-grain-and-feed-annual-4>
- Mohite, B. V., & Patil, S. V. (2014). A novel biomaterial: Bacterial cellulose and its new era applications. *Biotechnology and Applied Biochemistry*, *61*(2), 101–110. doi:10.1002/bab.1148 PMID:24033726
- Mutaqin, M. I., Widyarani, Hamidah, U., Janetasari, S. A., Muchlis, & Sintawardani, N. (2019). Biogas Consumption Pattern in Indonesia : (A Case Study of Sumedang Community Biogas Plant, Indonesia). *Proceeding - 2019 International Conference on Sustainable Energy Engineering and Application: Innovative Technology Toward Energy Resilience, ICSEEA 2019*, 113–118. 10.1109/ICSEEA47812.2019.8938624
- Nieto-Veloza, A., Zhong, Q., Kim, W.-S., D'Souza, D., Krishnan, H. B., & Dia, V. P. (2021). Utilization of tofu processing wastewater as a source of the bioactive peptide lunasin. *Food Chemistry*, *362*, 130220. doi:10.1016/j.foodchem.2021.130220 PMID:34098437
- Nilawati, D., Matsuura, N., Honda, R., Hara, H., & Neni, Y. (2021). Methane recovery from acidic tofu wastewater using an anaerobic fixed - bed reactor with bamboo as the biofilm carrier. *Journal of Material Cycles and Waste Management*, *23*(2), 537–547. doi:10.1007/10163-020-01145-9
- Nugroho, G., Sulistyanningrum, R., Melania, R., & Handayani, W. (2019). Environmental analysis of tofu production in the context of cleaner production: Case study of tofu household industries in {Salatiga}, {Indonesia}. *Journal of Environmental Science and Sustainable Development*, *2*(2), 127–138. doi:10.7454/jessd.v2i2.1021
- Palmieri, N., Forleo, M. B., & Salimei, E. (2017). Environmental impacts of a dairy cheese chain including whey feeding: {An} {Italian} case study. *Journal of Cleaner Production*, *140*, 881–889. doi:10.1016/j.jclepro.2016.06.185

- Pan, S., Alex, M., Huang, I., Liu, I., Chang, E., & Chiang, P. (2015). Strategies on implementation of waste-to-energy (WTE) supply chain for circular economy system : A review. *Journal of Cleaner Production*, 108, 1–13. doi:10.1016/j.jclepro.2015.06.124
- Perez-garcia, O., Escalante, F. M. E., Luz, E., & Bashan, Y. (2010). Heterotrophic cultures of microalgae : Metabolism and potential products. *Water Research*, 45(1), 11–36. doi:10.1016/j.watres.2010.08.037 PMID:20970155
- Poddar, M. K., & Dikshit, P. K. (2021). Recent development in bacterial cellulose production and synthesis of cellulose based conductive polymer nanocomposites. *Nano Select*, 2(January), 1–24. doi:10.1002/nano.202100044
- Pontas, K., & Muslim, A. (2015). Oxidation Process of H₂O/UV for COD Reduction of Wastewater from Soybean Tofu Production. *Makara Journal of Technology*, 19(3), 120–126. doi:10.7454/mst.v19i3.3043
- Qiao, Z., Chen, X. D., Cheng, Y., & Liu, H. (n.d.). Microbiological and Chemical Changes During the Production of Acidic Whey, A Traditional Chinese Tofu-Coagulant. *International Journal of Food Properties*, 37–41. doi:10.1080/10942910802180190
- Rajalakshmi, S. S. A. M., Jenny, M. N. S., & Dhandapani, A. R. (2020). Lab - scale degradation of leather industry effluent and its reduction by *Chlorella* sp. SRD3 and *Oscillatoria* sp. SRD2 : A bioremediation approach. *Applied Water Science*, 10(5), 1–11. doi:10.1007/13201-020-01197-0
- Rajwade, J. M., Paknikar, K. M., & Kumbhar, J. V. (2015). Applications of bacterial cellulose and its composites in biomedicine. *Applied Microbiology and Biotechnology*, 99(6), 2491–2511. doi:10.1007/00253-015-6426-3 PMID:25666681
- Ramaraj, R., & Dussadee, N. (2015). Biological purification processes for biogas using algae cultures. *RE:view*, 4, 20–32. doi:10.11648/j.ijrse.s.2015040101.14
- Rekha, C. R., & Vijayalakshmi, G. (2013). Influence of processing parameters on the quality of soycurd (tofu). *Journal of Food Science and Technology*, 50(1), 176–180. doi:10.1007/13197-011-0245-z PMID:24425905
- Revin, V., Liyaskina, E., Nazarkina, M., Bogatyreva, A., & Shchankin, M. (2018). Cost-effective production of bacterial cellulose using acidic food industry by-products. *Brazilian Journal of Microbiology*, 49, 151–159. doi:10.1016/j.bjm.2017.12.012 PMID:29703527
- Romli, M., & Suprihatin, S. (2009). Beban Pencemaran Limbah Cair Industri Tahu dan Anaisis Alternatif Strategi Pengelolaannya. *Jurnal Purifikasi*, 10(2), 141–154. doi:10.12962/j25983806.v10.i2.174
- Sakinah, N. E., Rahmatullah, L. T., Kuncoro, E. P., & Oktavitri, N. I. (2019). Performance of sequencing batch reactor (SBR) of treated tofu wastewater: Variation of contact time and activated sludge sources. *IOP Conference Series. Earth and Environmental Science*, 259(1), 012017. Advance online publication. doi:10.1088/1755-1315/259/1/012017
- Samuel, P. (1994). *Chitosan as a Coagulant for Recovery of Proteinaceous Solids from*. Academic Press.
- Sari, Y. W., & Division, B. (2021). *The protein challenge : Matching future demand and supply in Indonesia*. doi:10.1002/bbb.2176

Recovery of Energy and Materials From Small-Scale Tofu Processing Industries in Indonesia

Science, E., Fernandes, T. V., Shrestha, R., International, W., Sui, Y., & De Sousa, G. P. G. (2015). *Closing Domestic Nutrient Cycles Using Microalgae*. Advance online publication. doi:10.1021/acs.est.5b02858

Septifani, R., Suhartini, S., & Perdana, I. J. (2021). Cleaner production analysis of tofu small scale enterprise. *IOP Conference Series. Earth and Environmental Science*, 733(1), 12055. doi:10.1088/1755-1315/733/1/012055

Seroja, R., Effendi, H., & Hariyadi, S. (2018). Tofu wastewater treatment using vetiver grass (*Vetiveria zizanioides*) and zeliac. *Applied Water Science*, 8(1), 1–6. doi:10.1007/13201-018-0640-y

Setiawan, A., Jati, D. R., & Saziati, O. (2021). Penerapan produksi bersih industri kecil tahu di Jalan Parit Pangeran Siantan Pontianak. *Jurnal Rekayasa Lingkungan Tropis*, 5(1). <https://jurnal.untan.ac.id/index.php/jurlis/article/view/44564>

Shariatmadari, F., & Forbes, J. M. (2005). Performance of broiler chickens given whey in the food and/or drinking water. *British Poultry Science*, 46(4), 498–505. doi:10.1080/00071660500190900 PMID:16268109

Shilton, A. N., Powell, N., & Guieysse, B. (2012). Plant based phosphorus recovery from wastewater via algae and macrophytes. *Current Opinion in Biotechnology*, 23(6), 884–889. doi:10.1016/j.cop-bio.2012.07.002 PMID:22889679

Shurtleff, W., & Aoyagi, A. (2013). *History of tofu and tofu products (965 CE to 2013) : Extensively annotated bibliography and sourcebook*. Academic Press.

Sintawardani, N., Thye, Y. P., & Hamidah, U. 2013. Environmental Awareness of Local Government and Community to Support Applied Technological Solutions. In *Proc. The 12th Science Council Asia (SCA) Conference & International Symposium*. LIPI Press.

Sriwuryandari, L., Widayani, Priantoro, E. A., Muchlis, Hamidah, U., Sembiring, T., & Sintawardani, N. (2019). Performance of the three-stages anaerobic tofu wastewater treatment during the second start-up process. *IOP Conference Series: Earth and Environmental Science*, 277(1), 6–13. doi:10.1088/1755-1315/277/1/012010

Stephan, R. M., Mohtar, R. H., Daher, B., Embid Irujo, A., Hillers, A., Ganter, J. C., Karlberg, L., Martin, L., Nairizi, S., Rodriguez, D. J., & Sarni, W. (2018). Water–energy–food nexus: A platform for implementing the Sustainable Development Goals. *Water International*, 43(3), 472–479. doi:10.1080/02508060.2018.1446581

Sumardiono, S., Budiyo, B., Syaichurrozi, I., & Budi Sasongko, S. (2014). Utilization of Biogas as Carbon Dioxide Provider for *Spirulina platensis* Culture. *Current Research Journal of Biological Sciences*, 6(1), 53–59. doi:10.19026/crjbs.6.5498

Tambunan, T. (2019). Recent evidence of the development of micro, small and medium enterprises in Indonesia. *Journal of Global Entrepreneurship Research*, 9(1), 18. Advance online publication. doi:10.1186/40497-018-0140-4

Telaumbanua, M., Triyono, S., Haryanto, A., & Kusuma Wisnu, F. (n.d.). *Controlled electrical conductivity (EC) of tofu wastewater as a hydroponic nutrition*. <http://www.procedia-esem.eu>

- Thomas, D. N. (2004). Dissolved Organic Matter (DOM) in Aquatic Ecosystems: A Study of European Catchments and Coastal Waters. The Domaine Project.
- Tomczak, W., & Ferrasse, J. (2018). *ScienceDirect Effect of hydraulic retention time on a continuous biohydrogen production in a packed bed biofilm reactor with recirculation flow of the liquid phase.* doi:10.1016/j.ijhydene.2018.08.094
- van der Riet, W. B., Wight, A. W., Cilliers, J. J. L., & Datel, J. M. (1989). Food chemical investigation of tofu and its byproduct okara. *Food Chemistry*, 34(3), 193–202. doi:10.1016/0308-8146(89)90140-4
- Van Lier, J. B., Van Der Zee, F. P., Tan, N. C. G., Rebac, S., & Kleerebezem, R. (2001). Advances in high-rate anaerobic treatment: Staging of reactor systems. *Water Science and Technology*, 44(8), 15–25. doi:10.2166/wst.2001.0454 PMID:11730131
- Vishwanathan, K. H., Govindaraju, K., Singh, V., & Subramanian, R. (2011). Production of Okara and Soy Protein Concentrates Using Membrane Technology. *Journal of Food Science*, 76(1), E158–E164. doi:10.1111/j.1750-3841.2010.01917.x PMID:21535668
- Wagiman, W., & Suryandono, A. (2014). A Tofu Wastewater Treatment with A Combination of Anaerobic Baffled Reactor and Activated Sludge System. *AgriTECH*, 26(1). Advance online publication. doi:10.22146/AGRITECH.9471
- Wang, H. L., & Cavins, J. F. (1989). Yield and amino acid composition of fractions obtained during tofu production. *Cereal Chemistry*, 66(5), 359–361.
- Wang, S. K., Wang, X., Miao, J., & Tian, Y. T. (2018). Tofu whey wastewater is a promising basal medium for microalgae culture. *Bioresource Technology*, 253, 79–84. doi:10.1016/j.biortech.2018.01.012 PMID:29331517
- Widayat, P. J., & Wibisono, J. (2018). Cultivation of Microalgae *Chlorella* sp on Fresh Water and Waste Water of Tofu Industry. *E3S Web of Conferences*, 31, 2017–2019. doi:10.1051/e3sconf/20183104009
- Widyarani, B. B., Butar Butar, E. S., Dara, F., Hamidah, U., Sriwuryandari, L., Hariyadi, H. R., & Sintawardani, N. (2019). Distribution of protein fractions in tofu whey wastewater and its potential influence on anaerobic digestion. *IOP Conference Series. Earth and Environmental Science*, 277(1), 012012. Advance online publication. doi:10.1088/1755-1315/277/1/012012
- Widyarani, V., Victor, Y., Sriwuryandari, L., Priantoro, E. A., Sembiring, T., & Sintawardani, N. (2018). Influence of pH on biogas production in a batch anaerobic process of tofu wastewater. *IOP Conference Series. Earth and Environmental Science*, 160(1), 012014. Advance online publication. doi:10.1088/1755-1315/160/1/012014
- Xu, F., Khalaf, A., Sheets, J., Ge, X., Keener, H., & Li, Y. (2018). Phosphorus Removal and Recovery From Anaerobic Digestion Residues. In *Advances in Bioenergy* (1st ed., Vol. 3). Elsevier Inc., doi:10.1016/bs.aibe.2018.02.003
- Zhong, C. (2020). Industrial-Scale Production and Applications of Bacterial Cellulose. *Frontiers in Bioengineering and Biotechnology*, 8, 1–19. doi:10.3389/fbioe.2020.605374 PMID:33415099

Chapter 14

The Effect of Chinese Green Transformation on Competitiveness and the Environment

Poshan Yu

 <https://orcid.org/0000-0003-1069-3675>

Soochow University, China

Andong Jiao

Independent Researcher, China

Michael Sampat

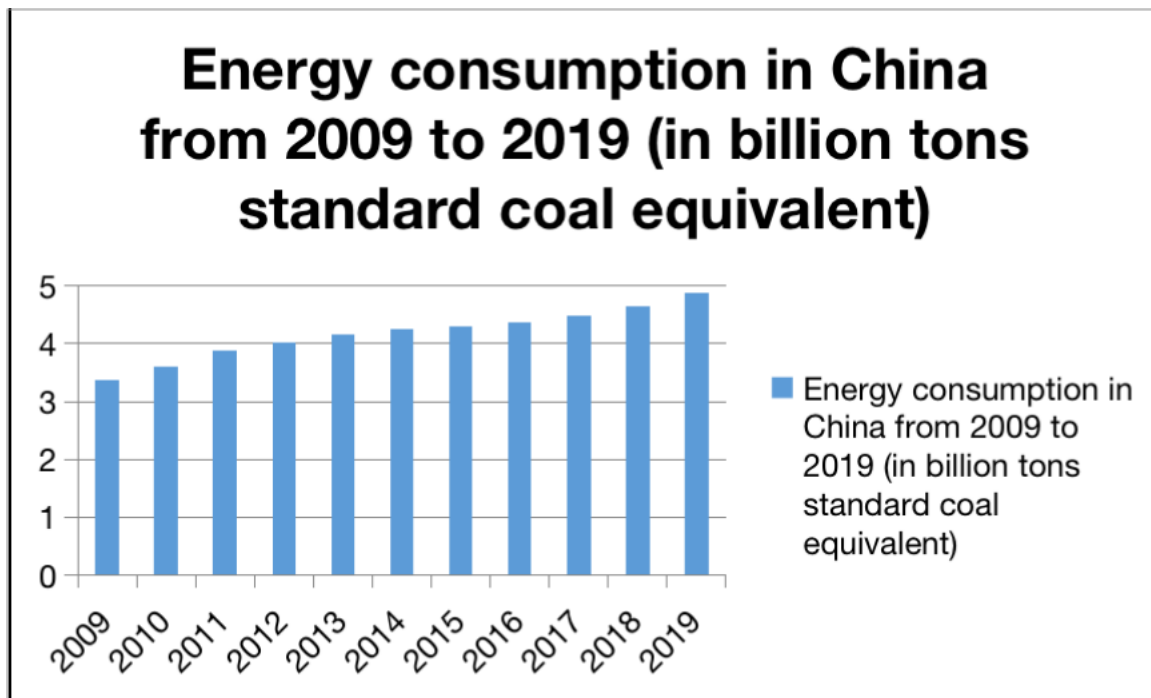
Independent Researcher, Canada

ABSTRACT

People in China are paying more attention to environmental issues as they increase in importance and consequence. At the same time, the Chinese government has gradually begun paying more attention to the environment, advocating sustainable development. The government has been actively developing green financial products such as green loans, green insurance, green funds, and other financial products to help Chinese companies “go green” and reach peak carbon and carbon-neutral goals ahead of schedule. China attaches great importance to its “green transformation” goals, as can be seen from the number of new policies related to green and sustainable development. Under these circumstances, companies must follow the policy and carry out green upgrades or risk total failure. This chapter mainly discusses the background of what firms face in China’s green finance environment, taking clean energy, green buildings, and green transportation as examples of how companies should adapt to these trends and improve their competitiveness.

DOI: 10.4018/978-1-7998-9664-7.ch014

Figure 1.



INTRODUCTION

After the implementation of reforms and opening up in 1978, China achieved rapid economic development, but this development also consumed a lot of energy. In 2009, China became the world's largest energy consumer (Wang, 2010). Energy consumption is closely correlated with environmental pollution. The more energy consumed, the more pollution generated. Over the years, economic growth has made the environmental situation worse and worse (Xiong & Xu, 2020). Zhang and Vigne (2021) noted that developing countries, especially China, have experienced rapid economic development along with serious environmental damage.

With the increasing frequency of severe weather conditions, more and more countries, in addition to China, have realized the importance of the environment, striving to promote sustainable economic development. In the process of achieving this goal, countries need to strike a balance between reducing emissions and promoting economic development. In 2016, the People's Bank of China took the lead in issuing the "Guiding Opinions on Building a Green Financial System." They clearly stated that green finance supports environmental improvement, responds to climate change, saves resources, increases energy efficiency, and provides financial services for project investment, project operation, and risk management in the fields of green transportation and green buildings. Thus, green finance contributes to the sustainable development of China.

This chapter introduces the development status of green buildings, clean energy and green transportation in the context of Chinese promotion of green development. According to the "China Building Energy Research Report (2020)," the total energy consumption of construction in 2018 was the equivalent of

Figure 2.

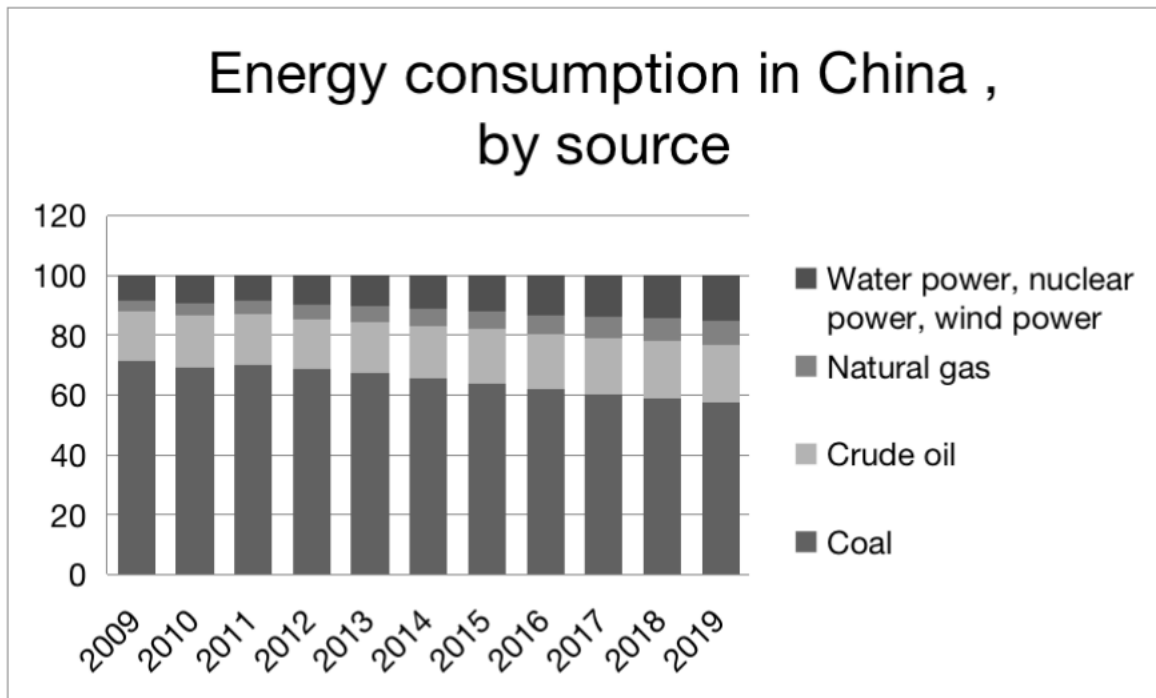


Figure 3.

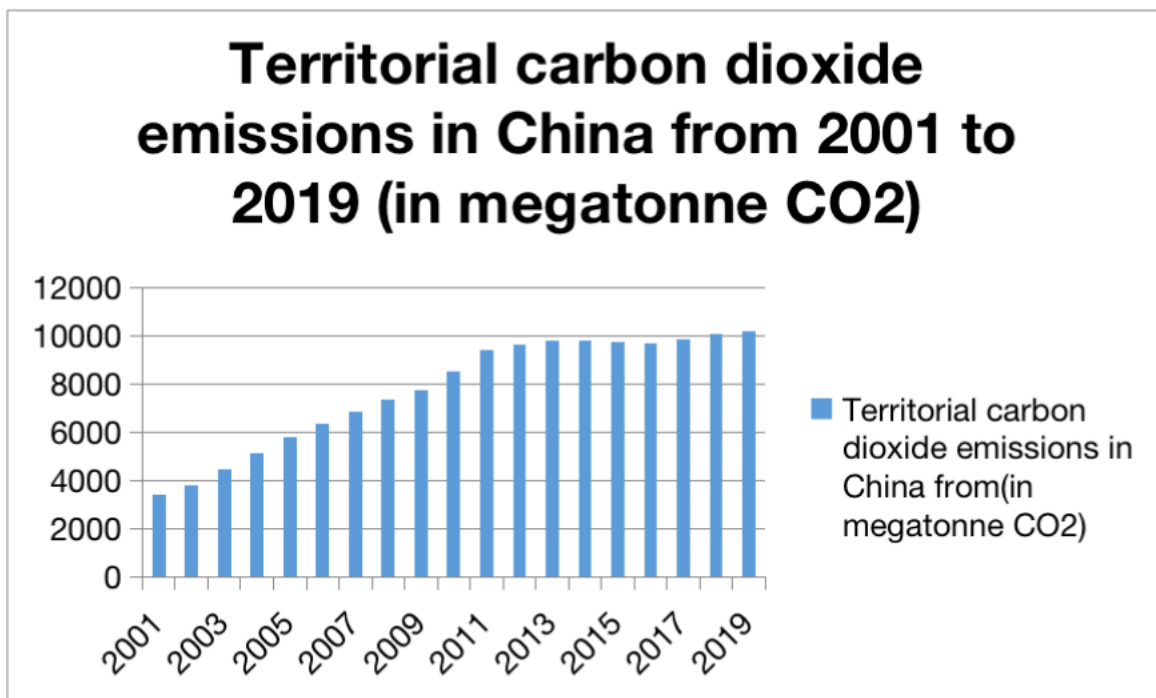
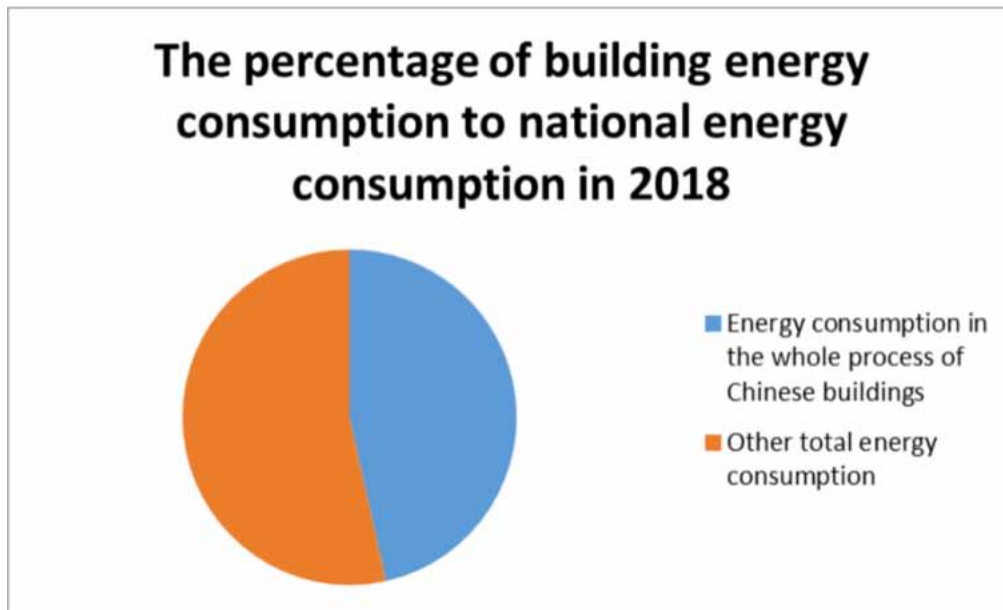


Figure 4.



2.147 billion tons of coal. This accounted for 46.5% of the total national energy consumption. The total carbon emission from all construction was 4.93 billion tons of carbon dioxide, accounting for 51.3% of national carbon emissions. The energy consumption and carbon emissions of China's construction industry are huge, meaning the possibilities for green transformation are as well.

In 1992, China proposed the need to develop green buildings. The term "green buildings" refers to high-quality buildings that use energy efficiently and reduce pollution emissions during construction. "Green building technology" refers to technologies such as solar thermal photovoltaic systems, green lighting systems, HVAC systems, green roofs, and energy-saving technologies (Yang et al., 2021). The construction industry needs to adopt green building technologies to facilitate the transformation from general buildings to green buildings. However, due to the high cost of green buildings, the period before a return can be accrued on investment is longer than that of ordinary buildings. Few companies have overcome these obstacles. For the incremental cost of green buildings, Yang et al. believe that the government needs to combine environmental taxes, green subsidies, and carbon emission markets to provide comprehensive subsidies to companies. Chinese first "National Standard for Energy-saving Design of Public Buildings" (GB50189-2005) was released in 2005 and revised in subsequent years until the new version of GB/T 50378 officially implemented the green building evaluation system on August 1, 2019 (Yang et al., 2021). China has also incorporated green development into the "13th Five-Year Plan," forming a policy framework for the green development of the construction industry.

As far as the need for clean energy is concerned, after the PM_{2.5} haze crisis in the winter of 2013, China's air pollution index was listed as "exceeded", especially in Beijing, which has surpassed the worst level of the air quality index 500 (Jiang et al., 2014). Such harsh climate conditions have severely affected people's lives. Visibility of fewer than 5m left an indelible impression in the hearts of Chinese people. Since then, air pollution control policies have become a high priority. The transformation of the energy system is regarded as a key component of the sustainable energy strategy, and the concept of "coal to

Figure 5.

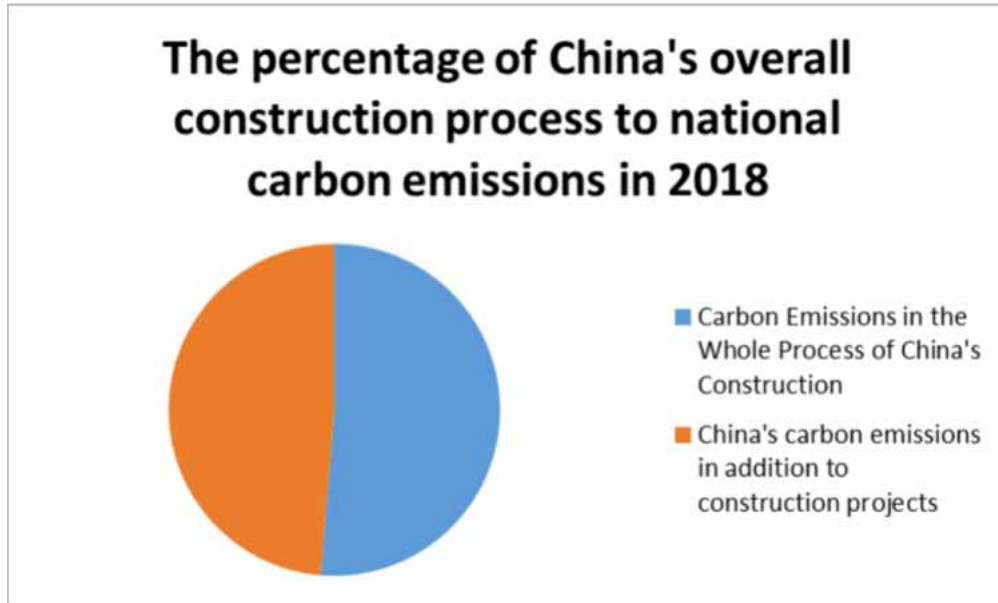


Figure 6.

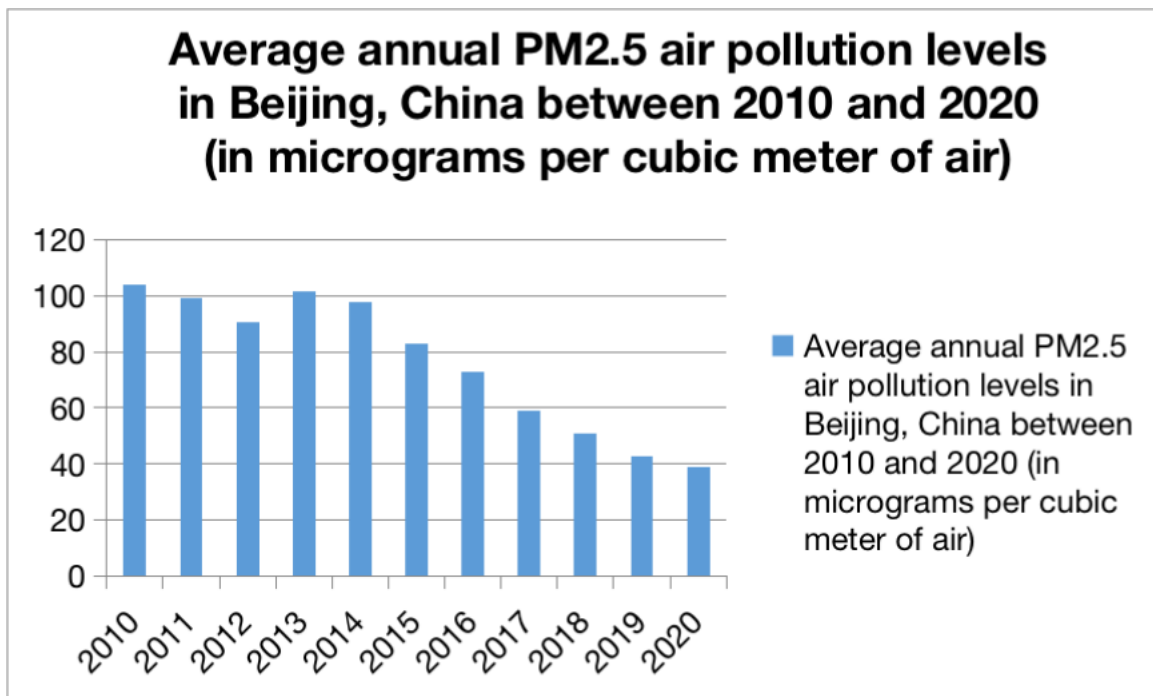
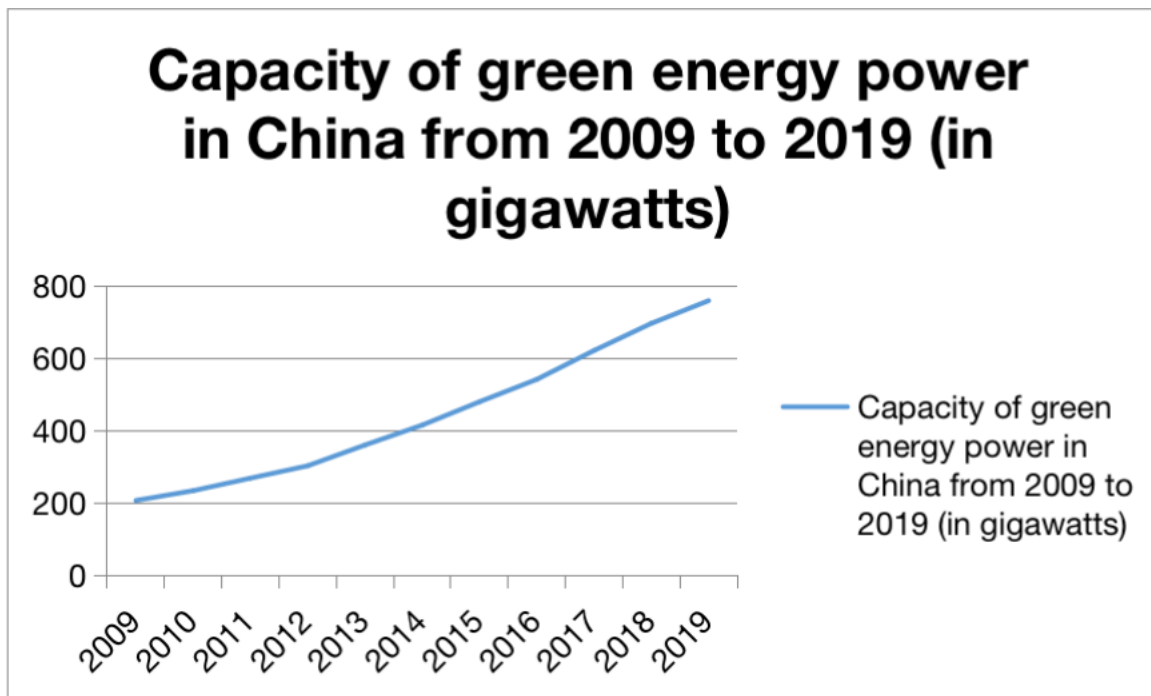


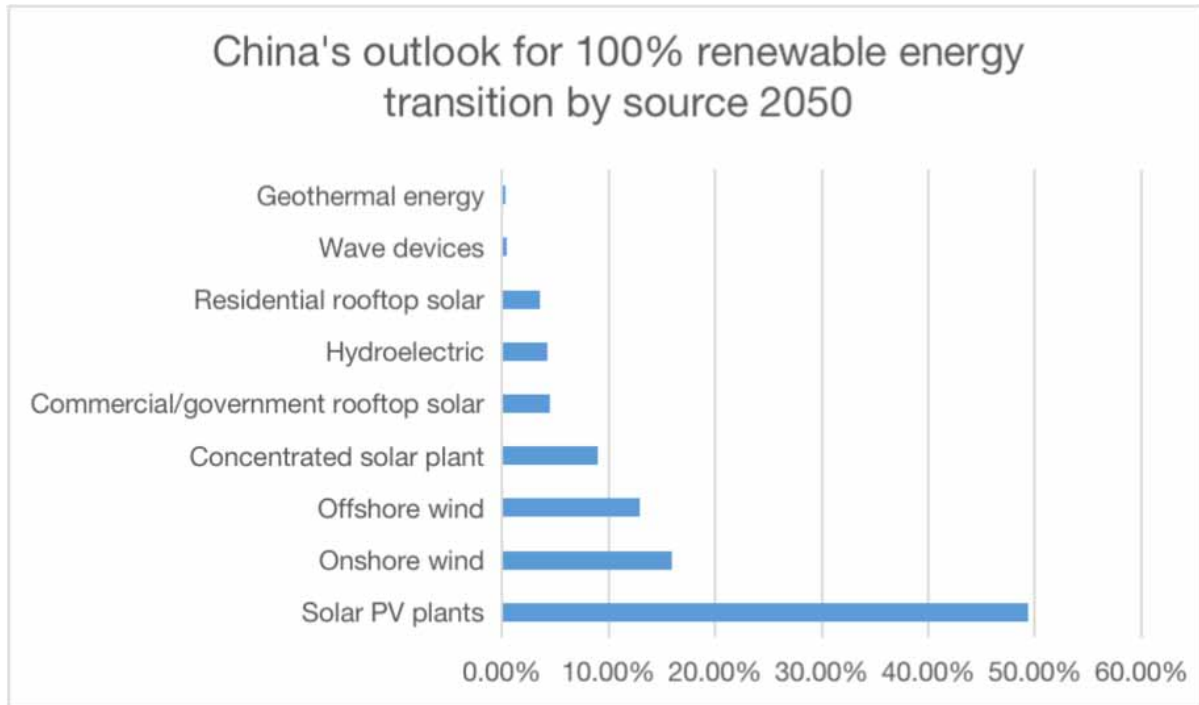
Figure 7.



gas/electricity” has been proposed for the first time (Zhang et al., 2020). This has led to a significant reduction in air pollution in China in recent years, but it is still not enough, because Zhang and Zhong (2011) showed that China’s demand for energy is increasing, so it is also advocating energy conservation and emission reduction. In this context, electricity has been prioritized as an energy consumption product, and the pace of replacing coal and gas with electricity has been accelerated. Electricity is a greener form of energy than fuel oil and natural gas combustion because clean energy sources such as hydropower, wind power, and solar energy can also be used to generate electricity, providing a green alternative to conventional fossil fuels for power generation (Gu, 2020). During the “14th Five-Year Plan” period, China plans to promote centralized construction, deploy a number of power supply bases and transmission channels, nine clean energy bases, and four wind power bases with new energy as the main source. This will enable the orderly development of wind power and photovoltaic power generation, actively promote the construction of clean energy bases with complementary multi-source energy, and the ecological benefits provided by China’s energy base will lead the world (Li et al., 2021). “The 14th Five-Year Plan for National Economic and Social Development of the People’s Republic of China and the Outline of Long-term Goals for 2035” states China will attach great importance to nine clean energy bases: Songliao, Hebei, Jiziwan of the Yellow River, Hexi Corridor, the upper reaches of the Yellow River, Xinjiang, the upper reaches of the Jinsha River, the Yalong River, and the lower reaches of the Jinsha River. Offshore wind power bases include Fujian, Zhejiang, Jiangsu, and Shandong offshore wind power bases. In addition to these large energy bases, the government also needs to pay attention to start-ups in the clean energy industry. Peng & Liu (2020) argue that government subsidies help guide and promote the survival and development of start-up companies, inject new vitality into the clean energy

Figure 8.

(Supplement the content of the ellipsis: Concentrated solar plant; Commercial/Government rooftop solar; Residential rooftop solar)

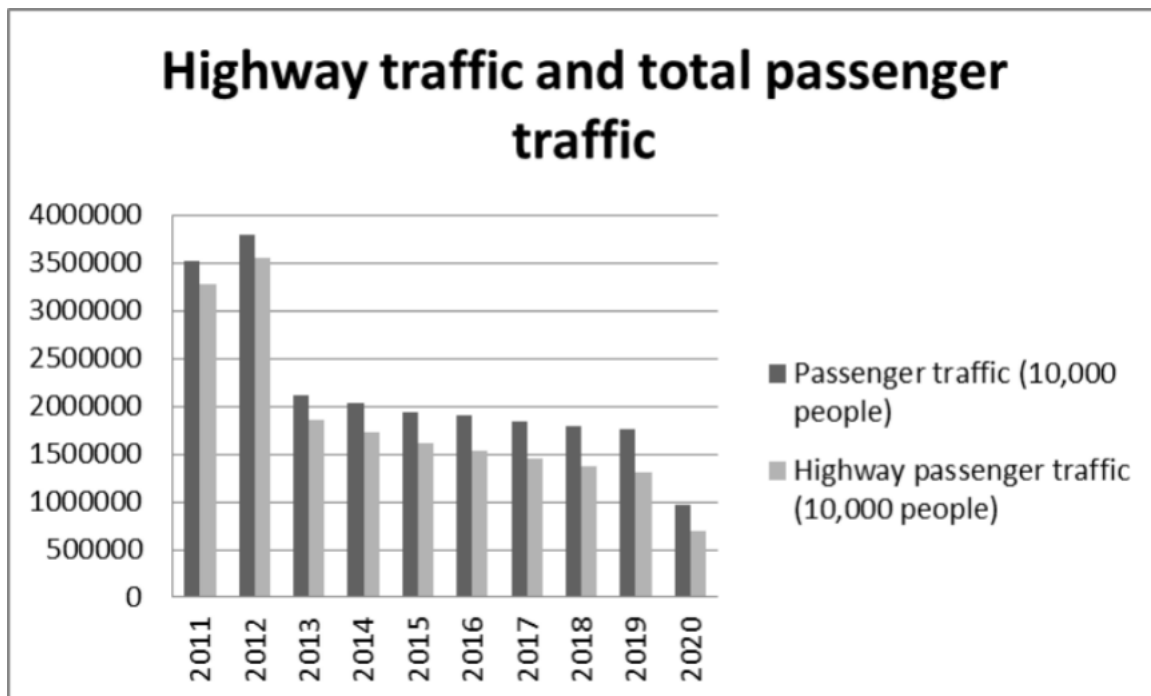


market, and achieve public-private cooperation to promote China's goal of realizing carbon neutrality ahead of schedule.

In China, the construction of transportation infrastructure is only undertaken by the state. From the comparison of highway passenger traffic and total passenger traffic in Figure 9, it can be seen that passenger travel in China occurs mainly by highway. Road traffic is very important to Chinese transportation. The development of the transportation industry has also led to more pollutants being discharged into the air. Therefore, the sustainable development of the transportation industry is an inevitable trend. Within that area, transportation infrastructure plays a fundamental role in reducing pollution emissions and preventing global environmental degradation (Sun et al., 2019). In 2020, Chinese provincial finance promoted the construction of key transportation areas and key projects, the development of railways, ordinary trunk lines, transportation by water, as well as other transportation methods, aiding in energy-saving and emission-reduction. In addition, technological progress plays a key role in promoting the development of green transportation (Yang et al., 2021). Today, lithium batteries are widely used in automobiles and public transportation, actively promoting the replacement of fuel with electricity, but lithium is not enough for China. In the future, hydrogen will replace petroleum as a fuel for vehicles and will not produce carbon emissions (Tarhan & Çil 2021). If hydrogen fuel cells can reach widespread use, they will inevitably lead to a reduction in the emission of pollutants in the entire transportation industry and may even achieve zero emissions.

On September 22, 2020, Chinese President Xi Jinping announced at the United Nations General Assembly that China strives to achieve carbon peaks by 2030 and achieve carbon neutrality by 2060. This

Figure 9.



demonstrates China’s determination to actively respond to climate change and promote the flourishing of human civilization. This also requires higher standards for the development of green finance.

This chapter will analyze what enterprises in the fields of clean energy, green transportation, and green building should do in the business environment of this era, how they contribute to sustainable development without sacrificing competitiveness, and how the government should regulate and guide the behavior of enterprises to achieve the common goal: sustainable development.

Following the introduction, the remainder of the paper is organized as follows: Section 2 reviews the development of China’s green finance; Section 3 shows how the Chinese government has assisted enterprises to reduce pollution and stimulate their green transformation. Section 4 examines successful and unsuccessful cases of enterprises that have gone green. Section 5 analyzes the opportunities and challenges enterprises face. Section 6 presents policy suggestions and the conclusion.

DEVELOPMENT OF CHINA’S GREEN FINANCE

As early as August 2005, when Xi Jinping was in Huzhou, Zhejiang, he first put forward the philosophical thesis that “green water and green mountains are golden mountains and silver mountains”, indicating that China’s future progress needs to integrate green development into society. When the domestic green finance market was still in its infancy, Industrial Bank became a leader in domestic green finance. In October 2008 it became the first “Equator Bank” in China. This not only marks the introduction of advanced international models by Industrial Bank in strengthening environmental and social risk management, but also provides a template for other banks and financial institutions to learn from (Liu and Shen, 2011).

The Effect of Chinese Green Transformation on Competitiveness and the Environment

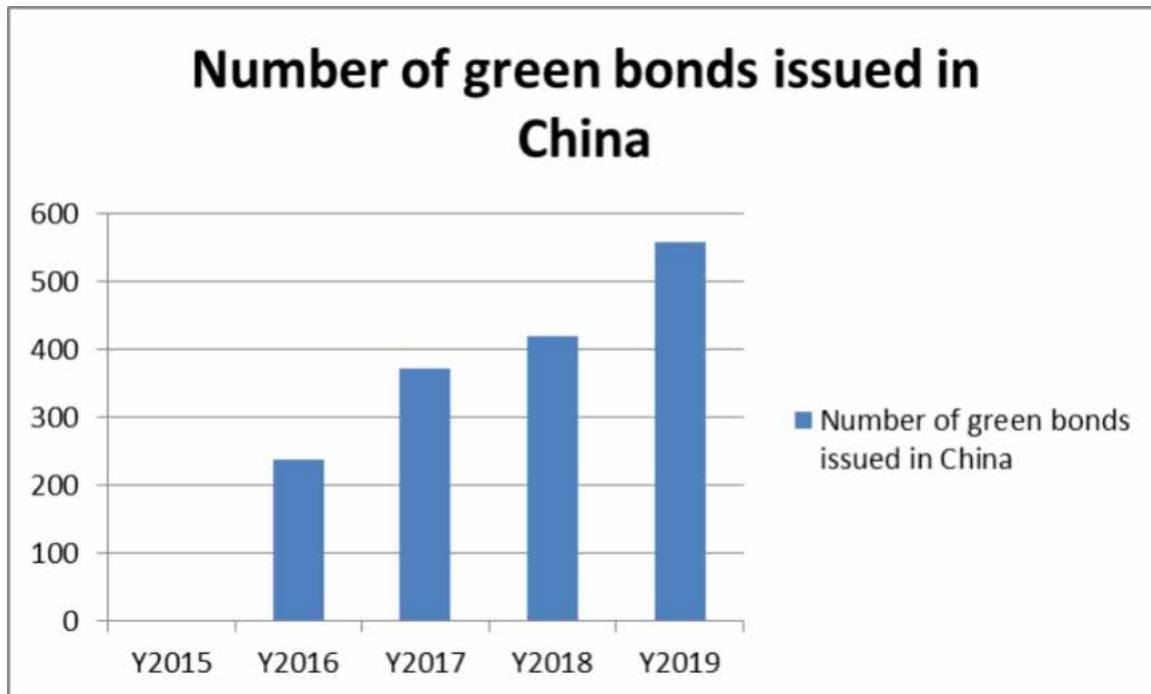
In 2007, China began building its green credit policy system. Now it has formed an institutional system with statistics and systematic evaluation at the core. The first green financial product label in China was green credit, which can be traced back to 2012 when the China Banking Regulatory Commission issued guidelines for green credit and the 2013 statistical system. These guidelines aimed to improve carbon efficiency and reduce emissions, impose interest rate penalties on companies that use low energy efficiency or pollute the environment, and guide more funds from commercial banks to low-carbon and environmentally friendly companies (He et al., 2019). In addition to green credit, there are other financial products such as green bonds, green insurance, and green funds to help companies accrue capital to make green transformations and encourage green and sustainable projects. What follows is an introduction to the development history of four financial products in China.

Compared with other developed countries in Europe and the United States, China's green bonds started relatively late, releasing the first discounted green bond in 2016. However, as the volume of China's green market is the largest in the world (Climate Bonds Initiative, 2019), China's green bond market has scaled up very quickly. As of the end of 2020, the cumulative value of green bonds issued by China has reached RMB 1.2 trillion, ranking second in the world. At the same time, China's green bond standards are becoming more and more sophisticated, the criteria for defining green projects have become more precise, and they are getting much closer to international standards, eliminating questions about whether some green bonds in China are really green from an international perspective (Shishlov et al., 2016). In 2020, the People's Bank of China, the Development and Reform Commission, and the China Securities Regulatory Commission clearly defined green bonds as referring to securities with debt-service that use raised funds to support green industries, green projects, or green economic activities that meet the prescribed criteria following legal procedures. The Green Bond Catalogue accepted six eligible categories of green bonds: Energy Saving, Pollution Prevention and Control, Resource Conservation and Recycling, Clean Transportation, Clean Energy, and Ecological Protection and Climate Change Adaption (Research Center for Green Finance Development, 2021).

Green insurance is the oldest green financial product besides green credit. Green insurance, also known as ecological insurance, is the basic means of risk management in the green economy and is used to promote the green transformation of the industry. As Wang et al. (2017) wrote, enterprises can also use green insurance to reduce the risk of green innovation. Since 2008, China has been piloting environmental pollution liability insurance in some high-risk industries. New energy industries such as photovoltaic power generation and wind power have increased demand for green insurance due to reduced government subsidies and their own instability. In addition, China has also offered economic compensation to enterprises suffering from unexpected circumstances.

A green fund is a special investment fund established for energy conservation, emission reduction strategies, low-carbon economic development, and environmental optimization and transformation projects. Its purpose is to promote the development of energy conservation and emission reduction through capital investment. In China, government-supported investment funds are playing a leading role in the country's capital market development. In 2020, China will set up the first national government investment fund, the National Green Development Fund, to promote the green transformation of traditional industries and accelerate the development of energy-saving and environmentally-friendly green industries. Schulz and Feist (2021) wrote that green climate funds, one type of green fund, have played an important role in mobilizing climate finance to achieve the Sustainable Development Goals and the goals of the Paris Agreement.

Figure 10.



In July 2015, Chinese President Xi Jinping formally put forward the concept of ‘green development’ at the Fifth Plenary Session of the 18th Central Committee of the Communist Party of China. He presented it as an important part of China’s economic and social development in the ‘13th Five-Year Plan’ period and a vital paradigm for the future.

According to The People’s Bank of China (2016), the industries that need to urgently employ green finance mainly include transportation, clean energy, green buildings, and green agriculture. At the same time, the People’s Bank of China took the lead in initiating the “Guiding Opinions on Building a Green Financial System,” which clarified the direction and tasks of Chinese green finance development, thus China became the first country in the world to designate a top-level financial design. Since then, green finance has accelerated its development. 2016 became a watershed in the history of Chinese green finance development.

At present, the “five pillars” supporting the green financial system have taken shape: First, the accelerated construction of the green financial standard system, maintaining a necessary focus on the three major areas of climate change, pollution control, and energy reduction. The goal is to promote the establishment and improvement of a domestic green financial standard system that can lead to a rapid expansion of a new finance practice: green bond issuance (Wang et al., 2020). The second is the continuous strengthening of information disclosure requirements and strict supervision of financial institutions, because inadequate disclosure may exacerbate information friction (Du et al, 2018). The third is the integration of points and areas with the incentive and restraint mechanism gradually improved, based on green credit performance evaluation, exploring more active and comprehensive green financial performance evaluations, and guiding financial institutions to increase green assets proportionally. The fourth

The Effect of Chinese Green Transformation on Competitiveness and the Environment

is the continuous enrichment of green financial tools and market systems. China has formed a multi-level green financial product and market system including green loans, green bonds, green insurance, green funds, green trusts, and carbon financial products, etc., providing a diversified financing channel. Green technology is also essential because technological innovation is one of the driving forces of these green products (Wang et al., 2021). Fifth, international cooperation in green finance is deepening and international idea-sharing improves green finance implementation.

In September 2020, China announced that it will strive to achieve peak carbon emissions by 2030 and carbon neutrality by 2060. Peak carbon refers to the point when carbon dioxide emissions reach their high, gradually reducing after reaching the peak. Carbon neutrality refers to the calculation of the total amount of greenhouse gas emissions produced directly or indirectly by enterprises, groups, or individuals within a certain period, and then offset through plant afforestation, energy-saving and emission reduction, etc., to achieve carbon dioxide “zero emission.” This will probably contribute more than 80% to air quality improvement from 2019 to 2060 (Shi et al., 2021). This is China’s plan for achieving green transformation in the future. For the financial industry, this means a vast space for incremental advancement and a new stage of development.

At the end of June 2021, China’s carbon emission trading market will be officially launched nationwide through pilot openings in Beijing, Shanghai, Shenzhen, Tianjin, and other locations. The goal of the carbon trading market is to control the total amount of carbon emissions through the trading of carbon emission rights. Companies that exceed emission limits must buy allowances in the carbon market, and companies that successfully maintain low emissions can sell excess allowances. This will further strengthen the carbon market’s regulatory role in carbon emission reduction and green financial resource allocation, enhancing market liquidity. Furthermore, the effect of the carbon market in driving carbon neutralization is reflected in stimulating innovation and development in low-carbon technology and emission reduction technology (Chen & Lin, 2021).

The following is a summary of the characteristics of China’s green finance development:

1. Late Start - The concept of green finance was first proposed in 1991. The following year, the United Nations Conference on Environment and Development adopted the Rio Declaration on Environment and Development and Agenda 21 to promote green finance. In China, in 2007, after the State Environmental Protection Administration, the Head Office of the People’s Bank of China, and the Banking Regulatory Commission jointly issued the ‘Opinions on Implementing Environmental Protection Policies and Regulations to Prevent Credit Risks’, green finance began to develop in China, later than Western countries (Zhang et al., 2021). China’s financial products, such as green credit, green bonds, and green funds, have also developed relatively late compared to other developed countries.
2. Rapid Development - Although Chinese green financial products started late, with green loans beginning to slowly develop in 2007 and green bonds not being issued until 2016, by 2020 the green loan balance will exceed 11 trillion yuan, ranking first in the world. The stock of green bonds is about 1 trillion yuan, ranking second in the world, and by issuance volume China has become the world’s largest green bond market (Climate Bonds Initiative, 2019). The speed of China’s green finance development far exceeds any other country in the world and this trend seems set to continue.
3. Vast Market Prospects - Green bonds are a good example. According to Jones et al. (2020), the average subscription amount of green bonds at the time of listing exceeds three times the issuance

- amount. On the one hand, this shows investors' concern for the environment and their confidence in green bonds. On the other hand, it also reflects the vast potential of China's green bond market.
4. National Strategic Support - In the past two decades, China has paid more and more attention to environmental issues. The increase in environmental problems has greatly improved China's green awareness and response. China is vigorously advocating sustainable development, just as Xi Jinping said that the green water and golden mountains are the golden mountains and silver mountains. Furthermore, many policies have been issued to support clean energy, green transportation, and green buildings. For example, green credit policy allocates capital through the financial market to achieve emission reduction purposes, making it an important strategic tool for China to develop the green economy in the new era (Zhang et al., 2021).
 5. Active Communication and Learning from Other Countries - Not only has China made progress internally, but China is also teaching its own green methodology to the world. In 2016, China initiated the Green Finance Study Group (GFSG) during its G20 Presidency, helping different countries communicate and learn from each other (Research Center for Green Finance Development, 2021). Chen and Lin (2021) believe nations should cooperate in carbon markets because the establishment of national carbon markets and their collaboration internationally will more effectively promote global carbon emission reduction and climate governance.

THE ROLE OF GOVERNMENT IN ASSISTING CHINESE BUSINESSES WITH GREEN FINANCE INTEGRATION

Since the cost and the risks of green transformation are both too high, individuals or firms seldom have the opportunity to access the abundant financing available. As Yu et al. (2020) points out, in agriculture the adoption of green control techniques requires the purchase of additional equipment, which involves a high input cost. But credit constraints in their financing process limit growth. Without outside help, the period of green transformation will be too long. Hence, the government must play its role and issue preferential policies, contributing to their financing to shorten the green transformation period (He et al., 2019).

As Liu et al. (2019) argued, the green credit policy system plays a guiding role in the allocation of credit resources, boosting green development. To have a clear understanding of the policy behind green finance in China, this part collects and summarizes the relevant policies, laws, guidelines and documents promulgated by the Chinese government from 2001 to 2021. The particular contents are listed in Table 1, which shows how China helped enterprises to implement green transformation.

The Chinese government has supported enterprises by promulgating these policies related to green development. Jiao et al. (2020) argued the support of the government and the competitiveness of the company have a mutually reinforcing effect.

The Effect of Chinese Green Transformation on Competitiveness and the Environment

Table 1.

Issuing date	Issuing departments	policies	Summary of content
1995	The People's Bank of China	Notice on issues related to the implementation of credit policies and strengthening environmental protection	Emphasized that the financial sector needs to protect the environment in credit work
2007	China Banking Regulatory Commission	Guiding Opinion on Credit for Energy Saving and Emission Reduction: Limit financing to high pollution and high energy consumption projects	It is proposed to give full play to the important role of the banking industry in energy conservation and emission reduction, and actively adjust and optimize the credit structure
2012	China Banking Regulatory Commission	Green Credit Guidelines	Defining three pillars of banking financial institutions in developing green loans
2013	China Banking Regulatory Commission	Promote green credit statistics system	Establish a comprehensive green credit statistics system
2013	China Banking Regulatory Commission	Green Credit Statistics System	Separating green loans into two categories
2013	Ministry of Ecology Environment, China Banking Regulatory Commission	Guidance on Pilot Work of Compulsory Liability Insurance for Environmental Pollution	Clarify the scope of pilot enterprises for compulsory environmental pollution liability insurance, establish and improve environmental risk prevention and pollution accident compensation mechanisms, and enable relevant departments to realize the importance of compulsory environmental pollution liability insurance work
2014	China Banking Regulatory Commission	Key evaluation indicators for the implementation of green credit	Established more than 100 indicators to standardize organizational management, capacity building, process management, internal control management, information disclosure, etc.
2015	State Council	The overall plan for the reform of the ecological civilization system	The top-level design for establishing China's green financial system was clarified for the first time
2015.12	The People's Bank of China	Announcement on issues related to the issuance of green finance bonds in the Inter-bank Bond Market	Clarified the necessary conditions and requirements for the issuance of green financial bonds by financial institutions as legal persons
2015.12	The People's Bank of China	Green Bond Endorsed Projects Catalogue	This is China's first document on the definition and classification of green bonds, which defines and classifies China's green bonds
2015	National Development and Reform Commission	Green Bond Issuance Guidelines	Introduced the scope of application, support focus and review scope of green bonds
2015.5	Ministry of Finance, National Development and Reform Commission, The People's Bank of China	Circular on the Guidance of Promoting PPP Model in the Field of Public Service	To promote the government and social capital cooperation model in the field of public services, all regions should attach great importance to it and work together to implement it
2015	National People's Representative Meeting	new Environmental Protection Law	The state encourages the insurance against environmental pollution liability
2015	CPC Central Committee and the State Council	Opinions to Accelerate the Construction of Ecological Civilization	Deepen the pilot work of environmental pollution liability insurance
2015	CPC Central Committee and the State Council	Overall Reform Plan for the Ecological Civilization System	It put forward to establish the compulsory liability insurance system for environmental pollution in high-risk areas, and defined compulsory environmental pollution liability insurance system as an important reform task
2015	China Banking Regulatory Commission	Energy Efficiency Credit Guidelines, National Development and Reform Commission	It encourages and guides banking financial institutions to actively carry out energy efficiency credit business, and clarifies that the key service areas of energy efficiency credit are energy-saving projects
2016	The National People's Congress of the People's Republic of China and the Chinese People's Political Consultative Conference	The "Thirteenth Five-Year Plan"	Clearly state that a modern financial system should be established to support the development of green finance
2016.8	Seven ministries including the People's Bank of China and the Ministry of Finance	The "Guiding Opinions on Building a Green Financial System"	Mark that China has become the world's first economy to establish a relatively complete green financial policy system
2016	Ministry of Industry and Information Technology	Notice on Issuing the Industrial Green Development Plan (2016-2020)	Accelerate the construction of ecological civilization and promote the green development of industry
2016	State Council	Notice on Issuing the Work Plan for Controlling Greenhouse Gas Emissions during the 13th Five-Year Plan	Ensure the completion of the low-carbon development goals and tasks set out in the "13th Five-Year Plan" outline, promote carbon dioxide emissions to peak around 2030 and strive to reach the peak as soon as possible
2016.9	Seven ministries including the People's Bank of China and the Ministry of Finance	Guiding Opinions on Building a Green Financial System	The People's Bank of China vigorously develops green credit, establishes a green development fund, mobilizes social capital, develops green insurance, and improves the environmental rights trading market, etc.
2016	Shanghai Stock Exchange	Notice on launching the pilot green corporate bonds	Put forward requirements for the issuance of green bonds and encourage investment in green bonds
2016	CSRC instructed Shanghai Stock Exchange	Notice of Launching the Pilot Zone of Developing Green Corporate Bond (The supported project catalogue is the same to the Catalogue issued by the PBOC on 22 Dec. 2015)	Explains the requirements for the issuer to apply for the pre-review of the listing of green corporate bonds or confirmation of listing conditions, listing and trading, or listing and transfer
2016	CSRC instructed Shenzhen Stock Exchange	Notice of Launching the Pilot Zone of Developing Green Corporate Bond (The supported project catalogue is the same to the Catalogue issued by the PBOC on 22 Dec. 2015)	Explains the requirements for the issuer to apply for the pre-review of the listing of green corporate bonds or confirmation of listing conditions, listing and trading, or listing and transfer

continued on following page

The Effect of Chinese Green Transformation on Competitiveness and the Environment

Table 1. Continued

Issuing date	Issuing departments	policies	Summary of content
2016	National Development and Reform Commission	Green Bond Issuance Guidelines	It introduces the scope of application and support focus of green bonds, and points out its review requirements and related policies
2017.1	People's Bank of China and China Securities Regulatory Commission	Guidelines for Green Bond Evaluation and Certification (Interim)	Standardize green bond evaluation and certification activities, improve the quality of green bond evaluation and certification, and promote the healthy development of the green bond market
2017.12	National Development and Reform Commission	National Carbon Emissions Trading Market Construction Plan (Power Generation Industry)	Officially launch a unified national carbon emissions trading market, laying a solid foundation for the establishment of a carbon financial market system
2017.12	China Banking Association	China Banking Industry Green Bank Evaluation Implementation Plan (Trial)	Detailed implementation of regulatory requirements such as the "Green Credit Guidelines" of the China Banking Regulatory Commission, standardize the green credit work of banking institutions, and carry out green bank evaluations
2017	The people's bank of China	Evaluation Program of Green Loans Performance for Deposit-taking Financial Institutions (Draft)	It established a special statistical scheme for green loans, requiring banking institutions to submit quarterly green loans statistics since 2018
2017	National Association Financial Market Institutional Investors	Operational Guidelines for Green Debt Financing Tools of Non-financing Enterprises	Clarified the four core mechanisms of green bond financing tools
2017	The people's bank of China, China Securities Regulatory Commission	Guidelines on Green Bond Assessment and Certification (Interim)	Standardizes the evaluation and certification body qualification, business undertaking, evaluation and certification content, and evaluation and certification opinions
2017	Ministry of Finance, National Development and Reform Commission, The People's Bank of China	Circular on Issues Related to Asset Securitization of PPP Projects	Encourage and support PPP project companies, project company shareholders, other relevant entities of the project company and relevant intermediaries to actively carry out PPP project asset securitization business in accordance with the law
2017	the General Office of the CPC Central Committee and the General Office of the State Council	Program of the Ecological Environmental Damage Compensation System	It is necessary to further clarify the scope of compensation for damage to the ecological environment on the basis of summarizing the previous pilot work, form a corresponding identification and evaluation management mechanism, and accelerate the construction of ecological civilization
2017	Ministry of Finance	Measures for the Administration of Special Reserves for Earthquake Catastrophe Insurance for Urban and Rural Residence	Improve the multi-level catastrophe risk dispersion mechanism, and promote the steady implementation of earthquake catastrophe insurance for urban and rural residents
2018	Price Regulations of the Development and Reform Commission	Opinions on Innovating and Improving the Price Mechanism for Promoting Green Development	1. Improving the sewage treatment charging policy; 2. Improving the solid waste treatment charging mechanism; 3. Establishing a price mechanism that is conducive to water conservation; 4. Improving the electricity price mechanism that promotes energy conservation and environmental protection
2018	Ministry of Industry and Information Technology	Notice on Promoting Financial Support for the Green Development of County Industries	In order to fully implement the spirit of the 19th National Congress of the Communist Party of China, enhance the ability of financial services to serve the real economy, promote the development of green and low-carbon industrial cycles, and promote the green transformation and upgrading of industries in counties
2018	People's Bank of China	Special Statistical System for Green Loans	Divide and verify the green loan industry
2018	People's Bank of China	Notice on Strengthening the Supervision and Management of the Duration of Green Financial Bonds	Improve the supervision and management of the duration of green financial bonds, enhance the transparency of information disclosure, and encourage issuers to increase their support for green development
2018.4	Shanghai Stock Exchange	Shanghai Stock Exchange Serving Green Development and Promoting Green Finance Vision and Action Plan (2018-2020)	Give full play to the capital market's function of optimizing resource allocation, serve economic transformation of development mode, optimize economic structure, transform growth momentum, cultivate new economic growth points, and promote high-quality development
2018.12	the General Office of the State Council	Pilot Work Plan for "Wasteless City" Construction	Guided by the new development concept, by promoting the formation of green development methods and lifestyles, the amount of landfill is minimized, and the environmental impact of solid waste is minimized
2018	Ministry of Ecology Environment	Guiding Opinions on Further Deepening the "Release Management" Reform in the Field of Ecological Environment and Promoting High-Quality Economic Development	Deepen the reform of the ecological environment, fully release the vitality of development, and realize the unification of environmental benefits, economic benefits, and social benefits
2018	the CPC Central Committee and the State Council	Opinions on Comprehensively Strengthening Ecological Environment Protection and Resolutely Fighting the Pollution Prevention and Control	It Promote the development of environmental pollution liability insurance and establish an environmental pollution compulsory liability insurance system in high-risk areas
2018.7	The people's bank of China	Notice on launching green credit performance evaluation scheme for banking depository financial institutions and Green credit performance evaluation scheme for banking depository financial institutions	Improve the ability of green finance to support high-quality development and green transformation, and vigorously develop green credit
2018	Shanghai Stock Exchange	Vision and Action Plan to Serve Green Development and Promote Green Finance (2018-2020)	It includes three parts: the background of its formulation, the goals and principles of the Shanghai Stock Exchange's promotion of green finance, and the action plan
2019	Development and Reform Commission	Green Industry Guidance Catalog (2019 Edition)	In order to further clarify the boundaries of the green industry, direct limited policies and funds to the most important, critical and urgent green industries for promoting green development

continued on following page

The Effect of Chinese Green Transformation on Competitiveness and the Environment

Table 1. Continued

Issuing date	Issuing departments	policies	Summary of content
2020.2	State council	Guiding Opinions on Accelerating the Establishment and Improvement of a Green and Low-Carbon Circular Development Economic System	Propose to vigorously develop green finance, develop green credit and green direct financing, and promote the two-way opening of the green financial market in an orderly manner
2020.9	President Xi Jinping	'Carbon Neutrality' goal	Propose that China will increase its nationally determined contribution, adopt more powerful policies and measures, and strive for carbon dioxide emissions. Reach the peak before 2030, and strive to achieve carbon neutrality by 2060. The Central Economic Work Conference subsequently made "Doing a Good Job in Carbon Peaking and Carbon Neutralization" a key task for the new year
2020.11	Shenzhen government	Shenzhen Special Economic Zone Green Finance Regulations	This is the country's first law in the field of green finance, which further clarifies the main responsibilities of financial institutions and green enterprises, and stipulates the supervision and management measures of government departments and the central financial regulatory agency in Shenzhen
2021.4	People's Bank of China, Development and Reform Commission, and China Securities Regulatory Commission	Catalogue of projects supported by green bonds (2021 version)	More specific technical indicators and environmental standards have been clarified, and the principle of 'DO NO SIGNIFICANT HARM' has been incorporated to bring it closer to global rules
2021.5	People's Bank of China	Notice of the People's Bank of China on Printing and Distributing the "Green Finance Evaluation Plan for Banking Financial Institutions	Formulate implementation rules for green finance evaluation of banking financial institutions (legal persons) in the jurisdiction based on actual conditions and do a good job of evaluation, actively explore and expand the application of evaluation results, and strive to improve the performance of green finance of banking financial institutions
2021	The people's bank of China, National Development and Reform Commission, China Securities Regulatory Commission	List of projects supported by green bonds	It divides green projects into six areas: energy conservation and environmental protection industry, clean production industry, clean energy industry, ecological environment industry, green upgrade of infrastructure, and green service

DISCUSSION OF CHINESE CASES (SUCCESSFUL AND UNSUCCESSFUL CASES)

Successful Cases

Green Building Technology Company: Wonderland-Time (WT)

When Chinese construction companies showed little interest in green buildings, WT began to practice the concept of green development. Established in Shenzhen in 2007, WT used the concept of 'Let more people enjoy the green and beautiful life of health, comfort, safety, and conservation' as its initial vision. (<http://www.wonderland-time.com>). In the following year, WT got the attention of the real estate giant Vanke Real Estate, becoming their strategic partner. In the fourth phase of the Vanke City project, it passed the national standard green building three-star logo certification, becoming China's first green building three-star design logo, then the later project successfully landed, becoming China's first project to pass the 'green building residential three-star operating logo'. Since then, the company's green business has spread across the country. The total construction area of the three-star green building service provided by WT has reached 33% of the three-star design and logo projects that passed the certification during the year. In 2016, WT passed the national high-tech enterprise certification and started cooperation with Gemdale Group and other companies. In 2020, the total number of award-winning projects served by the company was second in the country and they rank first in total number of development projects. And since 2010, they have been in the TOP10 of China's green building design consulting, according to the wonderland time official website.

In the era of poor green building awareness, WT used to seize the opportunity of green buildings. They strove to provide green building design services to China's real estate industry, ensuring compliance with a series of environmental policies initiated by the Chinese government (Yang et al., 2021)

WT has handled more than 1,000 cases and provided for them accordingly. The policy reward applied by the typical client company amounts to 100 million yuan. They are leaders in the green building industry because they consistently achieve the industry's goals.

Green Financial Services Technology Company: Carbonbase

Carbonbase was formally established in January 2020, with the corporate vision of “using technology to promote the realization of carbon neutrality goals.” The goal is to transform the energy-saving and emission-reduction efforts of an enterprise into the driver of customers' green consumption. From the official website of the “Carbonbase” (<https://www.tanzhongbao.com>), the company focuses on carbon accounting, carbon sink investment, carbon neutrality, and carbon finance. Through the SaaS platform's one-click carbon accounting and carbon neutrality, Carbonbase customizes the carbon neutrality roadmap precisely, realizes green digitization, and locates new opportunities for green finance. Carbonbase uses big data analysis, blockchain, and other technologies to break green information silos from production to consumption, empowering companies to achieve carbon neutrality, realize green transformation through technology, and seize new opportunities for carbon neutrality and green finance.

Carbonbase directly targets the goals of peak carbon and carbon neutrality proposed by China, striving to help individuals and enterprises jointly achieve these ambitious goals through technology. The carbon neutrality management platform completed a million-dollar round of angel financing at the end of 2020. Investors include Abraham Fund, Huayan Capital, Jaan Tallinn Family Office, former Merrill Lynch Asia-Pacific co-chair Liu Erfei, AT Kearney Board Chairman Alex Liu, and Qi Achievements. This round of financing will be mainly used for team expansion and product building (Guo, 2019). In January 2021, it was admitted with an acceptance rate of 0.96%. It participated in the roadshow in June and started the next round of financing. Carbonbase is undoubtedly leading the trend of green carbon neutrality.

New Energy Technology Company: CATL

CATL was established in December 2011. It is the world's leading lithium-ion battery R&D and manufacturing company, focusing on the R&D, production, and sale of new energy vehicle battery power and energy storage systems. From the official website of the “CATL” (<https://www.catl.com>), the company's vision is to build a world-class, innovative technology company based on Chinese culture and acceptance of global culture, make outstanding contributions to the cause of new energy for mankind, and provide a platform for employees to seek spiritual and material well-being. In 2012, CATL strategically cooperated with the German BMW Group, becoming its core supplier of power batteries. In 2015, it was the first company in the country to supply ternary power batteries for passenger cars, becoming top-three worldwide in power battery system usage. In China's 13th Five-Year Plan, CATL undertook the research and development of two special projects for new energy vehicles and smart grids in the 13th Five-Year National Key R&D Plan. They are upgrading the enterprises on the “Notice on Adjusting the Financial Subsidy Policy for the Promotion and Application of New Energy Vehicles” guide. Ding (2019) stated that since 2017, CATL's battery system has been the world's most widely used. CATL completed an IPO in 2018, raising 5.462 billion yuan, the largest IPO since the establishment of China's growth enterprise market. They were unable to achieve this without the support of the government. Gao (2021) states that since the establishment of CATL in 2011, it has already perfected the layout of the entire industrial

chain from raw materials upstream to batteries, battery packs, and recycling downstream. This is also a guarantee for the future development of CATL.

Now that the entire world attaches great importance to environmental pollution, CATL has cooperated with major automobile brands to replace fossil fuel with electricity, reducing pollution caused by the increasing number of vehicles, and replacing fossil fuel vehicles with new energy vehicles. It is just a matter of time.

Unsuccessful Cases

Shenzhen Yonglixin Hardware Products Co., Ltd.

Shenzhen Yonglixin Hardware Products Co., Ltd. was registered and established in the Shenzhen Municipal Market Supervision and Administration Bureau on April 17, 2003. The company's business scope includes the production and sale of electronic components, hardware accessories, hardware molds, craft products (using electroplating), etc.

Shenzhen Yonglixin Hardware Products Co., Ltd. was fined 12.39 million yuan by the Shenzhen Municipal Human Settlement and Environment Commission for excessive discharge of pollutants and wastewater and pollutants discharged from hidden pipes. This was the first environmental fine of over 10 million yuan in Shenzhen. Presently the company's pollution discharge permit has been revoked and is undergoing comprehensive modification. This provides an example that companies who do not carry out green transformation actively and continue to emit pollution as before will face severe punishment. Hebei Province took the lead in implementing the supervision plan that "unlicensed enterprises will suspend production and shut down, and licensed enterprises must discharge pollutants in accordance with the certificate." Serving as a model for other provinces, this also reminds polluting enterprises to control emissions and implement green transformation (Zhou & Zhang, 2017).

It can be seen from the above examples that green transformation is especially important for companies related to pollution, and even related to the survival of companies. Green technological innovation can improve the performance of enterprises, thereby improving the viability of green innovative enterprises (Jiao et al.2020). Companies first need to be able to survive before discussing their competitiveness.

Many studies have shown that R&D has a positive and stimulating effect on a company's performance and competitiveness (Brander, Egan, & Hellmann, 2008). So, this chapter tells little about the disadvantages of the green transition. Porter (1985) defined two ways for a firm to gain competitive advantages over its competitors: cost advantages and differentiation advantages. Green innovation can help companies build differentiated competitive advantages (Schiedrigetal, 2012). Take the carbon emission market as an example. When the carbon emission market becomes more and more perfect, companies are more inclined to improve energy-saving and emission-reduction technologies, which directly improve their efficiency and cost competitiveness, and further enhance their competitiveness (Tu & Wu, 2021).

OPPORTUNITIES AND CHALLENGES FOR CHINESE COMPANIES IN CARBON ECONOMY

Opportunities

Companies that are prone to create environmental pollution need to seize the following opportunities:

First of all, green and sustainable development is a key priority for China over the next few decades. The goals of peak carbon and carbon neutrality still require the joint efforts of the people, enterprises, and the national government. To promote the development of green finance, the government has issued many policies to support key industries such as clean energy, green buildings, and green transportation. The means of funding include green loans and subsidies. Enterprises should take advantage of these policies with flexibility.

Secondly, business managers can no longer follow the path China has taken previously, blindly pursuing quantitative development and ignoring quality. Companies need to pay attention to the environmental and green economy benefits they bring, not just production capacity. Green loan policies have a “punishment” effect on polluting companies because polluting companies that actively transform will receive better policy treatment, while companies that fail to transform will be penalized (Zhang & Vigne, 2021). The official opening of the carbon market in 2021 is clear proof that the carbon emission rights of low-carbon companies can be sold to companies with high carbon emissions to reduce corporate costs.

The third is that polluting enterprises’ pollutants should actively disclose environmental information to the public. They must truly disclose the carbon dioxide and ammonia nitrogen emissions of the enterprises to meet the corresponding green policies, receive policy subsidies, or be able to issue green bonds for financing.

Fourth, with the support of green policy and with all kinds of innovative green finance products providing many sources of capital inflows, green transformation and upgrading will be carried out promptly.

Fifth, companies can use financial technology, green innovation, and other new technology tools to upgrade corporate technology. Although costs may be higher than before in the short term, this measure can reduce the costs of industry and pollution over the long term (Zhang et al., 2021).

Challenges

First of all, in the pursuit of carbon neutrality, companies need to pay attention to the relevant policies issued by the state. The reason many companies lack enthusiasm for green transformation is the high initial cost and the unwillingness of investors to take on risk. However, the state has issued many policies, subsidies, and interest rate cuts to support the transformation of companies. For high-carbon enterprises particularly, if they cannot make their green transformation in time, their carbon costs will inevitably rise in the future, causing their profits to decline. Eventually, they may even face the risk of bankruptcy.

Secondly, companies that use green finance for funding need to confirm whether they meet the new standards. For example, new green financial products such as green bonds must be in line with the domestic green financial standard system. This will reassure the government and creditors that they are putting their funds toward green projects as expected.

The third is the lack of innovation awareness within companies. In the construction industry, the China-Europe Green Building Innovation Forum pointed out that the industry needs to carry out technological reforms in the future to make up for shortfalls in capability. Although government intervention

is a factor that drives green construction (Chan et al., 2009), green innovation is a more critical factor. Because science and technology investment and the transformation they bring influence the company at the most fundamental level (Wang et al., 2021), green building companies need to strengthen technological innovation to create value for themselves and China.

CONCLUSION AND RECOMMENDATIONS

In the last few years, China has begun assuming the responsibilities of a major power, striving to promote green and sustainable development. The great importance China attaches to this can be seen from the introduction of so many policy changes in this area. On September 22, 2020, the Chinese government proposed at the 75th United Nations General Assembly: “China will increase its nationally determined contributions, adopt more effective policies and measures, and strive to reach the peak of carbon dioxide emissions by 2030. China strives to achieve carbon neutrality by 2060”. This reflects China’s determination to achieve green development goals. Companies need to adapt to this trend, especially companies in the construction industry and energy-intensive industries. The government currently provides them with many opportunities they should seize to achieve green transformation, such as interest discounts and tax reduction measures. If these opportunities are not seized, the competitiveness of these firms will inevitably suffer. Those enterprises that do undergo green transformation will outcompete them and eliminate them from the market.

Finally, there are some suggestions for the government. First, since President Xi Jinping put forward the goals of peak carbon and carbon neutrality, this must be used as a constraint to modify and improve the definition and assessment principles of related green finance. From the green transportation perspective, Yang et al. (2021) believe the government should not only include pollutants emitted in the assessment criteria, but also traffic noise and accidents. This means many projects need to be reviewed and given clear definitions.

The second suggestion is to strengthen the incentive mechanisms for low-carbon investment and financing. The government should play an economic-oriented function to provide reasonable, scientific subsidy standards for industries with good development prospects (Peng & Liu, 2018). Although the country has issued many policies and established some incentive mechanisms, many local institutions have not responded. Therefore, following the example of the central government, local governments should decide whether they need to increase support for low-carbon projects based on the status of local development, to better achieve the dual carbon goals.

The third suggestion for the government is to encourage the development of green financial technology. Technology is particularly critical in achieving the dual carbon goals. It is vitally important to strengthen international exchange and cooperation, encourage domestic financial institutions to increase green financial technology research, and master core green transformation technologies to promote the early achievement of carbon neutrality goals.

ACKNOWLEDGMENT

We thank our colleagues from Soochow University, the Australian Studies Centre of Shanghai University and Krirk University as well as the independent research colleagues who provided insight and expertise

that greatly assisted the research, although they may not agree with all of the interpretations/conclusions of this paper. In addition, we thank China Knowledge for supporting our research.

REFERENCES

- Brander, J., Egan, E., & Hellmann, T. (2008). *Government sponsored versus private venture capital: Canadian evidence*. NBER Working Paper, 14029.
- Chan, E. H. W., Qian, Q. K., & Lam, P. T. I. (2009). The market for green building in developed Asian cities-the perspectives of building designers. *Energy Policy*, 37(8), 3061–3070. doi:10.1016/j.enpol.2009.03.057
- Chen, X., & Lin, B. Q. (2021). Towards carbon neutrality by implementing carbon emissions trading scheme: Policy evaluation in China. *Energy Policy*, 157, 112510. doi:10.1016/j.enpol.2021.112510
- China Building Energy Conservation Association and Energy Consumption Statistics Professional Committee. (2020). *China Building Energy Research Report 2020. Achievements Released*. Author.
- China Building Energy Conservation Association Climate Bonds Initiative. (2019). *Chinese Green bond market 2019*. Climate Bonds Initiative and China National Debt Registration and Settlement Co., Ltd.
- Commissioner of Shenzhen Municipal Human Settlement and Environment. (2017). Shenzhen severely fined companies that violated environmental protection laws: Issued the first tens of millions of fines and revoked their pollution discharge permits. *China Environmental Supervision*, 11, 22.
- Ding, J. Y. (2019). “Unicorn” CATL IPO case study (Master’s thesis). Anhui University of Finance and Economics. <https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD201902&filename=1019134973.nh>
- Du, X., Jian, W., Zeng, Q., & Chang, Y. (2018). Do auditors applaud corporate environmental performance? Evidence from China. *Journal of Business Ethics*, 151(4), 1049–1080. doi:10.1007/10551-016-3223-6
- Further improve the “five pillars” of the green financial system. (2021, March 9). *Farmers daily*. http://www.farmer.com.cn/2021/03/09/wap_99866690.html
- Gao, C. (2021). CATL released the first generation of sodium-ion batteries, the future can be expected. *Automobiles and Accessories*, 15, 55.
- Green Credit. (n.d.). In *Encyclopædia Baidu online*. <https://baike.baidu.com/item/%E7%BB%BF%E8%89%B2%E8%B4%B7%E6%AC%BE/5417936?fr=aladdin>
- Green Fund. (n.d.). In *Encyclopædia Baidu online*. <https://baike.baidu.com/item/%E7%BB%BF%E8%89%B2%E5%9F%BA%E9%87%91>
- Green Insurance. (n.d.). In *Encyclopædia Baidu online*. <https://baike.baidu.com/item/%E7%BB%BF%E8%89%B2%E8%B4%B7%E6%AC%BE>
- Gu, D. Z. (2020). Dedication to Clean Power and Promotion of the Energy Revolution. *Engineering*, 6(12), 1331–1332. doi:10.1016/j.eng.2020.10.005

The Effect of Chinese Green Transformation on Competitiveness and the Environment

Guo, J. J. (2021, June 10). *36Kr First Release | Combining a one-stop carbon neutral SaaS with green finance, “Carbonbase” completes a million-dollar angel round of financing.* <https://36kr.com/p/1254216551313160>

He, L., Liu, R., Zhong, Z., Wang, D., & Xia, Y. (2019). Can green financial development promote renewable energy investment efficiency? A consideration of bank. *Renewable Energy*, *143*, 974–984.

He, L., Zhang, L., Zhong, Z., Wang, D., & Wang, F. (2019). Green credit, renewable energy investment and green economy development: Empirical analysis based on 150 listed companies of China. *Journal of Cleaner Production*, *208*, 363–372. doi:10.1016/j.jclepro.2018.10.119

Jiang, L. L., Lin, C., & Lin, P. (2014). The determinants of pollution levels: Firm-level evidence from Chinese manufacturing. *Journal of Comparative Economics*, *42*(1), 118–142. doi:10.1016/j.jce.2013.07.007

Jiao, J. L., Zhang, X. L., & Tang, Y. S. (2020). What factors determine the survival of green innovative enterprises in China?— A method based on fsQCA. *Technology in Society*, *62*, 101314. doi:10.1016/j.techsoc.2020.101314 PMID:32834233

Jones, R., Baker, T., Huet, K., Murphy, L., & Lewis, N. (2020). Treating ecological deficit with debt: The practical and political concerns with green bonds. *Geoforum. Journal of Physical, Human, and Regional Geosciences*, *114*, 49–58. doi:10.1016/j.geoforum.2020.05.014 PMID:32536703

Li, J. L., Chen, X. T., Chen, X., Jin, M. X., Ma, Z. Y., Zhao, Z., J., Yang, F., & Sun, R. H. (2021). Method for Assessing Ecosystem Service Values of Clean Electricity Generation. *Journal of Global Energy Interconnection*.

Liu, J. G., & Shen, Z. Q. (2011). Low Carbon Finance: Present Situation and Future Development in China. *Energy Procedia*, *214-218*, 4–5.

Liu, X. H., Wang, E. X., & Cai, D. T. (2019). Green credit policy, property rights and debt financing: Quasi-natural experimental evidence from China. *Finance Research Letters*, *29*, 129–135. doi:10.1016/j.frl.2019.03.014

Peng, H. T., & Liu, Y. (2018). How government subsidies promote the growth of entrepreneurial companies in clean energy industry: An empirical study in China. *Journal of Cleaner Production*, *188*, 508–520. doi:10.1016/j.jclepro.2018.03.126

People’s Bank of China. (2016). *Guiding Opinions on Building a Green Financial System* (Vol. 000014672). Ministry of Ecology and Environment of the People’s Republic of China.

People’s Bank of China, Development and Reform Commission, and China Securities Regulatory Commission. (2020). *Catalogue of Green Bond Supported Projects (2021)*. People’s Bank of China.

Porter, M. E. (1985). *The Competitive Advantage: Creating and Sustaining Superior Performance*. Free Press., doi:10.1590/S0034-75901985000200009

Research Center for Green Finance Development. (2021). *Green Finance in China: Overview, Experience and Outlook*. Author.

- Schiederig, T., Tietze, F., & Herstatt, C. (2012). Green innovation in technology and innovation management - an exploratory literature review. *R & D Management*, 42(2), 180–192.
- Schulz, K., & Feist, M. (2021). Leveraging blockchain technology for innovative climate finance under the Green Climate Fund. *Earth System Governance*, 7, 100084.
- Shenzhen WONDERLAND-TIME Green Building Technology Co. Ltd. (n.d.). In *Encyclopædia Baidu online*. <https://baike.baidu.com/item/%E6%B7%B1%E5%9C%B3%E4%B8%87%E9%83%BD%E6%97%B6%E4%BB%A3%E7%BB%BF%E8%89%B2%E5%BB%BA%E7%AD%91%E6%8A%80%E6%9C%AF%E6%9C%89%E9%99%90%E5%85%AC%E5%8F%B8/22448288?fr=aladdin>
- Shenzhen Yonglixin Hardware Products Co. Ltd. (n.d.). In *Encyclopædia Baidu online*. <https://baike.baidu.com/item/%E6%B7%B1%E5%9C%B3%E5%B8%82%E6%B0%B8%E5%88%A9%E9%91%AB%E4%BA%94%E9%87%91%E5%88%B6%E5%93%81%E6%9C%89%E9%99%90%E5%85%AC%E5%8F%B8/21181903?fr=aladdin>
- Shi, X. R., Zheng, Y. X., Lei, Y., Xue, W. B., Yan, G., Liu, X., Cai, B. F., Tong, D., & Wang, J. N. (2021, November). Air quality benefits of achieving carbon neutrality in China. *The Science of the Total Environment*, 795, 148784. doi:10.1016/j.scitotenv.2021.148784 PMID:34246132
- Shishlov, I., Morel, R., & Cochran, I. (2016). Beyond Transparency: Unlocking the Full Potential of Green Bonds. *Institute for Climate Economics*, 2016, 1–28.
- Sun, D. X., Zeng, S. X., Lin, H., Meng, X. H., & Byungjun, Y. (2019). Can transportation infrastructure pave a green way? A city-level examination in China. *Journal of Cleaner Production*, 226, 669–678. doi:10.1016/j.jclepro.2019.04.124
- Tarhan, C., & Çil, M. A. (2021). A study on hydrogen, the clean energy of the future: Hydrogen storage methods. *Journal of Energy Storage*, 40, 102676. doi:10.1016/j.est.2021.102676
- Tu, Y., & Wu, W. K. (2021). How does green innovation improve enterprises' competitive advantage? The role of organizational learning. *Sustainable Production and Consumption*, 26, 504–516.
- Wang, C., Nie, P. Y., Peng, D. H., & Li, Z. H. (2017). Green insurance subsidy for promoting clean production innovation. *Journal of Cleaner Production*, 148, 111–117.
- Wang, J. Z., Chen, X., Li, X. X., Yu, J., & Zhong, R. (2020). The market reaction to green bond issuance: Evidence from China. *Pacific-Basin Finance Journal*, 60, 101294. doi:10.1016/j.pacfin.2020.101294
- Wang, M. Y., Li, Y. M., Li, J. Q., & Wang, Z. T. (2021). Green process innovation, green product innovation and its economic performance improvement paths: A survey and structural model. *Journal of Environmental Management*, 297, 113282. doi:10.1016/j.jenvman.2021.113282 PMID:34314965
- Wang, W., Tian, Z., Xi, W. J., Tan, Y. R., & Deng, Y. (2021). The influencing factors of China's green building development: An analysis using RBF-WINGS method. *Building and Environment*, 188, 107425. doi:10.1016/j.buildenv.2020.107425
- Wang, X. Z. (2010). Is China the world's largest energy consumer? *Big View*, 000(26), 80–82.

The Effect of Chinese Green Transformation on Competitiveness and the Environment

Yali, Z., Wenqi, L., & Feng, W. (2020). Does energy transition improve air quality? Evidence derived from China's Winter Clean Heating Pilot (WCHP) project. *Energy*, *206*, 118130. doi:10.1016/j.energy.2020.118130

Yang, X. H., Jia, Z., & Yang, Z. M. (2021). How does technological progress impact transportation green total factor productivity: A spatial econometric perspective. *Energy Reports*, *7*, 3935–3950. doi:10.1016/j.egy.2021.06.078

Yang, Z., Chen, H., Mi, L., Li, P. P., & Qi, K. (2021). Green building technologies adoption process in China: How environmental policies are reshaping the decision-making among alliance-based construction enterprises? *Sustainable Cities and Society*, *73*, 103122. doi:10.1016/j.scs.2021.103122

Yu, L. L., Zhao, D. Y., Xue, Z. H., & Gao, Y. (2020). Research on the use of digital finance and the adoption of green control techniques by family farms in China. *Technology in Society*, *5*, 214–218. doi:10.1016/j.techsoc.2020.101323

Zhang, D. Y., & Vigne, S. A. (2021). The Causal Effect on Firm Performance of China's Financing–Pollution Emission Reduction Policy: Firm-Level Evidence. *Journal of Environmental Management*, *279*, 111609. doi:10.1016/j.jenvman.2020.111609 PMID:33218832

Zhang, H., & Zhong, N. (2011). Forecast of energy demand in the next decade. *Energy Procedia*, *5*, 2536–2539. doi:10.1016/j.egypro.2011.03.436

Zhang, K., Li, Y. C., Qi, Y., & Shao, S. (2021). Can green credit policy improve environmental quality? Evidence from China. *Journal of Environmental Management*, *298*, 113445. doi:10.1016/j.jenvman.2021.113445 PMID:34375920

Zhang, Y. M., Xing, C., & Wang, Y. (2021). Does green innovation mitigate financing constraints? Evidence from China's private enterprises. *Journal of Cleaner Production*, *264*, 121698. doi:10.1016/j.jclepro.2020.121698

Zhou, Y. J., & Zhang, M. X. (2017). Unlicensed companies will suspend production and shut down. Licensed companies must discharge pollution according to the license. Hebei takes the lead in launching the post-discharge permit monitoring system. *Environment and Ecology*, *24*, 21–23.

Chapter 15

Rural Tourism and Its Impact on the Economy: A Study of Lalong Village, Meghalaya

Saibal Kumar Saha

 <https://orcid.org/0000-0002-7842-698X>

Sikkim Manipal Institute of Technology, Sikkim Manipal University, India

Sawarisa Suiam

 <https://orcid.org/0000-0002-3308-1009>

Assam Royal Global University, India

Ankita Sarangi

 <https://orcid.org/0000-0002-3499-9196>

Sikkim Manipal Institute of Technology, Sikkim Manipal University, India

ABSTRACT

The changing tastes and preferences of tourists have given rise to a new form of tourism, rural tourism. This new form of tourism plays an important role to change the rural economy and living standard of villagers. Meghalaya, the abode of clouds, is famous for a number of its villages and attract thousands of tourists every year. This research aims to study the impact of rural tourism on the economy of the village. For this study, Ialong village has been selected, and 150 people were interviewed with the help of a structured questionnaire and insights of people concerned were noted and analyzed. It was found that people believe the facilities of electricity, hygiene, toilets, accommodation have improved and have accounted for more influx of tourists into the region. However, lack of exposure of the different villages and their offerings in advertisement media have limited the potential of growth of tourism in these villages.

DOI: 10.4018/978-1-7998-9664-7.ch015

INTRODUCTION

Influx of travelers and visitors in rural areas can transform the future of tourism industry in India. In recent years' tourists have been changing their route towards rural areas to experience what they can't have in the urban setups. Given the fact that many people in urban areas are living a life prescribed by modernization with frequent technological advancements, that results in a feeling of loss of the innocent traditional and hard way of living (Batra, 2009) (George, 2005), rural tourism has gained popularity. Majority of the urban settlers live a life of comfort and ease and are not accustomed to the rural lifestyle and its adventurous activities. Furthermore, cities are polluted due to increase in number of vehicles and garbage. As more people migrate to urban areas for higher education and job prospects, the populations of cities are on a rise (Bhatta, 2010). The urban areas are cementing the nature day by day creating barren lands devoid of any greenery and forests (Kaur et al., 2021), as most of them have been cleared to set up buildings and other manmade structures for easing the urban lives (Ramaiah & Avtar, 2019). However, in rural areas, the scenario is different. The atmosphere is clean and pollution free. The presence of forests and undisturbed natural resources enhances the beauty of the landscape. One can experience life of peace and freshness. The benign and simple nature of the rural people add to the beauty of these landscapes. The tourism industry in India is well established. Meghalaya, a hilly state in the North Eastern part of India is famous for its tourist spots and scenic beauty. Every year thousands of tourists visit this part of the country to spend their vacations and pay a visit to these places. Apart from a few established tourist destinations there is a potential for development of tourist spots in many villages of this state because of the unique tourism features offered by these villages. As there is lack of published literature in this field, an effort is made with the help of this research to study the impact of rural tourism on the economy of a village.

LITERATURE REVIEW

Rural tourism is conducted in places with sparse populace which attracts travelers for an experience of the natural, traditional, and historical characteristics of the place (European Commission, 2003). Rural tourism helps the natives by providing entrepreneurial opportunities. It helps to increase their earning, provides employment, and improvement of rural art and craft. It also provides investment for infrastructure advancement and conservation of local heritage and environment (Mishra, 2001). Some scholars consider rural tourism as a tourism activity in a non-urban territory with only agricultural activity (Hall, Kirkpatrick & Mitchell 2005).

The growth of country side recreation evolved towards the end of the 18th century. It was primarily carried out to relieve the stress developed as a result of urbanization and industrialization. The scenic beauty of the countryside landscape became the "gaze" of tourists (Urry, 1990). It attracted a large number of poets and artists. The popularity of rural tourism may also be attributed to availability of free time and enhancement in disposal income of the families due to technological advancements. The popularity of cars after the end of the Second World War may be attributed as one of the leading factor for a growth in the rural tourism sector (Harrison, 1992). According to UNWTO, (2004) rural tourism is a term used when "rural culture is a key component of the product". Depending on the main activity of this product; several terms have been given to the tourism: viz. adventure, cultural tourism, green tourism, hunting, nautical tourism, historical or agritourism.

A diversity of cultures, traditions and natural heritage in various rural areas further compounds the context of rural tourism. Rural tourism is practiced by tourists, scientists, hikers, students, businessmen joining in an event or retreat. Therefore, rural tourism combines three elements, namely space, people and product, and includes different events which can be done in rural spaces, providing free time events and several facilities. The advantage associated with the integrated nature of rural tourism is that it allows for a unified approach to poverty alleviation. Rural tourism takes many shapes and forms. These different shapes and forms give rural tourism a potential of being more inclusive, and thus an activity of maximum community involvement and poverty alleviation.

The state of Meghalaya in the North Eastern part of India has great potential for promoting rural tourism, given its natural features and the rich culture and traditions of the local people (Saha et al., 2018). The main aim of rural tourism is to promote travel to rural areas in a responsible and sustainable way where tourists learn and experience rural life, culture, interact with the locals and at the same time encourage maximum participation of local communities in activities related to tourism and businesses. This benefits the development of rural economy and plays an important role in environmental conservation.

Proenca & Soukiazis (2005) identified two major factors influenced the demand for rural tourism in the 19th century:

- Technological progress, with the development of railway transportation in Europe favoring enhancement in tourism industry.
- The advancements in cable cars and elevators which transformed many areas into common rural tourism destinations.

This corresponds with Sarkar's (2009) argument that infrastructure and connectivity are key factors for rural tourism development. The demand for rural tourism was further accelerated by increased income and leisure. Besides the development of transport, there are other factors which determine the increase in demand for rural tourism (Chowdhary et al., 2020). Measurement of rural tourism demand is essential if people wish to evaluate its growth, development and value and to increase its situation. Most countries experienced a trend towards increasing demand for rural amenities, educational functions concerned with rural heritage and environment and tourism (Sharma 2006). The demand for a destination also depends on several factors, some being natural, such as environmental attractiveness, wildlife, scenic beauty, man-made amenities like: accessibility of the destination, tourism infrastructure, climate, attractive beaches, the quality of management and the services available in that place (Ohe, 2008).

There is a link between the demand for rural tourism and the level of development. The demand for rural tourism is affected by social class. Records show that education, affluence and mobility are the primary factors associated with people who visit the countryside (Sharma 2006). This is a reason why demand for rural tourism is growing at different rates in different countries. In rural areas, the growth of demand for tourism must not be a mere statistic but it should reflect itself in the improvement of the lives of people and poverty reduction. It is in the interest of rural tourism to understand the new tourist who has different desires and motives for travelling. The change in the desires of the tourists mean that improved products and services must be available in destinations. In return customers are willing to pay a fair price for quality products and services.

The motivation for travel is no longer about appreciation of flora and fauna only. It includes the broadening of knowledge and experience about the culture which is different from their own (Nzama 2008).

Rural Tourism and Its Impact on the Economy

The improvement of tourism products must be taken as an advantage as it can increase the potential of a destination to create more job opportunities.

Impact of Rural Tourism

Rural tourism enhances employment and increases income of local people. It also helps to enhance the social and economic development of rural societies (Sharpley, 2001). Due to high levels of poverty and lower levels of non-farm economic activities, the infrastructural advancement and access to vital services is poor. Gannon (1994) and Kieselbach and Long (1990) proposed that growth of tourism in rural areas may solve problems by:

Employment Generation

Jobs are created through founding tourist amenities like lodges, camps, hotels and dining joints (Mbaiwa 2003). Job with respect to transport facilities, tourist guides, short and long distance travels are created with enhancement in development of rural tourism. It also facilitates employment in rural communities especially on services and new product development. Employment generation is vital alleviate poverty and stabilize the rural population. As rural tourism sector is dependent on inputs from other sectors of the economy, it can create employment among the low-skilled rural poor. Its linkage with the agricultural sector is beneficial as it acts as a propeller of economic growth in rural development.

1. Economic Growth

Rural tourism is an important contributory factor for economic development in the third world (Udovc & Perpar 2007). It is a potential propeller of rural development and an engine that can drive the campaign against rural poverty. Many social scientists who have focused on the economic impact of rural tourism tend to emphasize the role of rural tourism as a solution to socio-economic ills of the rural world. Rural tourism encourage demand in other economic sectors as tourists require much more than just paying a visit to their destinations and local community (Ashe, 2005). Tourism attracts a plethora of supporting services such as banking, post offices and telecommunications, to mention a few. All these supporting services contribute to the improvement of the rural economy. Further economic activities are created by the multiplier effect which allows rural people to earn wages, make savings, and become credit-worthy.

Economic activism created by rural tourism is beneficial to the rural inhabitants and can shift their focus from urban job opportunities to rural business and employment opportunities (Ryglova, 2007). Rural tourism generates economic growth by acting as a kind of export industry, attracting money from the outside world to spend on goods and services. In this way the local businesses do not close, retrench employees, entrench poverty and contribute to rural depopulation. Such improvements can help to foster growth of non-recreation industries in destinations by attracting entrepreneurs and labor, by providing direct inputs to those industries (Ohe, 2020). Benefits such as foreign exchange, employment opportunities, higher government revenues and transformation of rural economic activities can result from tourism.

2. Generation of Supplementary Income

Due to low agricultural incomes, cuts in subsidies and depressed farm prices, the success of farmers no longer depends on one activity. It largely depends on their ability to diversify into tourism, recreation,

environmental protection, generation of green energy and other sectors. This requires them to establish new enterprises on a farm to supplement their income and to save the population from job losses and poverty. Rural tourism is a way of supplementing income from the farming activities in rural areas (Lopez, 2006).

3. Emergence of New Markets

According to Dawar & Chandra (2010) rural tourism creates rural markets. At local levels tourism has great potential for creating markets for local products. Travelers enjoy the pleasure of visiting rural craft markets. Some of the rural destinations have craft markets once or twice a week. Few markets operate throughout the week durith peak season. Development of tourism in most rural areas are usually accompanied by the emergence of local markets occupied by small stalls which sell fruits, vegetables, crafts, work of art, and farm produce. This flooding encourages the introduction of new products and an increase in the volume of goods sold. This, in turn, creates more income for rural small traders and changes their focus from urban opportunities to available rural possibilities (Ćurčić et al., 2021).

Risk Factors

The risk factors associated with rural tourism are:

1. Lack of Support from Other Sectors

Lack of political will on the part of local authorities in many rural areas makes it difficult for the rural poor to initiate tourism development projects. The tourism business relies heavily on the support, cooperation and participation of other sectors through services, access to private land, and natural and cultural heritage. Cooperation between stakeholders is important for ensuring faster economic development of a tourist destination. Governments have a crucial role in creating and accomplishing strategies, policies, regulations and coordination between structures. The private sector is an essential player as a partner, facilitator, customer, marketing channel and advisor to tourism development (Dimsoka 2008). Lack of support for rural tourism by various stakeholders in the development of rural tourism as a mechanism for poverty alleviation may frustrate the rural poor and encourage rural depopulation. Lack of information on the potentials and chances for additional growth of tourism, leading to disconnection of villages in a unique tourist product and lack of support of local, regional and governmental entities (Sharpley, 2002).

2. Lack of Human Capital and Lack of Qualification and Training

Limited knowledge and education among rural residents regarding tourism is a major obstacle to the success of tourism (Chauhan, 2020). Often rural people do not understand the importance of service quality in a tourism setting and are unfamiliar with the behavior and expectations of urbanites. In addition, it is not uncommon to find rural tourism business failing to keep regular hours because the owner has other things to do. Employment of the poor in the tourism enterprises and the establishment and running of tourism enterprises by the poor are some of the mechanisms which will enable tourism to contribute to poverty alleviation. A major issue in the development of rural tourism is the need for education and training. Tourism as an industry requires business management, marketing. Lack of understanding of the concept of the rural tourism and wrong assumptions about markets, income and employment (Sharpley,

Rural Tourism and Its Impact on the Economy

2002) create hindrances for local entrepreneurs. The rural population is untrained to accept the evolving challenges of tourism or get into jobs reserved based on qualification.

3. Lack of Financial Capital

Shortage of funds for opening and/or continuation of business due to of inadequate understanding and provisions from the state, financial organizations in transition countries (Demonja and Ružić, 2011). The most common obstacle to investment in rural tourism and entrepreneurship is inadequate access to capital. Limited finances can be a significant constraint for the rural poor as most of them are likely to have insufficient budgetary resources to enable them to prepare their communities for tourism ventures. Typically, access to financial resources for small tourism businesses is much more limited than for larger mass tourism firms which can access public debt markets. New and small businesses face difficult to get finance. Lenders require security for loans, and many of the unemployed rural poor are not creditworthy and lack adequate security for acceptance by lenders.

4. Low Capacities to Meet the Tourist's Expectations

Lack of planning for further development and limited use of marketing concept as a business philosophy that leads to the lack of information about the tourists' needs and desires (Clarke, 2005). Meeting the expectations of tourists is very important for a destination to market itself and ensure the possibility of repeat visitors. There are tangible and intangible attributes which are basis from which the quality of rural tourism is evaluated. The tangible attributes are references, service differentiation according to price and content, infrastructure, amount of services, and applied technologies. Intangible attributes are ambience, respect, security, convenience, friendliness and competence. All these are very impressive for consumers and can impact on the business. If the rural participants fail to meet the tangible and intangible attributes of quality tourism, they are unlikely to reap the benefits of the tourism business. The tourism industry, like other industries providing goods and services, is constrained by demand functioning of its consumers.

Dimsoka (2008) maintains that the benefits of tourism can reach the poor if the sale of goods and services to tourists is made directly by the poor or by the enterprises employing the poor. One of the most important constraints faced by the industry is limited resources for tourists' "enjoyment". This is particularly true when geographical distribution of these sites is considered. A lack of adequate financing makes it difficult to employ staff or pursue business development financially with an intention to improve customer care (Rukuiziene 2007, Dimsoka 2008, Eruera 2008). Some destinations in poor communities possess good resources and products for tourism to flourish but lack destination-marketing skills. Mathew (2009) argues that marketing is the most important factor in destination competitiveness these days. Tourism destinations in poor rural communities' lack skills for creating awareness, promoting products and services, communication, creation of brand image, and developing a network of channels through a variety of marketing tools.

5. Lack of Physical Capital

Infrastructure is an issue that must be addressed for rural tourism to be successful. It increases accessibility of the destination because the tourists must travel to the destination to consume the product as industry tourism relies heavily on bringing the consumer to the point of sale. Remote geographic allocation and

low population densities in many parts of the countryside means that transport must play a critical role in determining the success of rural tourism ventures (Eruera 2008). The investment in infrastructure stimulated by tourism in the locality is one of the mechanisms for enabling tourism to benefit the poor. The importance of infrastructure in the development of tourism cannot be over emphasized, but lack of public sector support for rural tourism makes it difficult to put infrastructure in place for the influx of tourists. Absence of good infrastructure also creates an unfavorable climate for encouragement of small enterprises (Dimsoka 2008). The lack of infrastructure can hinder the potential contribution of tourism towards job creation, entrepreneurial development and economic growth.

Spencely & Seif (2003) maintain that the absence of efficient public transport in certain rural areas can also be a barrier to tourism development. Similarly, Eruera (2008) acclaims tourist destinations are only accessible by means of private vehicles. This, according to Eruera (2008) still creates more accessibility problems because the type of roads may become a deterrent for travelers who use private cars as they find travelling in gravel too expensive for the maintenance of their cars.

6. Location

The geographical distribution of tourism amenities and activities is uneven, and this translates to a serious barrier. Many poor people may be in remote areas far from the locations where tourism flourishes, which are usually related to a site or situation. In such situations, infrastructure is an issue (Bowel & Weinz 2008). Lack of accessibility is a serious disadvantage for the rural tourism business and the surrounding communities. Some rural tourism destinations are only accessible to tourists using four-wheel drive vehicles. A bus service may improve accessibility to certain remote destinations and attract tourists from other destinations by offering an alternative service. A challenge is that in geographically dispersed areas this service may only assist travelers to reach the destination but not to move from one product to another (Eruera 2008). Accessibility is one of the factors that make the potential of rural tourism to alleviate poverty a reality because it makes it possible for the consumer to come to the destination.

BACKGROUND

Ialong, is a typical village in West Jaintia Hills. It is also known as 'Ri Jaintia' or 'the land of the Jaintias'. It is a magnificent hilly region located in the eastern part of Meghalaya, India. The land is lavishly gifted by nature with numerous cascading rivers, mighty waterfalls, undulating grass covered hillocks, picturesque landscapes and thick forests (Suchiang et al., 2020). Rich presence of flora and fauna, numerous streams, brooks and rivulets with crystal clear cold water can also be found at every nook and corner of the land and is rightly described as 'Nature's Own Land'. Jaintia Hills in local parlance is also known as 'Ka Ri Khat-ar Dalloi', which means "The Land of the Twelve Chiefs". The Dalloi is the traditional chief who governs an 'Elaka' comprising a number of villages. There are twelve Dallois who govern their respective Elakas in the entire Jaintia Hills. The twelve Elakas are Nartiang, Jowai, Nangbah, Nongjngi, Raliang, Mynso, Shiliang Myntang, Shangpung, Sutnga, Lakadong, Amwi and Nongtalang. After the formation of the Jaintia Hills Autonomous District Council which is an elected body under the sixth schedule of the Indian constitution, all Dallois came under the administrative control of the District Council.

Rural Tourism and Its Impact on the Economy

The region is blessed by the southwest monsoons and the northeast winter winds. Summers are pleasant while winters are cold. Rainfall is abundant during summer, particularly in the southern slopes bordering Bangladesh. Jaintia people are by nature simple, peace-loving and hospitable. They have rich cultural heritage and are fond of arts, sports, music, song and dance. They are believed to be of Indo-Mongoloid race. Those residing in the central and northern region are called Pnars while those in the southern slopes are called “War Jaintias”. The North Eastern part of the region is inhabited by people of two different tribes called ‘Biate’ and ‘Hmar’.

Matrilineal system is practiced by the inhabitants of this state. It is a system in which children inherit title from their mother. Inheritance passes to the youngest daughter of the family. A Jaintia woman thus enjoys high degree of respect in society. However, this does not mean that the females enjoy absolute authority in the family. The father also occupies an honored position as the authoritative head and the decision maker of the family. The main livelihood of Jaintia’s come from agriculture.

Jaintia’s have a special place in the annals of history. The legend of U Kiang Nangbah, U Sajar Nangli, U Marphalangki and others find a place in the unwritten history of the Jaintias. U Kiang Nangbah was a freedom fighter and led the fight against British imperialism during 1861. U Sajar Nangli was a brave army chief of the Jaintia Kingdom, who along with his followers, created the beautiful Thadlaskein Lake. It remains as the pride of Jaintia Hills even today. U Marphalangki is another legend of the Jaintias. He was a Lieutenant of the Jaintia King. He erected the giant monolith at Nartiang village, which stands witness to the greatness of the ancient Jaintias.

The most popular dish of the Jaintia’s is “kha-rang”. It is grilled fish on a bamboo stick, roasted till the skin becomes crisp as a wafer and the flesh is baked to perfection. It is often eaten as a side dish with rice. Other snacks are delicious as well, often enjoyed with tea and staying true to tradition most of these are made with rice.

Ialong village is situated at a distance of 8kms from Jowai on the National Highway-44. The village has the reputation of being one of the oldest villages in the Jaintia Hills. It is associated with fight of the Jaintias against British under the leadership of U kiang Nangbah. The Sacred Grove in the village is inhabited by a wide diversity of flora and fauna. It is said to have been used by the Jaintia soldiers to garrison themselves from time to time when they took a fight against the enemies.

History also has it that one time when the Shad Pastieh festival was performed by the villagers, British police under the leadership of the Daroga from Jowai Thana came and seized all the materials used to perform the dance of the festival. Since then, the festival was never performed in the village. Shad Pastieh is a warrior dance in which the participants use swords and shields.

The village also has several other tourist attractions. The Sacred Grove, the Ialong Eco Lodge, the Umtichi falls and the fishery ponds. The annual Nohskyriat festival is performed every year in April before the villagers engaged themselves in sowing activities. The festival is unique as it is performed only by the Raj Ialong and young ladies. With the Rural Tourism project sanctioned by the government of India in the recent years, the village has been branded by the District Administration as a “Tourist Village”.

The village also houses the famous Ialong Eco Park. It is spread over 12.80 hectares. The, Sacred Grooves also resides within the park. The park and the “Ialong Traveler’s Nest” are run by the “Ialong Tourism Cooperative Society Limited” providing contented lodging in the natures lap. Archery competitions are organized for tourists and locals. Ialong Park offers another panoramic view of the serpentine course of the Myntdu river, a view which is rare to be seen elsewhere. There is also a good scope for trekking down along the path to the river. Fishing activities are also undertaken by many.

METHODOLOGY

The research was conducted in two phases. The first part of study was conducted by interviewing tourists who visited the village in the year 2019. With the help of a semi structured questionnaire, 150 tourists were interviewed using random sampling method. In the second part of the study, local stakeholders dealing with rural tourism projects of Ialong village were interviewed which gave insights on the view-point and their feelings about the importance, requirement and the positive and negative impacts of rural tourism on the economy of the village.

RESULTS AND DISCUSSION

Destinations

The most common villages visited by tourists in Meghalaya are i) Mawlynnong village - Asia's cleanest village ii) Cherrapunjee village - famous for many legendary and cultural attractions. It once held the record of being the wettest place on Earth iii) Mawphlang village - famous for the 'Lawkyntang' also known as 'The Sacred Grove' iv) Ialong village - famous for the Sacred Grove and eco park and the annual Nohskyriat festival which is performed every year in April v) Thadlaskein village – which houses Thadlaskein lake, famous as a picnic spot vi) Dawki village - famous for its scenic boating experience and fishing vii) Nongriat village - famous for "Living Root Bridge" and trekking viii) Nartiang village - famous for monoliths, built as a part of the local rituals and practices ix) Nongkhnum River Island (West Khasi Hills) - 2nd biggest river island in Asia x) Pynursla village and Umden Village (Ri-Bhoi District) - famous for silkworm rearing and hand weaving of silk.

Development of Rural Tourism in Meghalaya

77% of the respondents believed rural tourism in Meghalaya was developing. As the local communities become aware about the importance of tourism and the benefits that can be retrieved, they take the ownership and make greater efforts to preserve and protect nature, natural attractions, culture and other rural attributes. This may lead to inflow of tourists to villages and help to increase the local economy. Local communities may introduce new ideas and features' which can attract more tourists.

Ialong village has opened an array of rural activities and cultural extravaganza which attracts a large number of tourists. Picturesque landscape, picnic spots, guest houses, parks, etc. have contributed towards the progress of rural tourism development in the state. The Department of Arts and Culture, Government of Meghalaya often organizes events and festivals which highlight cultural and heritage of rural communities of villages. Cultural activities like singing, dance festivals of different tribes highlight the folk dances and songs of these native inhabitants. These act as major attractions to the tourists. Recreational activities like boating, fishing competitions, bike campaigns, etc are also held in rural areas which act as major source of tourist attraction. These activities boost local economy and help to increase the living standards of people. Media plays a major role in promoting rural tourism and activities. Promotion through articles, poster, publications, and other forms of advertisement; television, internet and other media channels help to increase the inflow of tourists.

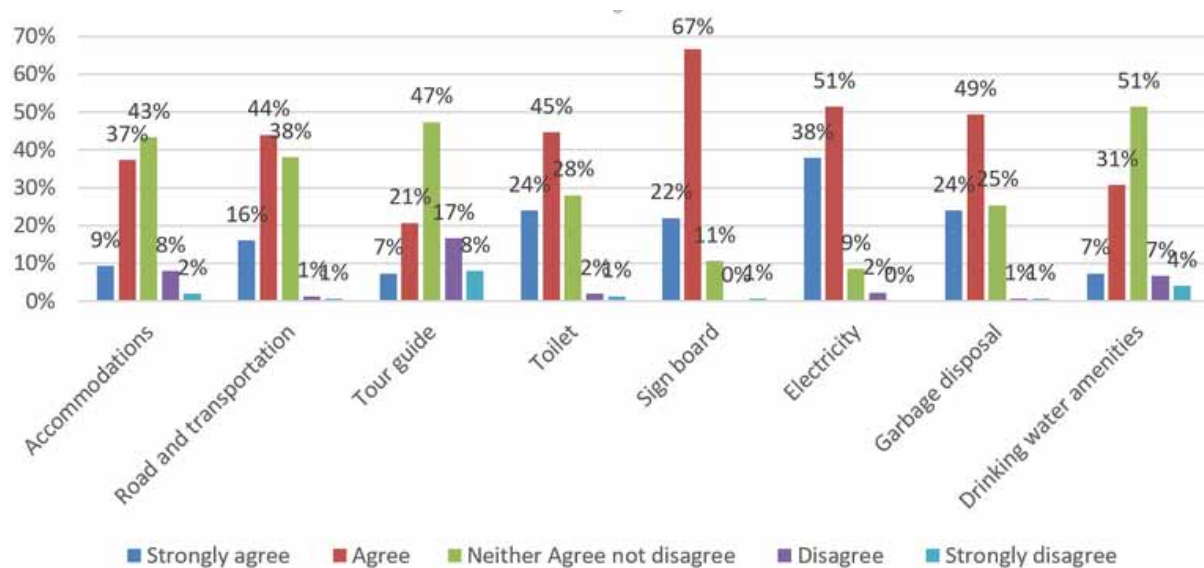
Rural Tourism and Its Impact on the Economy

23% of the respondents believed that rural tourism in Meghalaya was not developing enough due to the lack of awareness among people, lack of accommodation in rural areas and due to the poor condition of roads and electricity. They also highlighted the financial problems of local inhabitants in promoting the tourist spots.

Infrastructure Facilities and Amenities

Figure 1 shows the opinion of respondents regarding facilities, infrastructure and amenities in the rural areas of Meghalaya. It is evident from the graph that most of the amenities are considered to be good. Respondent tourists were not happy about the tour guides; which indicate that training and development programmes are required for enhancing the skills and social behavior of tour guides so that they may cater efficiently to the requirements of tourists.

Figure 1. Infrastructure facilities and amenities



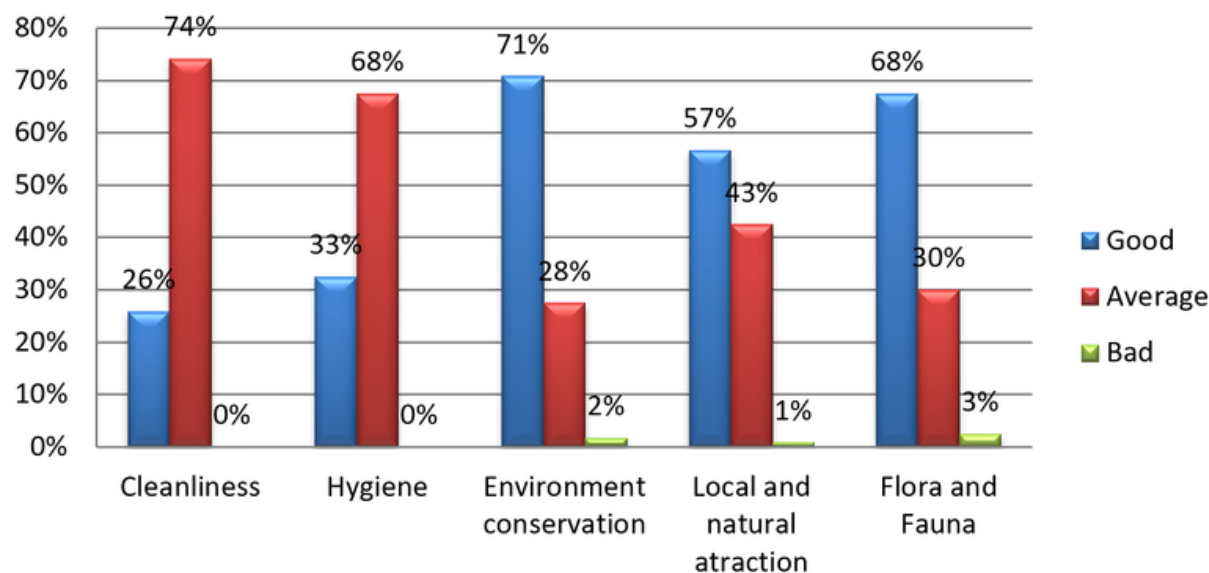
Features

The village of Mawlynnong- is accredited as the cleanest village in Asia. The locals co-operate effectively and efficiently in cleaning the villages. Figure 2 shows that most respondents believe cleanliness and hygiene in Meghalaya are at an average level. This influences a tourist's opinion, impression and re-visit intentions. Throughout Meghalaya, environmental conservation is given importance as inhabitants worship the Mother Nature and respect her in the most auspicious and revering ways. They perform rituals and have traditional practices for preserving and protecting the environment and nature.

The rituals concerned with environment conservation keep the new generations aware of the importance of nature and its preservation. 71% of the respondents rated that environment conservation of the state was good. The dense forests house many rare species of plants and animals. Tourists often

venture into these forests to get an experience of Jungle and its adventures. The present of the Sacred Grove in several rural areas of Meghalaya have ensured preservation of many unique varieties of plants and animals in their natural habitat. The Sacred Groves also act as major source of revenue for the local people as travelers often visit these places. Locals offer meals, handicraft items and other indigenous products to tourists.

Figure 2. Rating of features



Opinion Regarding Help to Local Communities

Rural tourism is a source of economic improvement for the local communities. Most of the respondents agree that rural tourism does help the local communities economically. Statistics of this study shows that 83% of the respondents believe that rural tourism helps in empowering local community, especially the women. In the 'Explore Exotic Meghalaya' campaign (rural tourism project) initiated by the Meghalaya Tourism Co-operative Society and the village societies; the villages in the campaign empowered women to take initiative and start tourism ventures and enterprises. At Ialong, the village society comprises mostly of women who engage in micro business like tea stalls, restaurants and handlooms. Women are encouraged to participate actively in rural tourism activities and make decisions regarding the development of tourism infrastructure and facilities. Rural tourism helps to improve the quality of life by encouraging local people to set up their businesses centered towards fulfilling the requirements of tourists visiting those place. Instead of migrating to towns and cities in search for jobs, the rural inhabitants can stay back and get employed in such ventures. The locals also find employment as tour guides, service providers and guards at guest houses. As reported by the local stakeholders, revenue from tourism is more than farming and animal husbandry sectors.

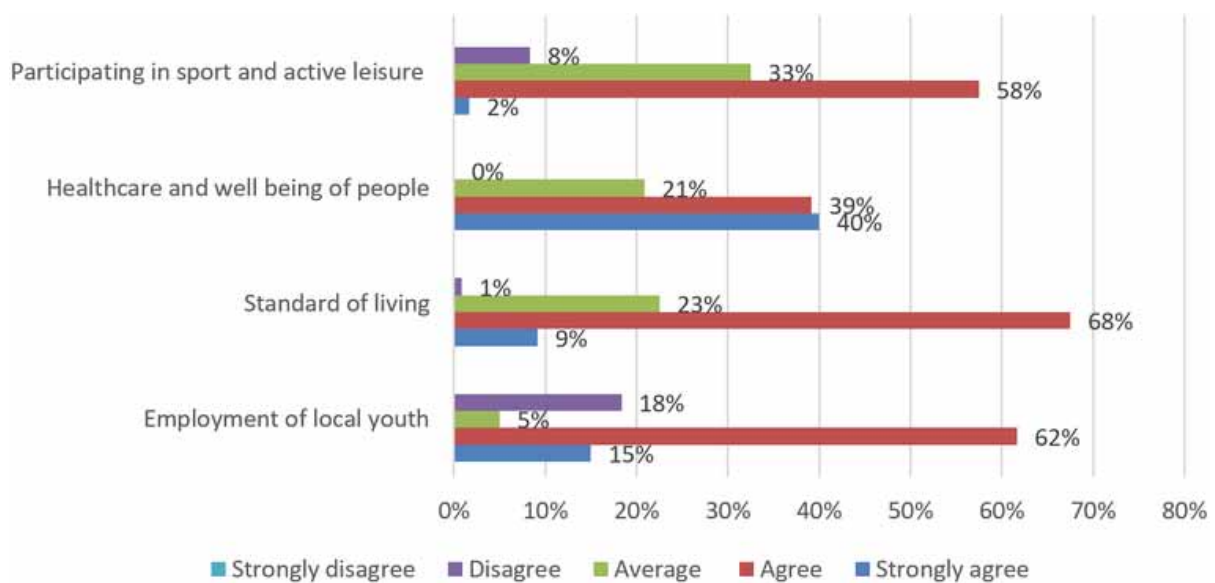
Rural Tourism and Its Impact on the Economy

13% of respondents, did not agree that rural tourism helps local communities socially and economically. According to them, the apex bodies responsible for promotion of rural tourism exploit the local communities. They believe the benefits from tourism are not equally distributed and there are numerous incidences of corruption among the officials and village Headmen.

Improvement in Quality of Life

From figure 3 it is evident that participating in sport and leisure activities, standard of living for village people, healthcare and wellbeing of people, and employment of local youth has increased with increase in rural tourism. However, 18% of the respondents believe that rural tourism has not been able to contribute to employment of local youth.

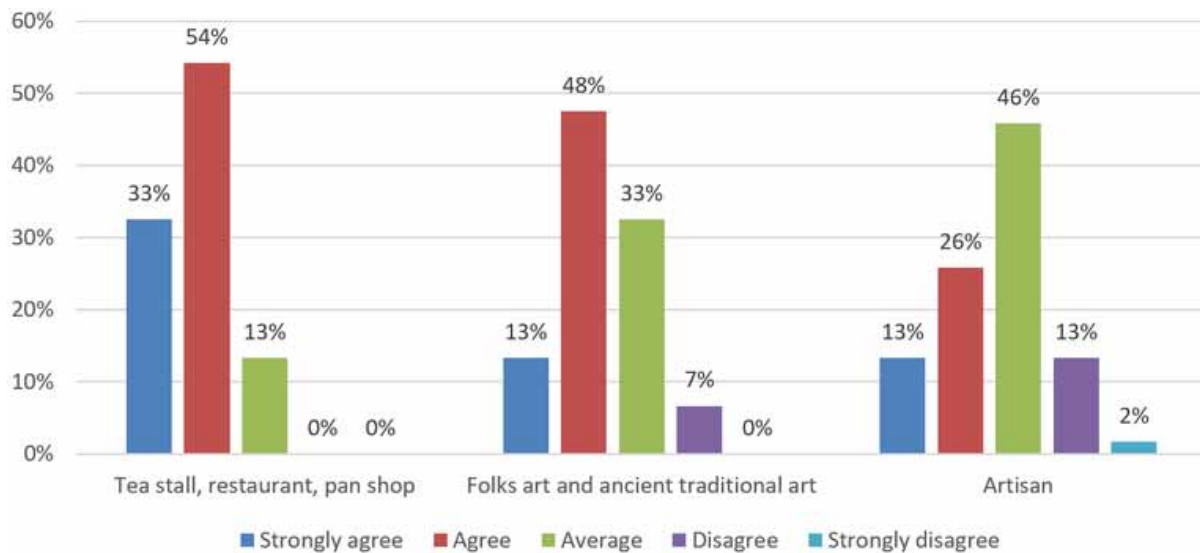
Figure 3. Improvement in quality of life



Improvement in income flow

Figure 4 reveals that sources of income through different initiatives like tea stalls, pan shop, folk art, traditional art and artisan has increased due to rural tourism. 61% of the respondents believe that folks art and ancient traditional arts get importance due to rural tourism. 39% of the respondents feel that local artisans get employment due to rural tourism.

Figure 4. Improvement in income flow



CONCLUSION

Ialong village in Meghalaya is famous for Ialong Park (Eco Park), Sacred Grove and various recreational activities. The survey of 150 respondents show that rural tourism in Ialong village helped in promoting the economic development of village. There has been an increase in income levels of the natives by setting up of small enterprises. It has helped them to increase their living standard. The village attracts tourists for its natural beauty, rich flora and fauna and its community festivals (Nohskyriat). Although many villages are blessed with beautiful landscape and natural beauty, the tourists are unable to visit regularly due to poor road conditions and unavailability of railway system. Lack of advertising is also attributed to poor footfall of tourists. The lack of business tie-ups among village authorities and travel agencies has resulted in less promotions of the tourist destinations among the potential visitors.

REFERENCES

- Ashe, J. W. (2005). *Tourism investment as a tool for development and poverty reduction. In The experience in Small Island Developing States*. SIDS.
- Batra, L. (2009). *A review of urbanisation and urban policy in post-independent India*. Centre for the Study of Law and Governance.
- Bhatta, B. (2010). Causes and consequences of urban growth and sprawl. In *Analysis of urban growth and sprawl from remote sensing data* (pp. 17–36). Springer. doi:10.1007/978-3-642-05299-6_2
- Bowel, D., & Weinz, W. (2008). *Reducing Poverty through Tourism*. International Labour Office.
- Chauhan, E. (2020). Challenges to community participation in heritage tourism development: Case studies of shahjahanabad and nizamuddin basti in new delhi, india. *WIT Trans Ecol Environ*, 248, 225–233.

Rural Tourism and Its Impact on the Economy

- Chowdhary, N., Kaurav, R. P. S., & Sharma, S. (2020). Segmenting the domestic rural tourists in India. *Tourism Review International*, 24(1), 23–36. doi:10.3727/154427220X15791346544761
- Clarke, J. (2005). Effective marketing for rural tourism. *Rural Tourism and Sustainable Business*, 26, 87-103.
- Ćurčić, N., Mirković Svitlica, A., Brankov, J., Bjeljac, Ž., Pavlović, S., & Jandžiković, B. (2021). The Role of Rural Tourism in Strengthening the Sustainability of Rural Areas: The Case of Zlakusa Village. *Sustainability*, 13(12), 6747. doi:10.3390/s13126747
- Dawar, S., & Chandra, M. (2010). *Masters of Rural Markets*. Academic Press.
- Demonja, D., & Ružić, P. (2011). *Rural tourism in Croatia with Croatian case studies of good practice and European experiences*. Meridians.
- Dimsoka, T. (2008). *Sustainable Tourism Development as a Tool for Eliminating Poverty*. Facta University.
- Eruera, A. (2008). *Rural Tourism and Development in the Eastern Hokianga Area*. Ministry of Tourism International Research.
- European Commission, Directorate-General for Energy, & Ethniko Metsovio Polytechnio (Greece). (2003). *European energy and transport: Trends to 2030*. European Communities.
- Gannon, A. (1994). Rural tourism as a factor in rural community economic development for economies in transition. *Journal of Sustainable Tourism*, 2(1-2), 51–60. doi:10.1080/09669589409510683
- George, A. M. (2005). *India untouched*. Cranston, RI: The Writers' Collective.
- Hall, D. R., Kirkpatrick, I., & Mitchell, M. (Eds.). (2005). *Rural tourism and sustainable business* (Vol. 26). Channel View Publications.
- Harrison, D. (1992). *Tourism and the less developed countries*. Belhaven.
- Kaur, N., Kaur, M., Padhi, S. S., & Singh, K. K. (2021). Geospatial analysis of the distribution of urban green spaces: a study of four Indian cities. *Cities & Health*, 1–17.
- Kieselbach, S. R., & Long, P. T. (1990). Tourism and the rural revitalization movement. *Parks & Recreation (Arlington)*, 25(3), 62–66.
- López, J. J. (2006). Dynamic growth in the Rio Grande valley. *Southwest Economy*, 2, 11–14.
- Mathew, V. (2009). Sustainable tourism: A case of destination competitiveness in South Asia. *South Asian Journal of Tourism and Heritage*, 2(1), 83–89.
- Mbaiwa, J. E. (2003). The socio-economic and environmental impacts of tourism development on the Okavango Delta, north-western Botswana. *Journal of Arid Environments*, 54(2), 447–467. doi:10.1006/jare.2002.1101
- Mishra, R. K. (2001). *Insolvency Procedure and Corporate Restructuring: The Case of State Public Undertakings in Orissa*. Academic Press.

- Nzama, A. T. (2008). Socio-Cultural Impacts of Tourism on the Rural Areas Within the World Heritage Sites–The case of KwaZulu-Natal, South Africa. *South Asian Journal of Tourism and Heritage*, 1(1), 1–8.
- Ohe, Y. (2008). Impact of rural tourism operated by retiree farmers on multifunctionality: Evidence from Chiba, Japan. *Asia Pacific Journal of Tourism Research*, 13(4), 343–356. doi:10.1080/10941660802420945
- Ohe, Y. (2020). *Community-based rural tourism and entrepreneurship*. Springer. doi:10.1007/978-981-15-0383-2
- Proenca, S., & Soukiazis, E. (2005). Tourism as an alternative source of regional growth in Portugal. *Centro de Estudos da Uniao Europeia Faculdade de Economia da Unversidade de Coimbra, Discussion paper*, (34).
- Ramaiah, M., & Avtar, R. (2019). Urban green spaces and their need in cities of rapidly urbanizing India: A review. *Urban Science*, 3(3), 94. doi:10.3390/urbansci3030094
- Ryglóva, K. (2007). Limiting factors in the field of business activities in rural tourism. *Zemelska Ekonomika-Praha*, 53(9), 421.
- Saha, S. K., Babai, T. C., & Saha, S. (2018). Adventure Tourism in Meghalaya. *J Tourism Hospit*, 7(350), 269–2167.
- Sarkar, S. (2009). *Rural Tourism Prospects in West Bengal Province*. Berjaya University College of Hospitality.
- Sharma, J. (2006). *Tourism Planning and Development. A New Perspective*. Kanishka Publishers.
- Sharpley, R. (2001). Tourism in Cyprus: Challenges and opportunities. *Tourism Geographies*, 3(1), 64–86. doi:10.1080/14616680010008711
- Spenceley, A., & Seif, J. (2003). *Strategies, impacts and costs of pro-poor tourism approaches in South Africa*. Overseas Development Institute.
- Suchiang, B. R., Nonghuloo, I. M., Kharbhih, S., Singh, P. P., Tiwary, R., Adhikari, D., Upadhaya, K., Ramanujam, P., & Barik, S. K. (2020). Tree diversity and community composition in sacred forests are superior than the other community forests in a human-dominated landscape of Meghalaya. *Tropical Ecology*, 61(1), 84–105. doi:10.100742965-020-00066-w
- Udovč, A., & Perpar, A. (2007). Role of rural tourism for development of rural areas. *Journal of Central European Agriculture*, 8(2), 223–228.
- United Nations World Tourism Organization (UNWTO). (2004). *Tourism Congestion Management at Natural and Cultural Sites*. Madrid: World Tourism Organization.
- Urry, J. (1990). The consumption of tourism. *Sociology*, 24(1), 23–35. doi:10.1177/0038038590024001004

Chapter 16

Market Segmentation and Dark Tourism and the (Post) Pandemic Scenario

João Miguel Veiga

Polytechnic Institute of Cávado and Ave, Portugal

João Daniel Veloso

Polytechnic Institute of Cávado and Ave, Portugal

Sara Quintão Pereira

Polytechnic Institute of Cávado and Ave, Portugal

Bruno Barbosa Sousa

 <https://orcid.org/0000-0002-8588-2422>

Polytechnic Institute of Cávado and Ave (IPCA), Portugal & CiTUR research member, Portugal

ABSTRACT

Dark tourism is a segment of tourism that has been growing in recent decades and is strongly associated with tragedy and mystery. There are several academic researchers who present literature on this specific group of tourist consumers. As a result, 2020 was strongly marked by the pandemic of the new coronavirus (COVID-19). This chapter presents a reflection on the role of dark tourism in the pandemic and post-pandemic period. From an interdisciplinary perspective, this chapter presents contributions to (dark) tourism, marketing, and pandemic management.

INTRODUCTION

Tourism is a phenomenon responsible for a set of activities carried out by one or more individuals, for a period of less than a year. These individuals are considered tourists or visitors, depending on whether they stay overnight at the destination, traveling to a place outside their area of residence for any reason related to leisure or recreation, as long as they don't engage in a paid activity. There are several seg-

DOI: 10.4018/978-1-7998-9664-7.ch016

ments that make up this sector, Dark Tourism is the one highlighted in this article. This is defined as the phenomenon that embraces the presence and consumption, by visitors, of places related to frightening events and that serve as tourist attraction and/or entertainment. These had a certain impact, historically, and will continue to have it in our lives (Fonseca, Seabra & Silva, 2016; Gonçalves, 2017). In 2020, the planet saw a sharp decline in the Tourism sector, caused by the entry of COVID-19 into the lives of the world's population. This is an infectious disease, caused by a virus, that is closely linked to the severe acute respiratory syndrome that emerged and spread around the world in the early 21st century. The present chapter aims to analyze and understand the impacts of COVID-19 on Dark Tourism, nowadays, as well as in the future. Initially, the concept of Tourism was studied, followed by an extensive analysis of the notion of Dark Tourism and its various parameters. This was followed by a search about COVID-19. It was firstly defined, then established a relationship with Dark Tourism and how it is affected by it.

Finally, a reflection was made on these two themes, seeking to obtain a future perspective for the development of this niche of tourism in a post-pandemic period. Covid-19 had a big impact in people's lives and their routines. One of the most affected sectors was the tourism one, because the world stopped. The authors thought it would be interesting to understand better how this pandemic affected the Dark Tourism industry and how this niche will develop afterwards. The purpose of this study is to acknowledge how this industry will react, along with its consumers, to the changes that are happening worldwide. It was applied a mono-method research to get a general view of Dark Tourism and Covid-19, along with its impacts. The authors also want to understand what changes will happen to the Dark Tourism customers, meaning that some tendencies can be adjusted, disappear or can be started. Furthermore, customer behavior will change, and we will see, in the next few years, lots of transformations coming to this niche, such as the implementation of the online industry/sector, which will impact supply and demand, so companies will have to keep in touch with all these developments. The present chapter finds can be used for future research, acting as a basis for empirical studies.

BACKGROUND

Dark Tourism Trends

Tourism, as we know it today, is a phenomenon that emerged after the Industrial Revolution in the 19th century and is currently characterized by the set of activities undertaken by an individual (or a group of individuals) for a variable period. This individual, tourist or visitor, depending on whether he stays or not overnight at the destination he visits, travels to a place outside his area of residence, mostly for leisure (e.g., to rest, for social or cultural reasons, among others) (Santos et al., 2021). There are, however, some exceptions, such as tourism associated with business travels. It is important to note that business travels are different from travelling to work. For instance, a person driving to his usual workplace, even if it is located outside the town where he lives, is not considered a tourist. According to the statements above, tourism is defined as the movement of people from their place of residence for a determined period and not motivated by reasons of professional activity. A worker who sporadically travels to attend a congress or close a deal in a location other than his residence is considered a traveler as well (Alves et al., 2021). This complex phenomenon based on the relationship between the target and the place of visit and its stakeholders involves a wide range of people who increasingly seek new and unique experiences (staged authenticity) in order to satisfy the most diverse desires, extending to new markets, more demanding,

more complex and even unusual (Lubowiecki-Vikuk et al., 2021). Poria, Butler & Airey (2003) state that any tourism context involves people's perceptions of activity, space and time.

This activity has a huge importance to the economy of some destinations and leads several places to adapt to live exclusively from this resource, since the tourist is an avid consumer of local products and services, triggering a whole world economy around this area over the last few years.

Although different designations have emerged, Dark Tourism is globally considered the most accepted and is defined as the phenomenon that encompasses the presence and consumption, by visitors, of places of genocide, holocaust, murder or crime, related to death, suffering, disasters and macabre events. These places serve as a tourist attraction or entertainment and had a certain impact, historically, and will continue to have it in our lives (Fonseca et al.; Gonçalves, 2017). According to Gonçalves (2017), and in a shorter definition, it is defined as "(...) the act of traveling to places associated with death, suffering, and the macabre". Henderson (2000) and Sánchez and Sousa (2020) complete the idea by saying that it also offers distinct experiences, such as the emotional, the educational and can even have a therapeutic aspect.

This niche allows individuals to have more contact, in a safe environment, with death, bringing past events into the present, by sharing information and causing emotions (Stone & Sharpley, 2008). Podoshen (2013) present the idea that Dark Tourism favors the visual and experiential over the historical (usually found in heritage sites). This is in line with Sharpley & Stone's (2009) assertion that dark tourism is a more complex process that is augmented by the spontaneity of sensations and driven by interest in death and/or catastrophes as the dominant reason for engaging in tourism activities. "Dark tourism allows for the reconceptualization of death in forms that stimulate something other than primal terror and dread" (Stone & Sharpley, 2008). Light (2017) notes that Dark Tourism is a mix of various subthemes, depending on the interests of those who study it, including history, psychology, literature, and others, pointing out that its focus is on the social sciences, particularly geared towards death. Moscardo & Ballantyne (2008) note that interpretation is a key component of the tourist experience at attraction sites. Sharpley and Stone (2009) affirm that this interpretation is responsible for the tourist's navigation between the place, the objects, the history and its heritage.

Within Dark Tourism and all its expansions: ghost tourism, spiritual tourism, religious tourism and pilgrimage tourism, the highlight goes for paranormal tourism, which is defined as "(...) a wide range of beliefs and experiences related to religion, the occult, witchcraft, superstitions, supernatural and extraordinary life forms, and extraterrestrials" (Pharino, Pearce & Pryce, 2018), and can contribute to destination image (Baloglu & Brinberg, 1997; Baloglu & McCleary, 1999; Lin, Morais, Kerstetter & Hou, 2007; Pharino et al. 2018; Sánchez & Sousa, 2020; Wang et al., 2021). Examples of these experiences may be haunted excursions (haunt jaunting), guided tours and investigative tours (Pharino et al., 2018), which include looking for UFOs or mystical animals, participating in ghost hunting tours or traveling to destinations related to spiritual beliefs. The distinctive feature of paranormal tourism is the interest in processes, forces or events that are not easily explained in logical and conventional terms. There is also another recently explored expansion of Dark Tourism called Dark Tourism Online and, according to Krisjanous (2016), it has a great capacity to disseminate information for tourists. They can learn more about certain places, access different cultures and understand what is accepted and rejected, being this information essential to respect the local culture. In the current pandemic context, this aspect of dark tourism gains a new meaning, since it becomes one of the main access doors to this niche, since the travels abroad are extremely limited, but people still seek to consume culture and entertainment.

The Dark Tourism – Past, Present and Future

Wright and Sharpley (2018) highlight the presence of death in human beings as long as it can be remembered, being defined as an intrinsic characteristic of them. This has been a source of entertainment for many years, due to the way humans face death itself, a fact that can be proven by gladiator battles or the execution of people in public squares. More recently, this exhibition with the purpose of entertaining the tourist has acquired other forms of representation, through photographs taken during the American Civil War in the 19th century, the search by newspapers for stories related to crime/tragedy or even films, in the 20th century (Fonseca et al., 2016). Before getting the current title, Dark Tourism, which emerged in Romania (Ariawan & Ahmat, 2020) went through several concepts, namely:

Black Spot – “Commercial developments of grave and sites in which celebrities or large numbers of people have met with sudden and violent deaths” (Fonseca et al., 2016).

Thanatourism - “Travel to a location wholly, or partially, motivated by the desire for actual or symbolic encounters with death, particularly, but not exclusively, violent death, which may, to a varying degree be activated by the person-specific features of those whose deaths are its focal objects” (Seaton, 2004)

Atrocity Tourism - “(...) type of tourism that leads the individual to visit holocaust sites” (Fonseca et al., 2016).

Morbid Tourism – “(...) the travel to attractions that focus on accidents and sudden violent death” (Fonseca et al., 2016).

Dark Tourism has demystified the idea individuals have about death, because it allows them to confront and contemplate it. Thus, death can also be used as a mean to entertain tourists/consumers (Fonseca et al., 2016). Sánchez and Sousa (2020) state that the media has a huge importance in advertising dark events, as the scale and scope of the tourism product is likely to be driven by them. The fact that dark tourism is becoming a trend in the 21st century raises some ethical and moral questions, such as the discussion regarding the behavior of the visitor, who sometimes disrespects the dark past of the place he visits or disobeys defined rules to share content on social media (Zhang, 2017). Tourism and entertainment may be displayed as horror shows, in fun factories, theme parks, rides or even roller coasters, where consumers will have the opportunity to revisit the past tragedies. The use of technology could improve waiting times, reduce energy consumption and environmental impacts. A darker future is also envisioned, one that will involve more interaction with the guest so that he has a personalized experience (Wright, 2016).

Different Typologies in Dark Tourism

Sharpley (2009) designs a typology that investigates dark tourism consumption with supply as an axiological factor, beginning from pale to dark based on how attractions and experiences are quantified by the degree to which interest in death is expressed in correlation with how the supply is directed toward consumer fascination. Dark Tourism involves several strands that can be separated into several categories, such as: Holocaust Tourism, Prison Tourism, War/Battlefield Tourism, Cemetery Tourism, Disaster Tourism and Ghost Tourism (Fonseca et al., 2016).

Holocaust Tourism - consists of visiting places where cruel historical events took place, especially in areas linked to exterminations (Fonseca et al., 2016).

Prison Tourism - visits to prisons that have a dark history, combining education and entertainment (Fonseca et al., 2016).

Market Segmentation and Dark Tourism and the (Post) Pandemic Scenario

War/Battlefield Tourism - recreational travel to war zones for tourism or historical study purposes. Tourists deliberately visit nations that have been or are involved in a war, looking for evidence of the conflict (Fonseca et al., 2016).

Cemetery Tourism - travel to cemeteries to see statues and funerary ornaments on the graves of famous people or others (Fonseca et al., 2016).

Disaster Tourism - travel to areas that have recently experienced natural or man-made disasters (Fonseca et al., 2016).

Ghost Tourism - movement of tourists with the objective of capturing paranormal activity (Fonseca et al., 2016).

Different places are listed as points of interest for the practice of Dark Tourism. Some of the most emblematic are:

Auschwitz Concentration and Extermination Camp - Birkenau (Poland) - Between 1940 and 1945, more than one million men, women and children died in the Auschwitz - Birkenau concentration camp. This was the worst of a total of 6 camps dedicated to extermination, where prisoners were pushed to the limit through hard labor and horrific experiments or were directly killed by the gas chambers without mercy.

Ground Zero - National 9/11 Memorial (New York - USA) - This site represents a tribute to the nearly three thousand people killed in the terrorist attacks on the twin towers on September 11, 2001 (Tole, 2018).

Chernobyl Disaster (Ukraine) - After the nuclear accident that occurred in Chernobyl on April 26, 1986, several tour operators organize excursions to the area and its abandoned villages (Tole, 2018).

Leap Castle (Ireland) - According to a local folk legend, the castle is haunted by a supernatural entity half man, half beast called Elemental, who died of leprosy there, and whose spirit has remained in that place over the years. The castle is known for its television exposure, having been used as a backdrop for some television series, such as "Most Haunted".

Dharavi Slum (Mumbai - India) - This slum gained great projection after the release of the movie "Slumdog Millionaire" and is one of the most visited places in India (Kumar, 2019).

Paris Catacombs (France) - These are underground ossuaries, containing the remains of some six million people and filling a section of the historic caves and tunnels that make up the remains of the stone mines of Paris, giving it its reputation as The World's Largest Tomb.

The Island of Dolls (Mexico City) - The story of this island is based on the supposed death of a little girl, who met her fate too soon under strange circumstances. This island is home to hundreds of terrifying dolls, with their severed limbs, decapitated heads and blank eyes that were disposed on that spot by the former owner of the island to appease the soul of the child who died and tormented him. These adorn trees, but also other spaces on the island. It is one of the creepiest and most visited places in the world (Sánchez & Sousa, 2020).

Anne Frank House (Amsterdam) - Anne Frank was a young Jewish girl who wrote a diary about her life while living in hiding from the Nazis in the middle of World War II. In her honor, there is now the Anne Frank House, a museum depicting her story.

Cimetière du Père Lachaise (Paris - France) - Cemetery where countless famous people have been buried, among them Jim Morrison, Oscar Wilde, Eugène Delacroix, Edith Piaf and others.

Magic Kingdom (Florida - USA) - It's a theme park that has several connections to Dark Tourism. On the one hand, there are several rumors of ghosts in several attractions of the park, some of which "demand" to be greeted otherwise the attractions where they "inhabit" will not work throughout the day. On the other hand, there is indeed a "dark attraction" in the park, the "Haunted Mansion", a man-

sion where tourists are welcomed by a ghost, who guides them on a tour through several rooms of the house, where they may encounter more ghosts and even vampires, among other supernatural creatures.

MAIN FOCUS OF THE CHAPTER

Tourists' Motivations

Regarding tourists' motivations for visiting dark sites, Zhang, Yang, Zheng and Zhang (2016) properly identified visitors' reasons. The first is associated with gaining benefits from the contemplation of life and death, due to the increase of integral dark tourism supply infrastructures. Death has become socially accepted, which has led to its incorporation for educational and entertainment purposes.

The second reason, according to Sánchez and Sousa (2020), consists of learning, curiosity, identity, remembrance and commemoration, all of which are related to mortality. Iliev (2020) states that historical or heritage sites are places where tourists are involved in different experiences at the same time, these being the cultural, educational and historical experience. Finally, the third reason is based on leisure, highlighting, Iliev (2020), the ambition for exclusivity, memory and knowledge enrichment. People who seek out dark tourism sites have a high cultural level, as they visit iconic places where knowledge and discovery are their main interest (Gonçalves, 2017).

As Podoshen (2013) describes, tourists are often driven by the desire to engage in comparisons between the landscape they are experiencing and the image they have created based on books, movies or other media. Some of these tourists do not seek a "safe distance" but rather a closer immersion in death to simulate and feel a strong emotion, possibly even the emotion of the death carriers themselves and exchange knowledge and experience with the destination.

Liberato, Liberato, Alén and Lopes (2018) identified four dimensions that allow the individual to retain aspects of the experience, namely: affect, expectations, consequence and recall. Affect consists of the positive emotions associated with the experience, expectations refer to the destination having fulfilled all the requirements that the tourist idealized and even exceeded what the tourist had in mind, consequence refers to the importance and particular taste of each individual and recall refers to the mental effort of each person to remember what happened in the experience.

Authors such as Biran et al. (2011) understand that people visit these sites due to personal reasons, such as having an educational and learning opportunity and seeking to understand about what happened at a particular place.

Visiting museums can provide both negative and positive experiences, with the former evoking feelings of anger, fear, horror, sadness, discomfort and depression, as argued by Zhang et al. (2016). On the other hand, museums are places of cultural entertainment, contributing to personal identification and escape from everyday life. Within cognitive experiences, according to Sánchez and Sousa (2020), the educational component is the most relevant. He also adds that, in dark tourism, past experiences can influence behaviors in future trips through word-of-mouth recommendations as well as repeat visits.

It is noteworthy that motivations are not only directed towards questions of understanding, but also towards the question of status. Nowadays, it is increasingly common to observe visitors taking selfies and smiling at sites where tragedies have occurred. Therefore, according to Iliev (2020), personal motives are not only based on the desire that tourists feel to visit dark sites, but also on their interest in showing that they have been there and, consequently, promoting their own image.

Market Segmentation and Dark Tourism and the (Post) Pandemic Scenario

Similarly, the motives of those who engage in cultural tourism are like those who do dark tourism, because, according to Light (2017), in both cases, visitors are interested in learning and understanding about the past. Thus, tourists' motives are varied, as they include the desire to understand the history of what is presented to them, provoking a sense of "seeing to believe" and an emotional experience.

Briefly, the initial researches done on dark tourism stated that the admiration for the end of life would be the main reason for people to go to places where death could be gifted. In addition, curiosity for the morbid was identified as one of the main motivations in several studies, and this was not exclusive to visiting dark places. Later, studies emerged that excluded fascination with death as the main component of dark tourism and revealed that people went to dark places for reasons of memory, understanding, and learning. Finally, some scientists consider that most of the reasons why people do dark tourism are associated with those related to cultural tourism, forming a kind of dark tourism light.

Supply and Demand in a Dark Tourism Context

The pandemic we are currently going through is impacting many different sectors and all over the world. According to McKinsey & Company (2020, as cited in Hall, Scott & Gössling, 2020), the epidemic is not only a health crisis of enormous proportions, but also an opportunity to restructure the world economic order, potentially including the nature of international tourism as a social and economic phenomenon. To reduce contagions, social distancing is required, and this is a factor that reduces the capacity of hospitality operations, particularly in restaurants, hotels, among others, since it is not possible to host many people within the same space. Another tourism sector affected by this physical distance is events, due to the limitation of the number of people, affecting its activity (Hall et al., 2020).

Due to the crisis currently faced by the tourism industry, according to Ioannides and Gyimóthy (2020), two general outcomes can be outlined about it. Based on past historical events concerning pandemics, tourism will return to what it was, being unsustainable and unmeasured, gradually. Alternatively, the recovery of this sector will be radical and will operate differently. All businesses, whether large, medium, or small, have been forced to suspend their activities and operations because they depend, either directly or indirectly, on tourist flows, and many of these entities will probably not reopen (Ioannides & Gyimóthy, 2020).

Regarding the demand for dark tourism (Kunwar & Karki, 2019) identified three groups of travelers, being the global nomads, the backpackers and the flashpackers. Firstly, global nomads are those who seek contact with local people and knowledge of their daily lives. To do this, they get so close to people that they stay in their own homes and seek to connect with the internet.

Nextly, backpackers (independent travelers) usually travel with others from the same country and these travelers are motivated by the desire to create or even strengthen connections with those on the trip. Related to dark tourism, the visitors are categorized as backpackers. These individuals visit sites where violence is related to black metal artists and seek places where they can experience live music and festivals.

Finally, another group classified by Richards (2015), flashpackers, are those who stay connected during their trip, often using social media.

Pereira (2020) argue that, many times, visitors who engage in dark tourism are motivated by the search for a new experience, in order to acquire knowledge and understand aspects that were not known before. A dark experience is a journey to the place and a junction with knowledge, which results in a deep intellectual experience, and may even bring a new perspective, a new look. Dark Tourism is a market

that is getting more and more notoriety and has been explored by the popular press. It is through films, photographs, and news of tragedies or accidents that it is possible for the community to experience the reported events. Photography is one of the ways to integrate society into tragic events, as a connection is made among realism, representation and photography, as instead of these simply presenting the disasters, suffering and wars, they provide images to which viewers should already have prior knowledge, leading to their understanding and interpretation (Wright & Sharpley, 2018).

From the point of view of tourist demand, in the future, it should be directed towards a demand for tourists with a high academic degree, who are eager for knowledge and discovery, who therefore pay close attention to detail. Driven by curiosity, when it comes to morbid places, these same tourists seek out places where tragic events have occurred, especially those involving deaths (Liberato et al., 2018).

Dark tourism attractions can vary between those that are darkest black and those that are lightest black, the darkest black ones consisting of places where deaths have happened and therefore do not need high grade infrastructures to attract visitors. In the case of lightest black attractions, they focus on recreating past events linked to the macabre events and, unlike darkest black, need more infrastructure to attract tourists (Stone, 2006). The end of life is marketed and generated as a topic of attention, aiming to impact, entertain and provoke the consumer.

There are seven types of Dark Tourism supplies:

Dark fun factories: consist of rides and attractions that focus on entertainment and have a commercial purpose, featuring real or fictional deaths and macabre events (Pereira, 2020). This type of product requires high technology, as well as high grade infrastructure targeted at those seeking the macabre experience, with Stone (2006) identifying this type of offering as the least authentic. Thus, Dracula Park is an example of this type of attractions, due to its terrible story of a count who tortured his prisoners by impaling them on skewers, leaving them to die.

Dark exhibitions: are represented by the supply of products linked to death and suffering that usually have a commemorative, educational, or reflective message. Dark exhibitions aim to portray education and learning activities (Fonseca et al., 2016). However, although these products advocate a conservation ethic, they involve infrastructure and some commercial focus (Pereira, 2020). Museums that exhibit death for educational purposes are the best examples of dark exhibits, such as the War Museum in Vietnam.

Dark dungeons: consist of local dungeons or attractions related to justice and criminal matters, namely former prisons. Dark dungeons offer a combination of entertainment and education (Fonseca et al., 2016). In addition, there is a great focus on commercial point of view, tourism infrastructures and they appropriate places that were not originally envisioned for dark tourism (Pereira, 2020). Stone (2006) positions this type of attraction at the center of the dark tourism spectrum, featuring a mix of light and dark tones. Examples of this type of attraction include The Alcatraz Federal Prison and The Robbens Island Prison.

Dark resting places: focus on cemeteries and graves as potential products for dark tourism since more and more tourists include visits to cemeteries in their trips. In addition, they are positioned at the center of the dark tourism spectrum, as mentioned above. The most visited places of cult are the Arlington National Cemetery, the *Cimetière du Père Lachaise* and the La Recoleta cemetery (Fonseca et al., 2016).

Dark conflict sites: they are associated with wars and battlefields and their transformation into tourism products. These attractions focus on an educational and commemorative aspect, as well as a historical

perspective. An example of this is the Battle of Guadalcanal in the Solomon Islands, as many of them still have debris from the war (Fonseca et al., 2016).

Dark shrines: shrines that are based on the act of remembrance and respect for a recently deceased person, commercializing the action of remembering him/her (Fonseca et al., 2016; Sánchez and Sousa, 2020). These shrines do not have tourism infrastructure due to their temporal nature and are usually built near the sites where tragedies occurred (Pereira, 2020). Stone (2006) suggests that these shrines are on the darker end of the dark tourism spectrum. An obvious example of dark shrines is Ground Zero in New York City (Stone, 2006).

Dark camps of genocide: marked by death and atrocity, represent the darker end of the dark tourism spectrum (Stone, 2006). Currently, tourist attractions associated with genocide sites constitute one of the largest categories of visited sites worldwide, providing an emotional experience. The most visited concentration camps are those in Auschwitz and *Cambodja* (Fonseca et al., 2016). Thus, Dark Tourism plays an important role in both the economy and the image of certain destinations. From the previously mentioned analysis of the Dark tourism supply, the destinations considered to be part of dark tourism are museums, cemeteries, concentration camps, war scenes and other places that witness tragic events.

METHODOLOGY

The methodology of this chapter consisted of a qualitative analysis, supported by an extensive literature review based on documents related to this niche and COVID-19 itself. The approach used consisted of a narrowing down of concepts and subsequent deepening, starting with the concept of tourism (generalized), then focusing on dark tourism, exploring the concept itself and unveiling all its characteristics. Then the information was complemented with an explanation of what the Coronavirus is, associating it with Dark Tourism and exploring its repercussions in the tourism sector, namely, in this segment. Finally, the future and trends of it were studied, taking into account the current global panorama.

Covid-19 and Pandemic Context

According to the Ariawan & Ahmat (2020), COVID-19, or Coronavirus, is an infectious disease caused by a virus and is closely linked to the severe acute respiratory syndrome (henceforth Sars) that emerged and spread around the world at the beginning of the century and infected about 8,000 people. Sars killed 800 people, but eventually extinguished itself due to the severity of the disease it caused, which killed most of those infected, making it easier to control.

COVID-19, also known as Sars Coronavirus 2 or SarsCov-2, (Reynolds, 2020, cited in Ariawan & Ahmat, 2020) is characterized by mild to moderate lung tract disease in most patients and is treated naturally or with little medical intervention. Those who are worst affected are the elderly and those who have already been diagnosed with a serious health problem. Some of the most effective ways to avoid the disease are washing your hands with alcohol or soap-based solutions frequently and not touch your face with your unwashed hands.

According to the World Health Organization (henceforth WHO) website, there are already several vaccines, such as Pfizer's approved for use December 31, 2020, to combat this virus (2020). Work is underway to achieve group immunity, a process that will take time, but that in Portugal may be completed by August 2021 (Mendes & Neves, 2021). Group immunity is achieved when a sufficient portion of

the population is immune against the disease presented, and no longer contributes to the spread of the disease (Machado et al., 2020; Sousa et al., 2020).

DARK TOURISM ONLINE

Nowadays, technology is a tool that is used more and more worldwide. The Internet is an important tool in the context of Dark Tourism. Its presence has been noticed online, as mentioned by Light (2017, cited by Pereira, 2020), who says that searching the term on Google brings up almost 4 million results. Through cyberspace, dark tourism experiences can be approached. Its use is crucial in the sense that it is possible to pre-visit destinations on their websites. This tool is widely used when tourists are organizing their trip, so their purchase decision process can be influenced by the features offered on the Internet (Choi, Lehto & Morrison, 2007). With this, by providing information about the details of destinations and experiences in them, it is possible to effectively manage the expectations of potential tourists, so they can understand what the places offer and have an idea of what they will find. In addition, through the information provided on the websites, visitors can go properly prepared for any physical difficulties they may encounter at the location, for example, a rough terrain, severe weather conditions, routes that can only be done on foot, access limitations, among others (Krisjanous, 2016).

The internet offers high amounts of up-to-date information and promotional materials aimed at persuading the customer. The applications that underpin social media and the possibilities for customer co-creation are becoming increasingly important as a means of engaging and shaping pre-visit impressions (Brejla & Gilbert, 2014, cited in Krisjanous, 2016; Choi et al., 2007). Therefore, sharing of customer lived experiences are increasingly important for destination image, as these accounts will influence the decision of potential visitors (Krisjanous, 2016).

It should be noted that a dark tourism site should provide a tourism experience that meets the expectations of customers and ensures the profitability and sustainability of the site while maintaining its ethical integrity. A website can be followed by other, traditional communication tools, such as brochures or the use of an intermediary. In other words, the beginning of an individual's tourism experience begins in the act of consulting information about dark tourism destinations on the Internet. A widely used communication tool is precisely the website, which can communicate and influence potential visitors in order to create expectations in them. Consequently, the reports of experiences in certain destinations are gaining more and more weight in the decision of individuals, so the websites are consulted more often, and there is a good marketing strategy here, consistent in word-of-mouth (Krisjanous, 2016).

CONSUMER BEHAVIOR AND MOTIVATIONS IN THE POST COVID-19 PERIOD

The issue of changes in consumer behavior and travel demand must also be addressed. Behavior is influenced by several factors that include personal economic well-being and disposable income, changes in costs, perceived health risks, and changing consumption capacities because of pandemic constraints (Lee & Chen, 2011).

As a result of travel restrictions and lockdowns, tourism (overall) slowed significantly, with the number of flights decreasing to half of what it was: as the number of flights increased, travel restrictions grounded an increasing number of carriers. Passenger numbers are likely to have declined even

Market Segmentation and Dark Tourism and the (Post) Pandemic Scenario

more drastically as many airlines have adopted specific seating policies to maintain a distance between customers (Gössling et al., 2020).

Tourism is about movement, and transportation acts as a vector for the distribution of pathogens on a regional and global scale (Gössling et al., 2020). However, this also indirectly supports pandemics. Due to the trips taken, tourists are constantly in contact with different cultures, each with diverse customs. Among these, eating habits are present. There is much evidence that food production patterns are responsible for repeated outbreaks of the Corona Virus, including SARS, MERS and COVID-19 (Pongsiri, Roman, Ezenwa, Goldberg, Koren, Newbold, Ostfeld, Pattanayak & Salkeld, 2009; Labonte, Mohindra & Schrecker, 2011). As commented by Fan, Jamison & Summers (2018), ” (...) intense media coverage can lead populations to overreact to mild pandemics,” stating that behaviors are strongly influenced by the communication of information from news and social media (Kantar, 2020; Kristiansen, Halvorsen & Gyrð-Hansen, 2007).

DARK TOURISM AND COVID-19

As far as the future of tourism is concerned, due to all the restrictions implemented around the world due to COVID-19, there will be less international travel, as Batra (2020) points out. According to Ioannides & Gyimóthy (2020), air transport will be very limited and will have to follow all the imposed rules to avoid contagion, as well as other transport such as trains and buses. Tourism policy will focus on sustainability, encouraging tourism growth, events and attractions will have to comply with sanitation and disinfection rules, and the local and domestic market will be emphasized. In addition, consumer behavior will also change, as consumers will not be as confident because of the cleaning that has to be done (Ioannides & Gyimóthy, 2020).

Currently, people seek trips with increasingly smaller groups and opt for personalized services, as well as distance themselves from crowded places, such as beaches, and take refuge in quieter places (Batra, 2020). In addition, the same author argues that airline tickets will be more difficult to make, uninviting and more expensive, since now every trip that is made, the plane needs to be cleaned and sterilized, so each of these moments represents expenses. Finally, the same author points out that virtual tourism is a way to use technology to enhance or recreate a tourist experience.

After any catastrophe is over, it is normal to raise a park or memorial area, statue or building that represents the horrifying stories that happened in that area. New York is famous for Ground Zero, built after 9/11. China, on the other hand, is expected to be famous for Wuhan Market where the virus began to spread. The fastest hospital ever built may also be the next sacred site, the stage for the beginning of this great struggle. Even the cemeteries and graves of COVID-19 victims around the world will be visited so that family members can provide a proper burial according to their traditional customs and religion to their loved ones, something that was not possible during the time of the pandemic. It is anticipated that, although with no memorial yet built, tourism will be on the government's agenda to overcome the great post-pandemic recession (Ariawan & Ahmat, 2020).

SOLUTIONS AND RECOMMENDATIONS

Following the line of study of the chapter and considering all the research done, it is clear that the concept of dark tourism has changed over the years and today it's in a phase of more pronounced expansion and can now be considered a genuine niche market. The long history associated with this type of tourism and its various aspects is evidenced not only by the current cult sites, but also by the many destinations in this market around the world that have existed for many years, among others that are emerging as new catastrophes and dark events occur on the planet. There are numerous and diverse motivations on the part of tourists to visit these places, and despite the many ethical and moral issues that it raises, this type of tourism attracts more and more followers every day, who seek exciting and out of the box experiences, which leads interested parties to find ways to promote this niche more and more and in the best possible way.

On another side and considering the current panorama and the fact that we live surrounded by technology, the transition of this type of tourism to the online world becomes inevitable, just as it happened with other similar ones. Once again, this factor only proves how up to date certain entities promoting this sector are, and how much they try to keep up with the world in the 21st century.

Since the appearance of COVID-19, the Tourism sector has suffered a lot, economically speaking, which led to companies having to quickly adapt to this new reality, so as not to be so penalized by this ferocious virus. This adaptation brought several challenges, at the face-to-face level. As in all sectors, the major difficulties were related to the adaptation to the frequent use of alcohol gel, the use of masks, as well as the social distancing, limitation of capacity and the adoption of respiratory etiquette rules. These companies also had to adapt, digitally, often carrying over the essence of their business to this new world, which allowed some to profit from this service supply. Dark Tourism was no exception to the rule, having also had to meet the standards proposed by health entities, which led some companies specializing in this niche to move their business to the technological world.

FUTURE RESEARCH DIRECTIONS

This chapter addresses the topic of "Dark Tourism and the Post Pandemic Context" from a theoretical perspective, based on several scientific documents. It allows the reader to understand the Tourism sector, namely Dark Tourism, and what are the effects of the pandemic on this niche market, both from its emergence and in days to come. Dark tourism is a segment of tourism that has been growing in recent decades and is strongly associated with tragedy and mystery. There are several academic researchers who present literature on this specific group of tourist consumers. As a result, 2020 was strongly marked by the pandemic of the new coronavirus (covid-19). This chapter presents a reflection on the role of dark tourism in the pandemic and post-pandemic period. From an interdisciplinary perspective, this chapter presents contributions to (dark) tourism, marketing and pandemic management. In the future, some research could be done to find out which places directly related to the COVID-19 pandemic were transformed into dark tourism attractions. It could also be done a survey within the Dark Tourist community to find out how they feel that the Coronavirus changed the niche and how they see the future of it. For future research, the ethnographic experience of the researchers allowed them to understand the phenomena of brand attachment with the dark tourisms and the consequent effect on satisfaction and loyalty (Sousa & Magalhães, 2019; Sousa & Rocha, 2019; Sousa et al., 2021).

REFERENCES

- Alves, G. M., Sousa, B. B., & Belino, M. (2021). Understanding the Brand Management and Rebranding Processes in Specific Contexts of Medical Tourism. In *New Techniques for Brand Management in the Healthcare Sector* (pp. 124-141). IGI Global. doi:10.4018/978-1-7998-3034-4.ch008
- Baloglu, S., & Brinberg, D. (1997). Affective images of tourism destinations. *Journal of Travel Research*, 35(4), 11–15. doi:10.1177/004728759703500402
- Baloglu, S., & McCleary, K. W. (1999). A model of destination image formation. *Annals of Tourism Research*, 26(4), 868–897. doi:10.1016/S0160-7383(99)00030-4
- Choi, S., Lehto, X., & Morrison, A. (2007). Destination image representation on the web: Content analysis of Macau travel related websites. *Tourism Management*, 28(1), 118–129. doi:10.1016/j.tourman.2006.03.002
- Fan, V. Y., Jamison, D. T., & Summers, L. H. (2018). Pandemic risk: How large are the expected losses? *Bulletin of the World Health Organization*, 96(2), 129–134. doi:10.2471/BLT.17.199588 PMID:29403116
- FerreiraD. B. (2020). *Imunidade de grupo*. <https://www.hospitaldaluz.pt/pt/guia-de-saude/dicionario-de-saude/I/377/imunidade-de-grupo>
- Fonseca, A. P., Seabra, C., & Silva, C. (2015). Dark tourism: Concepts, typologies and sites. *Journal of Tourism Research & Hospitality*.
- Gonçalves, A. (2017). *Dark Tourism – O lado sombrio do Turismo: Aplicação à cidade do Porto* (Dissertation). Porto Accounting and Business School, Porto.
- Gössling, S. (2002). Global environmental consequences of tourism. *Global Environmental Change*, 12(4), 283–302. doi:10.1016/S0959-3780(02)00044-4
- Gössling, S., Scott, D., & Hall, M. (2020). Pandemics, tourism and global change: A rapid assessment of COVID-19. *Journal of Sustainable Tourism*, 29(1), 1–20. doi:10.1080/09669582.2020.1758708
- Henderson, J. C. (2000). War as a Tourist Attraction: the Case of Vietnam. *International Journal of Tourism Research*, 2(4), 269-280. doi:10.1002/1522-1970(200007/08)2:43.0.CO;2-A
- Iliev, D. (2020). Consumption, motivation and experience in dark tourism: A conceptual and critical analysis. *Tourism Geographies*, 1-22.
- Ioannides, D., & Gyimóthy, S. (2020). The COVID-19 crisis as an opportunity for escaping the unsustainable global tourism path. *Tourism Geographies*, 22(3), 6. doi:10.1080/14616688.2020.1763445
- Kantar. (2020). *Global study of 25,000 consumers gives brands clearest direction on how to stay connected in a pandemic world*. Academic Press.
- Korstanje, M. (2012). The darker side of travel: The theory and Practice of Dark Tourism. *International Journal of Contemporary Hospitality Management*, 24(1), 160–162. doi:10.1108/09596111211197854

- Krisjanous, J. (2016). An exploratory multimodal discourse analysis of dark tourism websites: Communicating issues around contested sites. *Journal of Destination Marketing & Management*, 5(4), 341–350. doi:10.1016/j.jdmm.2016.07.005
- Kristiansen, I., Halvorsen, P., & Hansen, D. (2007). Influenza pandemic: Perception of risk and individual precautions in a general population. Cross sectional study. *BMC Public Health*, 7(48), 1–7. doi:10.1186/1471-2458-7-48 PMID:17407563
- Kumar, S. (2019). *Dharavi slum beats Taj Mahal as India's top tourist destination*. Academic Press.
- Labonté, R., Mohindra, K., & Schrecker, T. (2011). The growing impact of globalization for health and public health practice. *Annual Review of Public Health*, 32(1), 83–263. doi:10.1146/annurev-publhealth-031210-101225 PMID:21219153
- Liberato, D., Liberato, P., Alén, E., & Lopes, M. C. (2018). *Dark Tourism: proposta de roteirização*. Academic Press.
- Light, D. (2017). Progress in dark tourism and thanatourism research: An uneasy relationship with heritage tourism. *Tourism Management*, 61, 275–301. doi:10.1016/j.tourman.2017.01.011
- Lin, C. H., Morais, D. B., Kerstetter, D. L., & Hou, J. S. (2007). Examining the role of cognitive and affective image in predicting choice across natural, developed, and theme-park destinations. *Journal of Travel Research*, 46(2), 183–194. doi:10.1177/0047287507304049
- Lubowiecki-Vikuk, A., Djercan, B., & Sousa, B. (2021). Sustainable development and leisure services: Changes and trends. In *A Handbook of Sustainable Development and Leisure Services, World Sustainability Series*. Academic Press.
- Machado, A., Nogueira, S., & Sousa, B. (2020). Semiótica e e-branding em comunicação de turismo: Estudo das capas de revistas digitais no período pandémico Covid-19. *Revista Ibérica de Sistemas e Tecnologias de Informação*, E34, 293–308.
- Mendes, F. A., & Neves, S. (2021). *Covid-19. Com vacinação, Portugal poderá atingir imunidade de grupo no início de Agosto*. Academic Press.
- Moscardo, G., & Ballantyne, R. (2008). Interpretation and attractions. *Managing visitor attractions: New directions*, 237-252.
- Organization, World Health. (2020). *Coronavirus disease (COVID-19): Vaccines*. Author.
- Pereira, T. (2020). Motivações para a prática do dark tourism. *ACENO-Revista de Antropologia do Centro-Oeste*, 7(14), 215–230.
- Pharino, C., Pearce, P., & Pryce, J. (2018). Paranormal tourism: Assessing tourists' onsite experiences. *Tourism Management Perspectives*, 28, 20–28. doi:10.1016/j.tmp.2018.06.003
- Podoshen, J. (2013). Dark tourism motivations: Simulation, emotional contagion and topographic comparison. *Tourism Management*, 35, 263–271. doi:10.1016/j.tourman.2012.08.002

Market Segmentation and Dark Tourism and the (Post) Pandemic Scenario

Pongsiri, M. J., Roman, J., Ezenwa, V. O., Goldberg, T. L., Koren, H. S., Newbold, S. C., Ostfeld, R. S., Pattanayak, S. K., & Salkeld, D. J. (2009). Biodiversity loss affects global disease ecology. *Bioscience*, 59(11), 945–954. doi:10.1525/bio.2009.59.11.6

Sánchez, M. B., & Sousa, B. B. (2020). O dark tourism e a perspectiva cultural no marketing dos tempos modernos. In C. Neves (Ed.), *Turismo, Sociedade e Ambiente* (pp. 158–171). Atena Editora. doi:10.22533/at.ed.55320041214

Santos, V., Ramos, P., Sousa, B., & Valeri, M. (2021). Towards a Framework for the Global Wine Tourism System. *Journal of Organizational Change Management*. Advance online publication. doi:10.1108/JOCM-11-2020-0362

Smith, W. W. (2007, October). New Horizons in Tourism: Strange Experiences and Stranger Practices. *Annals of Tourism Research*, 34(4), 1093–1095. doi:10.1016/j.annals.2007.04.006

Sousa, B., & Rocha, A. T. (2019). The role of attachment in public management and place marketing contexts: A case study applied to Vila de Montalegre (Portugal). *International Journal of Public Sector Performance Management*, 5(2), 189–205. doi:10.1504/IJPSM.2019.099094

Sousa, B. B., Castro, C., Luís, M. E., & Lopes, P. (2021). Religious and Spiritual Tourism: From Its Origins to Alentejo (Portugal). In *Global Development of Religious Tourism* (pp. 44–64). IGI Global.

Sousa, B. B., Machado, A. F., Igreja, C. M., & Campos, J. G. (2020). As redes sociais como veículo para combater os efeitos nefastos do covid-19: Um estudo exploratório no contexto turístico português, *Cambiassu. Estudos em Comunicação*, 15(25), 21–35.

Sousa, B. B., & Magalhães, F. C. (2019). An Approach on Attachment in Public Marketing and Higher Education Management Contexts. In C. Machado & J. Davim (Eds.), *Higher Education and the Evolution of Management, Applied Sciences, and Engineering Curricula* (pp. 151–171). IGI Global. doi:10.4018/978-1-5225-7259-6.ch006

Stone, P. (2006). A Dark Tourism Spectrum: Towards a typology of death and macabre related tourist sites, attractions and exhibitions. *Tourism: An Interdisciplinary International Journal*, 54(2), 145–160.

Stone, P. (2012). Dark tourism and significant other death: Towards a model of mortality mediation. *Annals of Tourism Research*, 39(3), 1565–1587. doi:10.1016/j.annals.2012.04.007

Stone, P., & Sharpley, R. (2008). Consuming Dark Tourism: A Thanatological Perspective. *Annals of Tourism Research*, 35(2), 574–595. doi:10.1016/j.annals.2008.02.003

Sun, J., & Lv, X. (2021). Feeling dark, seeing dark: Mind–body in dark tourism. *Annals of Tourism Research*, 86, 103087. doi:10.1016/j.annals.2020.103087

Tole, C. (2018). *Dark tourism: The destinations we don't talk about*. Academic Press.

Wang, E., Shen, C., Zheng, J., Wu, D., & Cao, N. (2020). The antecedents and consequences of awe in dark tourism. *Current Issues in Tourism*, 1–15.

Wang, E., Shen, C., Zheng, J., Wu, D., & Cao, N. (2021). The antecedents and consequences of awe in dark tourism. *Current Issues in Tourism*, 24(8), 1169–1183. doi:10.1080/13683500.2020.1782857

- Wang, N. (1999). Rethinking authenticity in tourism experience. *Pergamon*, 6(2), 349-370.
- Wright, D. (2018). Terror park: A future theme park in 2100. *Futures*, 96, 1–22. doi:10.1016/j.futures.2017.11.002
- Wright, D., & Sharpley, R. (2018). The photograph: Tourist responses to a visual interpretation of a disaster. *Tourism Recreation Research*, 43(2), 161–174. doi:10.1080/02508281.2017.1409921
- Zhang, H., Yang, Y., Zheng, C., & Zhang, J. (2016). Too dark to revisit? The role of past experiences and intrapersonal constraints. *Tourism Management*, 54, 452–464. doi:10.1016/j.tourman.2016.01.002
- Zhang, M. (2017). *Artist shames disrespectful holocaust memorial tourists using photoshop*. Academic Press.

ADDITIONAL READING

- Antón, J., & Almeida, M. (2020). COVID-19 Impacts and Recovery Strategies: The Case of the Hospitality Industry in Spain. *Sustainability*, 12(20), 1–17. doi:10.3390/s12208599
- Ariawan, Z., & Ahmat, N. N. (2020). Expected Tourist Attractions After Pandemic COVID-19. *International Journal of Human and Technology Interaction*, 4(1), 107–112.
- Millán, M. G. D., Millán Vázquez de la Torre, M. G., & Hernández Rojas, R. (2021). Dark Tourism in Southern Spain (Córdoba): An Analysis of the Demand. *International Journal of Environmental Research and Public Health*, 18(5), 2740. doi:10.3390/ijerph18052740 PMID:33800408
- Santos, V., Ramos, P., Sousa, B., Almeida, N., & Valeri, M. (2021). Factors influencing touristic consumer behaviour. *Journal of Organizational Change Management*. Advance online publication. doi:10.1108/JOCM-02-2021-0032

KEY TERMS AND DEFINITIONS

COVID-19: It is a contagious disease caused by a respiratory syndrome, named SARS-CoV-2, that was spread worldwide, leading to an ongoing pandemic. It was first identified in Wuhan, China.

Dark Tourism: It is the phenomenon that includes the presence and consumption, by visitors, of places related to genocide, holocaust, murder, or crime, meaning that is directly related with death, suffer, catastrophes or morbid events and that serve as a tourist attraction or entertainment. These places had or have historical impact in society, which will remain for a long time in people's mind.

Market Segmentation: Is the process of dividing a target market into smaller, more defined categories. It segments customers and audiences into groups that share similar characteristics such as demographics, interests, needs, or location.

Spirituality: Any kind of connection with your inner self and with whatever is around you, alive or not.

Chapter 17

The Projected Images of a Thrift Store Chain in Japan: A Study of Online Interview Materials

Bình Nghiệm-Phú

University of Hyogo, Japan

ABSTRACT

Being thrifty and frugal has become a distinct lifestyle choice. An insightful knowledge about thrifty and frugal consumers on the demand side has been revealed by previous studies. However, related issues on the supply side have largely been neglected. Therefore, this study aims to examine the projection of the thrift store images. By analyzing interviews displayed on public websites with the director and staff of Treasure Factory, a big thrift store chain in Japan, this study has revealed that the company is actively projecting its images. Among seven images, Treasure Factory is especially focusing on products, purchase processes and distribution channels (place), and customer benefits (psychology). The remaining images (prices, promotion, customers or people, and partnerships) are less emphasized but still harmoniously synchronize with and support the main images. Implications for the theory behind thrift stores and for the actual management of them are discussed based on these findings.

INTRODUCTION

When consumers want to cut expenses, many turn to thrifty or frugal shopping at clearance and closing sales and in second-hand stores (Civi & Jolliffe, 2013; Steward, 2020). When they want to actively participate in environment protection and sustainable development movements, customers choose thrifty or frugal shopping (Gatersleben, Murtagh, Cherry, & Watkins, 2019; Zwarthoed, 2015). When the hedonic values of finding and expressing a vintage or green look are appreciated, customers also adopt thrifty or frugal shopping (Chancellor & Lyubomirsky, 2014; Steward, 2020; Yan, Bae, & Xu, 2015). Thus, thriftiness or frugality have become certain distinct ways of living or lifestyles (Chancellor & Lyubomirsky, 2014; Gatersleben, Murtagh, Cherry, & Watkins, 2019; Podkalicka & Potts, 2014).

DOI: 10.4018/978-1-7998-9664-7.ch017

Both thrifty and frugal consumers are aware of spending less in order to increase resource consumption efficiency and autonomy, and to reduce indebtedness (Chancellor & Lyubomirsky, 2011; Gatersleben, Murtagh, Cherry, & Watkins, 2019). Although some of these consumers are constrained or facilitated by economic conditions, others believe that the long-term practice of thrifty and frugal consumption will help lead them to a happier life (Anderson & Nevitte, 2006; Bardhi, 2003; Chancellor & Lyubomirsky, 2014; Corral-Verdugo, Mireles-Acosta, Tapia-Fonhiem, & Fraijo-Sing, 2011; Okulicz-Kozaryn, Nash, & Tursi, 2015; Yan, Bae, & Xu, 2015). However, thrifty consumers differ from frugal consumers in several important points (Evans, 2011). First, the former spend less in order to save household economic resources for other family members and friends; the objects of the latter might be distant strangers. Second, thrifty consumers have a high level of consumption, which is opposite to frugal consumers. Third, thrifty practices possibly involve the use of less sustainable goods, while the buying patterns of frugal practices are the reverse. Fourth, while the former are dependent on economic circumstances, the latter are not. Nevertheless, in both cases, thrifty and frugal consumers are strongly directed by their own intrinsic values, for example, little interest in material goods, social status, and brand name products, and strong independence (Chancellor & Lyubomirsky, 2011; Goldsmith, Flynn, & Clark, 2014; Park, Kwon, Zaman, & Song, 2020). Neither group is much affected by religious values (Brinkerhoff & Jacob, 1987; Yenziaras & Akarsu, 2017). In addition, frugal consumers might become less frugal (i.e., spend more money) when they shop with close friends who are heavy spenders (Lee, 2016).

Previous studies, thus, have revealed an insightful knowledge about thrifty and frugal consumers on the demand side. They, however, have largely neglected the issues on the supply side. Among a few related studies, Hvass (2015) examined a novel business model in which fashion brands sell their own second-hand products (Filippa K in the Scandinavia and Northern Europe markets). This model targets loyal customers who value timeless design and quality. The products are collected through donation and compensation or consignment contracts, and are distributed through store-in-store, stand-alone store, and pop-up store channels. Discount vouchers are made available to help increase the sales volume. In another study, Parsons (2005) investigated the practices of second-hand-products dealers in Glasgow, Scotland. Interviews with the dealers revealed that these individuals have an intimate relationship with the products that they buy and sell. The dealers use practical knowledge gained through actual experience to determine the monetary values and prices of the products. In addition, previous studies have mostly overlooked the projection of the thrift stores' images. In a recent research, Chen, Zheng, Xu, Liu, and Wang (2018) analyzed sellers' posts and customers' comments on a second-hand e-commerce platform in China to identify the reputations of six product categories: cameras, jewelry, phones, suit dresses, watches, and women's shoes. Their findings have implications for thrift store buyers and platform managers regarding the selection of the suitable selling items. However, implications for thrift item sellers are limited, especially when the impressions of different sellers (specifically, different product categories) are aggregated, and the carrier of the impressions (the e-commerce platform) is a regular (non-thrift) one.

Furthermore, research on store image in general has largely neglected the image-projection topic. Research on perceived store image, however, has ascertained that the image of a store has an important contribution to its customers' satisfaction and behaviors (Chang & Tseng, 2013; Nettet, Nervik, & Helgesen, 2011; Thomas, 2013).

Considering the existing issues on the supply side, the study reported in this chapter aims to examine the projection of the image of thrift stores. Japan is selected as the context of this study since this is a developed market with many nationwide thrift-store chains (e.g., Book Off, Hard Off, and Treasure Factory) selling both new and old products at low prices. The country also is familiar with activities

The Projected Images of a Thrift Store Chain in Japan

aiming at promoting a circular economy (Despeisse, Kishita, Nakano, & Barwood, 2015; Wuyts, Miatto, Sedlitzky, & Tanikawa, 2019). The findings of this study, thus, are meaningful for the management of thrift stores, the important agents of the circular economy, in the future.

LITERATURE REVIEW

Store Image

Store image, or perceived store image, indicates the perceptions that customers have of a store. These perceptions are made up of a variety of components or attributes. For example, in a study on a supermarket chain in Greece, Theodoridis and Chatzipanagiotou (2009) identified six elements of store image: personnel, atmosphere, products, pricing, merchandising, and in-store convenience. In another study on an online apparel store, Eroglu, Machleit, and Davis (2003) ascertained two different components of store image: pleasure and arousal. Thus, perceived store image can be regarded as the thoughts (cognition) and feelings (affect) held by customers about a certain store. The thoughts may involve the physical (e.g., temperature, smell, cleanliness, products, shopping carts, and baskets), atmospheric (e.g., friendliness and caring attitude), and mixed (e.g., prices and staff) attributes, on the one hand (Echtner & Ritchie, 1993; Michael, Ramsay, Stephens, & Kotsi, 2019; Yacout & Hefny, 2015). On the other, the feelings reflect the affective attributes of the store, such as happy/unhappy, pleased/annoyed, contented/melancholic, and excited/calm (Michael, Ramsay, Stephens, & Kotsi, 2019; Russell & Pratt, 1980; Yacout & Hefny, 2015).

As mentioned earlier, perceived store image is very important in customers' evaluations and behaviors, both in real-life settings and in online environments. Perceived store image is found to have a significant impact on perceived quality (Bao, Bao, & Sheng, 2011), perceived risks (Aghekyan-Simonian, Forsythe, Kwon, & Chattaraman, 2012; Hong, Nawi, Hamsani, & Zulkiffli, 2020), perceived values (Chang & Tseng, 2013), and satisfaction (Wong, Osman, Jamaluddin, & Yin-Fah, 2012), among others. Perceived store image also is a direct determinant of customers' purchase and repurchase intentions (Nesset, Nervik, & Helgesen, 2011; Thomas, 2013). Therefore, it is necessary for store managers to carefully project their stores' images.

Little research, however, has been undertaken to understand the projected images of stores. Among related research, Nghiêm-Phú (2017) observed that stores in a shopping district in Japan mainly used visual cues (e.g., advertising boards and decorative objects) to present their images. Similarly, Spena, Caridà, Colurcio, and Melia (2012) noted that temporary shops (shops open for a short time) in Italy used colors and lights to connect with their customers. The sensory stimuli of sight, thus, seem to be the dominant tools used when shops try to create and communicate their images. From another perspective, Oppewal and Timmermans (1997) found that retailers in a European city maintained their stores' image on six dimensions: price, location, store interior, selection, service, and product quality. However, the perceived importance of each dimension differed among groups of retailers and points in time. Birtwistle, Clarke, and Freathy (1999) added that store-related personnel saw their own attributes more favorably than customers. In addition, perceptions of store managers were much more positive than those of store staff. It should be noted that the setting of the latter research was also in a European city.

On an additional note, only a few studies have investigated the image of thrift stores as perceived by their customers. For example, Brengman, Geuens, and Faseur (2002) identified a three-factor model (general, appearance, and sales personnel) and a five-factor model (price, store, service, promotion, and

other) of thrift store image. Darley and Lim (1999) added that perceived store image has a significant impact on thrift store customers' shopping frequency and travelling distance. Understanding about thrift stores' images, from both the demand and supply side, still is very scarce and somewhat outdated.

Overall, thrift stores are important units of the evolving circular economy (Holmberg & Ideland, 2021; Machado, de Almeida, Bollick, & Bragagnolo, 2019). These stores can act as the outlets to collect and redistribute unused goods. They help shorten the routes of recycling and reusing materials, in a sense, and facilitate the responsible and sustainable consumption of the existing resources, in another sense.

Japan

Japan is currently the third economy in the world with many big companies, advanced technologies, and business knowhow (Lehmberg, Dhanaraj, & Funai, 2013). Among the reasons behind the successes of the Japanese economy, the local business culture is a very important one. According to Hofstede, Hofstede, and Monkov (2010), Japanese people in general have a tendency to highly regard masculinity, avoid uncertainty, and aim at long-term goals on the one hand. They, on the other hand, score low on the "individualism" and "indulgence" cultural dimensions. The majority of Japanese people are willingly conforming to existing norms and values of their communities (Toivonen, Norasakkunkit, & Uchida, 2011). In addition, Marchiori, Carraher, and Stiles (2014) observed that business people in Japan are working hard to maintain respect and agreeableness among one another. They often are regarded as polite people, who may feel comfortable with silences and may not initiate or join in humorous acts during meetings (Murata, 2014). As amicable people, the Japanese can doubtlessly provide topnotch service quality, which is indicated by the philosophy of *omotenashi* or sense of hospitality (Belal, Shirahada, & Kosaka, 2013). The *omotenashi* practices are carried out based on service providers' excellent understanding of their guests' wants and needs, and their provision of timely and high-quality services and products to satisfy and even exceed such wants and needs (Morishita, 2016).

The generosity of Japanese people with their *omotenashi*, however, contrasts their frugal and thrifty nature. Driven by the scarcity of natural resources, the Japanese have devised a frugal and thrifty mindset in order to maximize what they have in hand (Soni & Krishnan, 2014). Many people in Japan still have a tendency to save to ensure their own and their country's wealth (Garon, 2002). They also are good at recycling things (Kinnaman, Shinkuma, & Yamamoto, 2014; Liu, et al., 2016). In recent years, Japanese customers are even getting used to sharing facilities and services, such as cars and laundromats (Ama-sawa, et al., 2018; Ikezoe, Kiriyama, & Fujimura, 2020). A circular economy can now be observed in Japan (Despeisse, Kishita, Nakano, & Barwood, 2015; Wuyts, Miatto, Sedlitzky, & Tanikawa, 2019).

METHOD

The purpose of this study is to investigate the projected image of a thrift store chain in Japan. Treasure Factory, a chain with more than 100 stores across Japan, was specifically chosen for this research. In addition to the large number and the nationwide distribution of the stores, the reasons for this selection also included the diversity of store types, both online and onsite, which was twelve at the time of this research (June 2020). Treasure Factory has even recently opened a store in Bangkok, Thailand in an attempt to expand internationally.

The Projected Images of a Thrift Store Chain in Japan

Generally, the investigation of the projected image of any entity may utilize one of two major methods: direct or indirect. On the one hand, researchers can directly ask the projectors about the images that they want to create and promote (Hughes & Allen, 2005). On the other hand, they can indirectly analyze the existing promotional materials to identify the images that are projected (Chan & Zhang, 2018). Interestingly, the advantage of one method may be the disadvantage of the other, and vice versa. Specifically, the direct method is able to extract the intended images exactly. However, the views are subjectively biased. On the other hand, the indirect method is less subjective and more objective, but the intended projected images may be misinterpreted.

This study adopted a hybrid or a semi-direct method. Specifically, it analyzed interviews with the director and staff of the company to identify the images that they want to present to the customers to ensure that the findings are correct. However, the materials were not derived from direct interviews with these people but from existing content posted on the company's website and other resources to maintain objectivity. This somewhat reflects a netnography approach which is widely adopted in academic research in recent years (Kozinets, 2010). Netnography is the ethnographical examination of Internet-based content. The use of ethnographic methods and Internet-based content has become common in research in the field of marketing (Neal & Ross, 2018; Nghiêm-Phú, 2017).

A total of 34 interviews (four of them with the director), implemented between 2014 and 2020, were collected from public online platforms, including Financial Field, IR Tsushin Online, The Japan Journal of Remodeling, The Remodeling Business Journal, Recruit Career Co., and Treasure Factory (Appendix). Google was used as the search engine, and three keywords were employed for the search: recycle shop interview (リサイクルショップインタビュー), reuse shop interview (リユースショップインタビュー), and second-hand shop interview (中古品店インタビュー). Since the main purpose of these interviews was to introduce the company, the content was believed to be suitable for use in this study on its projected images. However, as the interviewees were not fully aware that they were talking about the company's image, the possible subjectivity of the interviews was less of an issue.

The content of each interview, all of which were written in Japanese, was copied on a Microsoft Word page. A coding scheme was developed based on the existing literature about marketing and store image to guide the analysis (Brenngman, Geuens, & Fasseur, 2002; Eroglu, Machleit, & Davis, 2003; Rafiq & Ahmed, 1995; Theodoridis & Chatzipanagiotou, 2009). The scheme included six elements of the marketing mix representing the cognitive aspect of the projected image (product, price, promotion, place or distribution, people, and partnerships), and one psychology category representing the affective aspect of the same construct.

The analysis of the content was done inductively on the Microsoft Word file based on the above scheme (Elo & Kyngäs, 2008). The mention of each element was marked in red and tracked by the comment function of Microsoft Word. In the comment, the name of the element (e.g., product, price, promotion, place, people, partnerships, or psychology) was written. The mention of one element in one part of an interview was crosschecked with other parts of the same interview or with other interviews, and with information displayed on the company's websites as a triangulation measure (Flick, 2018). Any subthemes were also coded using the same method. However, the process was deductive, which began with the identification of a subtheme then followed by its verification and confirmation. The analysis was implemented by the researcher and an independent Japanese marketing expert. Agreement between the two was reached to ensure the reliability of the analysis (Given, 2008).

In this chapter, the original opinions of the interviewees were rephrased to be included as indirect quotes. The pictures illustrating certain points raised by the interviewees were taken by the researcher at a store closest to his place of residence.

FINDINGS

Following the coding scheme, the projected images of Treasure Factory (TF) in its various stores were determined to be made up of seven elements or attributes (Figure 1). However, the emphasis put on each of these attributes seemed to differ.

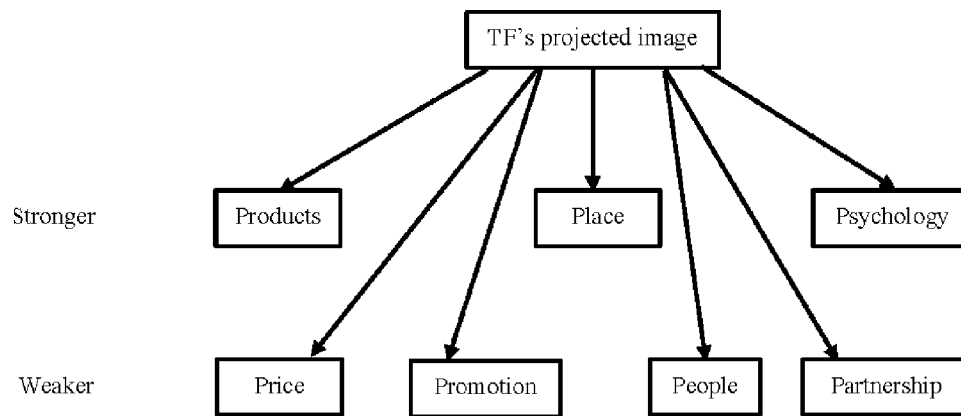
The first important attribute is related to the products, which are very diverse, including clothing and accessories, outdoor and sports equipment, home appliances, furniture and other interior products, toys, liquor, and antiques, among others (Figure 2). Concerning clothing and accessories, TF sells, buys, and rents both brand and non-brand items. With outdoor and sports equipment, TF deals with a great variety of specialties, for example, camping, cycling, surfing, and golfing. The products, both new and old, are sold to TF because they are left unused or over stocked. In recent years, TF also buys, sells, and manages unused real estates. As one worker explained in an interview, TF are second-hand shops so they deal with all product categories. Another one added that 60% of TF's purchases are clothing products. Among them, brand name clothes are the easiest items to determine the prices. And another worker said that they even have different corners for vintage and import products at large stores. In summary, customers can start a new life just by going to TF, as pointed out by one TF worker.

The second important attribute involves the purchasing processes and the distribution channels (place). On the one hand, TF is buying products at their stores and at customers' houses. The latter service started in October 2019, together with the real estate business operation, according to one TF worker. On the other hand, TF is selling their products in stores or online. The chain is now operating twelve store categories (9 onsite and 3 online). One worker said that TF is very serious about the development of their web channel, although the actual stores are not neglected. Another one declared that all TF stores are big, beautiful or clean, lively, and very attractive. Some of the stores even specialize in certain specific products or brands. For example, a worker noted that TF sells surf gears at stores near the sea and outdoor gears at stores near the mountains. TF also is applying localization and adaptation strategies in its management (differentiating the stores' operations according to locations, seasons, and trends). As a worker mentioned, TF is creating unique stores that blend into the local community. For example, the Shimokitazawa (Tokyo) store is targeting young customers while the suburban stores are focusing on older customers who travel by car, according to this worker.

The third important attribute is customer benefits or values (psychology). In a sense, TF emphasizes the monetary benefit when customers buy recycled products or sell unused items. For buyers, TF gives them inexpensive or reasonable purchase options. For sellers, TF provides them with a decent amount of extra money. In another sense, TF focuses on the atmospheric and the emotional benefits of convenience, assurance, happiness, satisfaction, novelty, and positive surprise, among others. Creating an inviting environment, as a store manager mentioned, is the most important task of a TF store. The key to delivering these benefits is to thoroughly understand the needs of customers. Last, but not least, TF helps its customers to obtain some symbolic benefits, such as a sustainable lifestyle, a vintage fashion style, or a sense of uniqueness. According to a worker, recycled items that differ from item to item can definitely give customers the feeling of individuality and enjoyment. In addition, as reported by another

The Projected Images of a Thrift Store Chain in Japan

Figure 1. Treasure factory's projected images



one, if customers use recycled clothes, they can spend the extra money for their other hobbies. A different worker assumed that if customers are conscious of the possibility of selling their belongings to someone to be reused, they will use them more carefully. The benefits or values, thus, are numerous.

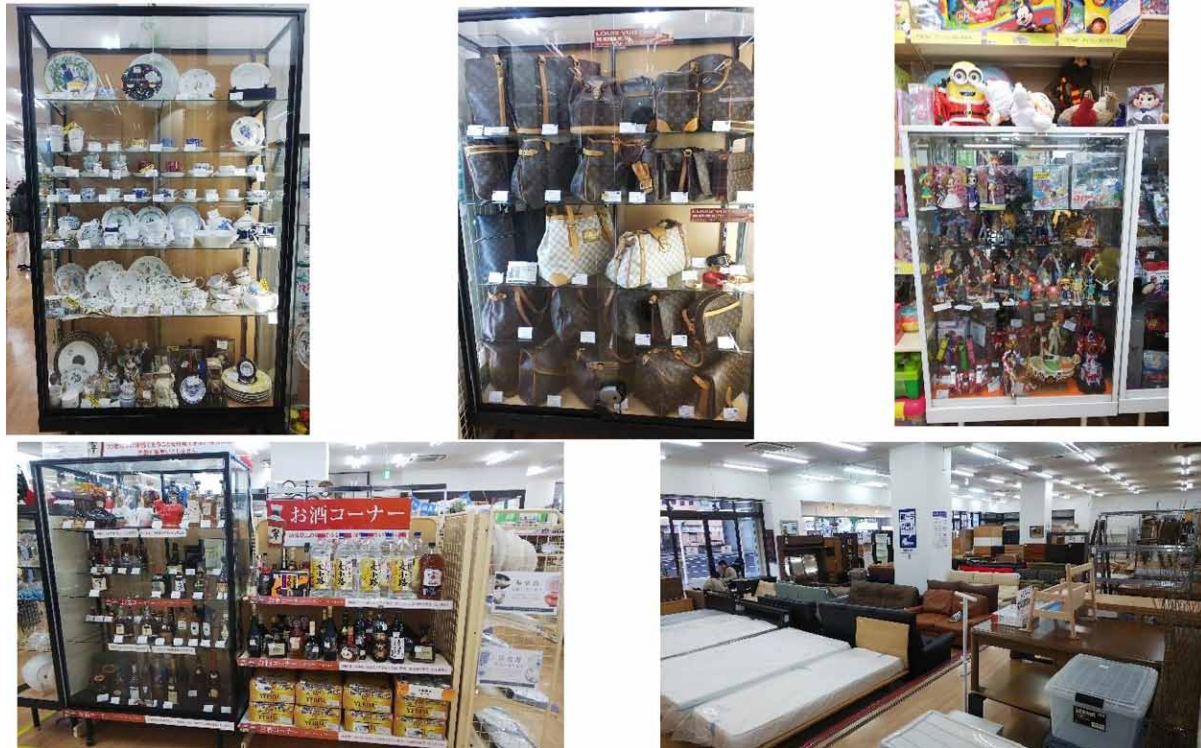
Compared with these three attributes, the remaining are less emphasized. Specifically, the fourth attribute is price. Regarding this attribute, TF wants to project two different images: inexpensive for buyers, but good prices for sellers (Figure 3). Appropriate prices, according to the TF director and workers, help create positive feelings in customers. For example, one worker stated that they try to define appropriate buying and selling prices so as to not cause their customers to feel stress. Another one rephrased this statement by saying that they try to set prices that satisfy their customers. Two different workers added that the most important merit with buyers is the low price, while that with the seller is the high price.

The fifth attribute is promotion. One of the promotional messages of TF is "TF provides customers with joy, chances for discovery, and excitement." Another message is "With other companies, the impressions that you have of all of their stores are the same. With our company, the impressions that you have of one store will differ from all of the others." Again, the benefits that TF emphasizes are restated here. In addition, TF acknowledges and clearly expresses their social responsibility to promote environmental friendliness and sustainability. As mentioned by one of the workers, TF realizes that the recognition that it is not good to throw away your belongings, or that it is unacceptable to use plastic straws has been spreading. According to this worker and their colleague, the idea of reusing things will become more common, and TF wants to contribute to the awareness of a recycling-based society on a global scale. These messages of TF are open to the customers and the public through certain Internet-based sources, such as websites and blogs. One worker said that they were specifically entrusted with the task of transmitting information, such as introducing stores on the websites and providing product introduction on blogs.

The sixth attribute is about people, or the TF customers, to be specific. Consistent with the diverse range of products, TF customers also are a heterogeneous group, including students, housewives, retirees, and residential caretakers, among others. As pointed out by one of the workers, TF deals with many types of people, and many types of things. However, customers in different regions may have different characteristics. For example, customers of TF in the Kansai region (West of Japan) are said to be warmer in their attitudes compared to their counterparts in other regions. Many of them are TF fans or return-

Figure 2. Examples of a store's product categories

Source: Taken by the author in January 2021 at Shinnagata store, Kobe



ing customers, and TF workers have a good understanding of their customers in order to provide them with the best products and services. A worker mentioned that they were very happy when a customer purchased an item that they chose for her, and also, when the customer came back with her child and wanted them to help choose other items. Another one said that customers tend to check for information online before going to the stores.

Finally, the seventh attribute is partnerships. Since the business scope of TF is large, the company has created relationships with many partners, for example, real estate companies. TF also operates some franchising undertakings in order to expand its business. Regarding this attribute, the TF director pointed out that the company is collaborating with various real estate companies to take advantage of their respective strengths and to broaden TF's range of services. TF can also connect with many people through their franchise stores.

DISCUSSION

The analysis of the interviews with the director and workers of Treasure Factory has revealed that the company is earnestly projecting its images. Among the seven attributes, products, purchase processes and distribution channels (place), and customer benefits (psychology) are especially emphasized. The remaining attributes (price, promotion, customers or people, and partnerships) are focused on less but

The Projected Images of a Thrift Store Chain in Japan

Figure 3. Examples of pricing strategies

Source: Taken by the author in January 2021 at Shinnagata store, Kobe



still harmoniously synchronize with and support the main attributes. For example, the diverse customer profile matches well with the wide range of products. In addition, the pricing strategies are consistent with the promise and delivery of customer benefits and values, especially the monetary and emotional benefits and values. Moreover, the partnerships support the convenience of the purchase and distribution processes.

Together, these attributes help create an overall image of a sophisticated thrift store chain. By choosing TF, customers are given the chance to have a joyful selling or buying transaction. Buyers are able to purchase good-quality products at affordable prices, while sellers can find a reliable outlet for their beloved items that will provide them with satisfactory monetary compensation. This overall image is captured well in the promotional messages delivered by the director and workers of TF. Moreover, having a socially responsible attitude has also added some aspects of frugality to thrift stores' images (Evans, 2011; Hanaysha, 2020). Specifically, the for-the-future and for-the-environment perspectives are relevant symbolic values that have helped lift the image of second-hand stores (known for their low prices) to a higher level (known for their unique styles, as well).

The emphasis on customer values has somehow reflected the *omotenashi* attitude of Japanese businesses (Belal, Shirahada, & Kosaka, 2013), through which the hospitality of the host is displayed and performed to its utmost. The values (monetary, atmospheric and emotional, and symbolic), interestingly, are mainly the intrinsic and egoistic ones (Chancellor & Lyubomirsky, 2011; Goldsmith, Flynn, & Clark, 2014). The extrinsic and altruistic values (environment and future) seem not to be actively integrated in the main value set.

Theoretical Implications

Thrift stores, although they sell cheap and used products, may have more complex and advanced images than they first appear to have. This examination of the Treasure Factory chain in Japan has suggested that its images are composed of seven attributes: products, purchase processes and distribution channels (place), customer benefits (psychology), price, promotion, customers (people), and partnerships. Some attributes, such as brand name products, at-home purchase, online distribution and promotion, emotional

and symbolic values, and partnerships even help to create an unexpected impression of classiness. This outcome is an improvement of the three-factor or five-factor model of perceived image of thrift stores as identified in previous studies (Brenngman, Geuens, & Faseur, 2002).

The findings of this study also suggest that the values of thrift stores may have some universal aspects, such as monetary and symbolic values (Chancellor & Lyubomirsky, 2014; Civi & Jolliffe, 2013; Hvass, 2015; Yan, Bae, & Xu, 2015). However, these values are shared between the store managers and staff and their customers, not only between the store owners and their products as observed in the literature (Parsons, 2005).

Additionally, this study has observed that although different marketing tactics are applied by a business, some tactics may be more emphasized, while others may not. This seems to be the norm in marketing practices, not only in Japan but also in other countries (e.g., the UK) (Liu, Eng, & Takeda, 2015).

Practical Implications

Since being thrifty has become a lifestyle choice, and thriftiness can help protect and sustain the environment and the future (Chancellor & Lyubomirsky, 2014; Gatersleben, Murtagh, Cherry, & Watkins, 2019; Podkalicka & Potts, 2014), thrift store networks will expand further, as will the circular economy in general. The projection and promotion of thrift stores' images, therefore, will become more and more necessary.

The case of the Treasure Factory in Japan suggests that the image of a thrift store can be sophisticated. The core of the image should be egoistic values that can personally and privately benefit the customers. The other attributes, such as products, prices, distribution channels, and promotion, should synchronize with and support these core values. In addition, to give the stores a more enlightened image, certain altruistic values, such as environmental friendliness and sustainability (de Groot & Steg, 2008), can be actively integrated and expressed. The projection should be well considered and delivered so as to make thrift stores the favorite destinations for those customers who want to buy and sell used, and even unused, items. Gaps in perception and implementation between company managers and store staff, if there are any (Birtwistle, Clarke, & Freathy, 1999), should be eliminated to ensure the reliability and success of the whole business.

CONCLUSION

The aim of the study reported in this chapter was to examine the projection of thrift store images. Applying an alternative approach (analyzing published interview materials), this study identified seven attributes that help create the images of one thrift store chain in Japan. Although the emphasis on each attribute varies, the harmonious integration and mutual support of the attributes have undoubtedly helped project an overall better-than-expected image of the company.

This study, however, could not avoid some limitations. First, due to a lack of materials, only one case was investigated. As a consequence, the projections of the images of other thrift stores and thrift store chains in Japan were overlooked. Second, although a seven-factor model of thrift store image was identified, it was not statistically validated. In addition, customers' evaluations of these attributes were also neglected.

The Projected Images of a Thrift Store Chain in Japan

Considering these limitations, several directions for future research are proposed. First, direct interviews with representatives of other stores and chains, or analysis of other promotional materials of these stores and chains (e.g., blogs and websites) will help provide more insights into as yet unrevealed operations. This direction may be repeated in Japan or in other countries to develop a more diverse picture. Second, direct surveys with thrift store customers will help understand their evaluations of thrift store attributes, to ascertain the structure of thrift store images, and to deepen the understanding of their perceptions and behaviors. These efforts will enrich the literature on thrift stores, which have been and will be important commercial businesses. They will also provide practical support for the management and promotion of thrift stores, especially for their images, in order to match with their importance in the business world of circular economy.

ACKNOWLEDGMENT

The author would like to thank Professor Komiya Kazutaka, School of Economics and Management, University of Hyogo, for his help with the analysis of the data.

REFERENCES

- Aghekyan-Simonian, M., Forsythe, S., Kwon, W. S., & Chattaraman, V. (2012). The role of product brand image and online store image on perceived risks and online purchase intentions for apparel. *Journal of Retailing and Consumer Services*, *19*(3), 325–331. doi:10.1016/j.jretconser.2012.03.006
- Amasawa, E., Suzuki, Y., Moon, D., Nakatani, J., Sugiyama, H., & Hirao, M. (2018). Designing interventions for behavioral shifts toward product sharing: The case of laundry activities in Japan. *Sustainability*, *10*(8), 2687. Advance online publication. doi:10.3390/s10082687
- Anderson, C. L., & Nevitte, N. (2006). Teach your children well: Values of thrift and saving. *Journal of Economic Psychology*, *27*(2), 247–261. doi:10.1016/j.joep.2005.08.001
- Bao, Y., Bao, Y., & Sheng, S. (2011). Motivating purchase of private brands: Effects of store image, product signatureness, and quality variation. *Journal of Business Research*, *64*(2), 220–226. doi:10.1016/j.jbusres.2010.02.007
- Bardhi, F. (2003). Thrill of the hunt: Thrift shopping for pleasure. *Advances in Consumer Research. Association for Consumer Research (U. S.)*, *30*, 375–376.
- Belal, H. M., Shirahada, K., & Kosaka, M. (2013). Value co-creation with customer through recursive approach based on Japanese omotenashi service. *International Journal of Business Administration*, *4*(1), 28–38. doi:10.5430/ijba.v4n1p28
- Birtwistle, G., Clarke, I., & Freathy, P. (1999). Store image in the UK fashion sector: Consumer versus retailer perceptions. *International Review of Retail, Distribution and Consumer Research*, *9*(1), 1–16. doi:10.1080/095939699342651

- Brengman, M., Geuens, M., & Fasseur, T. (2002). Capturing the image of second-hand stores: Investigating the underlying image dimensions. In R. Zwick & T. Ping (Eds.), *Asia Pacific Advances in Consumer Research* (Vol. 5, pp. 387–393). Association for Consumer Research.
- Brinkerhoff, M. B., & Jacob, J. C. (1987). Quasi-religious meaning systems, official religion, and quality of life in an alternative lifestyle: A survey from the back-to-the-land movement. *Journal for the Scientific Study of Religion*, 26(1), 63–80. doi:10.2307/1385841
- Chan, C.-S., & Zhang, Y. (2018). Matching projected image with perceived image for geotourism development: A qualitative-quantitative integration. *Asian Geographer*, 35(2), 143–160. doi:10.1080/10225706.2018.1527235
- Chancellor, J., & Lyubomirsky, S. (2011). Happiness and thrift: When (spending) less is (hedonically) more. *Journal of Consumer Psychology*, 21(2), 131–138. doi:10.1016/j.jcps.2011.02.004
- Chancellor, J., & Lyubomirsky, S. (2014). Money for happiness: The hedonic benefits of thrift. In M. Tatzel (Ed.), *Consumption and Well-Being in the Material World* (pp. 13–47). Springer. doi:10.1007/978-94-007-7368-4_2
- Chang, E.-C., & Tseng, Y.-F. (2013). E-store image, perceived value and perceived risk. *Journal of Business Research*, 66(7), 864–870. doi:10.1016/j.jbusres.2011.06.012
- Chen, R., Zheng, Y., Xu, W., Liu, M., & Wang, J. (2018). Secondhand seller reputation in online markets: A text analytics framework. *Decision Support Systems*, 108, 96–106. doi:10.1016/j.dss.2018.02.008
- Civi, E., & Jolliffe, L. (2013). Thrift shopping as a post-recession leisure and tourism pursuit. *Tourism Today (Nicosia)*, 13, 20–30.
- Corral-Verdugo, V., Mireles-Acosta, J., Tapia-Fonhiem, C., & Fraijo-Sing, B. (2011). Happiness as correlate of sustainable behavior: A study of pro-ecological, frugal, equitable and altruistic actions that promote subjective wellbeing. *Human Ecology Review*, 18(2), 95–104.
- Darley, W. K., & Lim, J.-S. (1999). Effects of store image and attitude toward secondhand stores on shopping frequency and distance traveled. *International Journal of Retail & Distribution Management*, 27(8), 311–318. doi:10.1108/09590559910288596
- de Groot, J. I.-M., & Steg, L. (2008). Value orientations to explain beliefs related to environmental significant behavior: How to measure egoistic, altruistic, and biospheric value orientations. *Environment and Behavior*, 40(3), 330–354. doi:10.1177/0013916506297831
- Despeisse, M., Kishita, Y., Nakano, M., & Barwood, M. (2015). Towards a circular economy for end-of-life vehicles: A comparative study UK–Japan. *Procedia CIRP*, 29, 668–673. doi:10.1016/j.procir.2015.02.122
- Echtner, C. M., & Ritchie, J. R. (1993). The measurement of destination image: An empirical assesemnt. *Journal of Travel Research*, 31(4), 3–13. doi:10.1177/004728759303100402
- Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107–115. doi:10.1111/j.1365-2648.2007.04569.x PMID:18352969

The Projected Images of a Thrift Store Chain in Japan

- Eroglu, S. A., Machleit, K. A., & Davis, L. M. (2003). Empirical testing of a model of online store atmospherics and shopper responses. *Psychology and Marketing, 20*(2), 139–150. doi:10.1002/mar.10064
- Evans, D. (2011). Thrifty, green or frugal: Reflections on sustainable consumption in a changing economic climate. *Geoforum, 42*(5), 550–557. doi:10.1016/j.geoforum.2011.03.008
- Flick, U. (2018). *Doing Triangulation and Mixed Methods*. SAGE. doi:10.4135/9781529716634
- Garon, S. (2002). Saving for ‘My Own Good and the Good of the Nation’: Economic nationalism in modern Japan. In S. Wilson (Ed.), *Nation and Nationalism in Japan* (pp. 97–114). Routledge.
- Gatersleben, B., Murtagh, N., Cherry, M., & Watkins, M. (2019). Moral, wasteful, frugal, or thrifty? Identifying consumer identities to understand and manage pro-environmental behavior. *Environment and Behavior, 51*(1), 24–49. doi:10.1177/0013916517733782
- Given, L. M. (2008). *The SAGE encyclopedia of qualitative methods*. SAGE. doi:10.4135/9781412963909
- Goldsmith, R. E., Flynn, L. R., & Clark, R. A. (2014). The etiology of the frugal consumer. *Journal of Retailing and Consumer Services, 21*(2), 175–184. doi:10.1016/j.jretconser.2013.11.005
- Hanaysha, J. R. (2020). Marketing mix elements and corporate social responsibility: Do they really matter to store image? *Jindal Journal of Business Research, 9*(1), 56–71. doi:10.1177/2278682120908563
- Hofstede, G., Hofstede, G. J., & Monkov, M. (2010). *Cultures and Organizations - Software of the Mind. Intercultural Cooperation and Its Importance for Survival*. McGraw Hill.
- Holmberg, T., & Ideland, M. (2021). The circular economy of food waste: Transforming waste to energy through ‘make-up’ work. *Journal of Material Culture, 26*(3), 344–361. Advance online publication. doi:10.1177/13591835211002555
- Hong, L. M., Nawi, N. B.-C., Hamsani, N. H., & Zulkiffli, W.-F. W. (2020). Online store image effect on perceived risks towards online purchasing behaviour. *International Journal of Business Information Systems, 35*(1), 27–44. doi:10.1504/IJBIS.2020.109530
- Hughes, H., & Allen, D. (2005). Cultural tourism in Central and Eastern Europe: The views of ‘induced image formation agents’. *Tourism Management, 26*(2), 173–183. doi:10.1016/j.tourman.2003.08.021
- Hvass, K. K. (2015). Business model innovation through second hand retailing: A fashion industry case. *Journal of Corporate Citizenship, 57*(57), 11–32. doi:10.9774/GLEAF.4700.2015.ma.00004
- Ikezoe, K., Kiriya, E., & Fujimura, S. (2020). Car-sharing intention analysis in Japan by comparing the utility of car ownership for car-owners and non-car owners. *Transport Policy, 96*, 1–14. doi:10.1016/j.tranpol.2020.05.018
- Kinnaman, T. C., Shinkuma, T., & Yamamoto, M. (2014). The socially optimal recycling rate: Evidence from Japan. *Journal of Environmental Economics and Management, 68*(1), 54–70. doi:10.1016/j.jeem.2014.01.004
- Kozinets, R. V. (2010). *Netnography: Doing ethnographic research online*. SAGE.

- Lee, S. H. (2016). When are frugal consumers not frugal? The influence of personal networks. *Journal of Retailing and Consumer Services*, 30, 1–7. doi:10.1016/j.jretconser.2015.12.005
- Lehmberg, D., Dhanaraj, C., & Funai, A. (2013). What do we make of Japan? Myths and realities. *Business Horizons*, 56(2), 219–229. doi:10.1016/j.bushor.2012.11.006
- Liu, C., Hotta, Y., Santo, A., Hengesbaugh, M., Watabe, A., Totoki, Y., Allen, D., & Bengtsson, M. (2016). Food waste in Japan: Trends, current practices and key challenges. *Journal of Cleaner Production*, 133, 557–564. doi:10.1016/j.jclepro.2016.06.026
- Liu, G., Eng, T.-Y., & Takeda, S. (2015). An investigation of marketing capabilities and social enterprise performance in the UK and Japan. *Entrepreneurship Theory and Practice*, 39(2), 267–298. doi:10.1111/etap.12041
- Machado, M. A.-D., de Almeida, S. O., Bollick, L. C., & Bragagnolo, G. (2019). Second-hand fashion market: Consumer role in circular economy. *Journal of Fashion Marketing and Management*, 23(3), 382–395. doi:10.1108/JFMM-07-2018-0099
- Marchiori, B. E., Carraher, C. E., & Stiles, K. (2014). Understanding and overcoming business etiquette differences in Japan, Turkey, and the United States of America. *Journal of Technology Management in China*, 9(3), 274–288. doi:10.1108/JTMC-08-2014-0045
- Michael, I., Ramsay, T., Stephens, M., & Kotsi, F. (2019). A study of unconscious emotional and cognitive responses to tourism images using a neuroscience method. *Journal of Islamic Marketing*, 10(2), 543–564. doi:10.1108/JIMA-09-2017-0098
- Morishita, S. (2016). Managing omotenashi in onsen ryokans - A case study of Kurokawa Onsen in Kyushu, Japan. *Journal of Global Tourism Research*, 1(2), 157–160. doi:10.37020/jgtr.1.2_157
- Murata, K. (2014). An empirical cross-cultural study of humour in business meetings in New Zealand and Japan. *Journal of Pragmatics*, 60, 251–265. doi:10.1016/j.pragma.2013.09.002
- Neal, D., & Ross, M. (2018). Mobile framing: Vertical videos from user-generated content to corporate marketing. In M. Schleser & M. Berry (Eds.), *Mobile Story Making in an Age of Smartphones* (pp. 151–160). Palgrave Pivot. doi:10.1007/978-3-319-76795-6_15
- Nesset, E., Nervik, B., & Helgesen, Ø. (2011). Satisfaction and image as mediators of store loyalty drivers in grocery retailing. *International Review of Retail, Distribution and Consumer Research*, 21(3), 267–292. doi:10.1080/09593969.2011.588716
- Nghiêm-Phú, B. (2017). Sensory marketing in an outdoor out-store shopping environment – an exploratory study in Japan. *Asia Pacific Journal of Marketing and Logistics*, 29(5), 994–1016. doi:10.1108/APJML-09-2016-0178
- Okulicz-Kozaryn, A., Nash, T., & Tursi, N. O. (2015). Luxury car owners are not happier than frugal car owners. *International Review of Economics*, 62(2), 121–141. doi:10.1007/12232-015-0223-2
- Oppewal, H., & Timmermans, H. (1997). Retailer self-perceived store image and competitive position. *International Review of Retail, Distribution and Consumer Research*, 7(1), 41–59. doi:10.1080/095939697343120

The Projected Images of a Thrift Store Chain in Japan

- Park, H., Kwon, T. A., Zaman, M. M., & Song, S. Y. (2020). Thrift shopping for clothes: To treat self or others? *Journal of Global Fashion Marketing*, 11(1), 56–70. doi:10.1080/20932685.2019.1684831
- Parsons, E. (2005). Dealing in secondhand goods: Creating meaning and value. In K. M. Ekstrom & H. Brembeck (Eds.), *European Advances in Consumer Research* (Vol. 7, pp. 189–194). Association for Consumer Research.
- Podkalicka, A., & Potts, J. (2014). Towards a general theory of thrift. *International Journal of Cultural Studies*, 17(3), 227–241. doi:10.1177/1367877913496198
- Rafiq, M., & Ahmed, P. K. (1995). Using the 7Ps as a generic marketing mix: An exploratory survey of UK and European marketing academics. *Marketing Intelligence & Planning*, 13(9), 4–15. doi:10.1108/02634509510097793
- Russell, J. A., & Pratt, G. (1980). A description of the affective quality attributed to environments. *Journal of Personality and Social Psychology*, 38(2), 311–322. doi:10.1037/0022-3514.38.2.311
- Soni, P., & Krishnan, R. T. (2014). Frugal innovation: Aligning theory, practice, and public policy. *Journal of Indian Business Research*, 6(1), 29–47. doi:10.1108/JIBR-03-2013-0025
- Spena, T. R., Caridà, A., Colurcio, M., & Melia, M. (2012). Store experience and co-creation: The case of temporary shop. *International Journal of Retail & Distribution Management*, 40(1), 21–40. doi:10.1108/09590551211193586
- Steward, S. (2020). What does that shirt mean to you? Thrift-store consumption as cultural capital. *Journal of Consumer Culture*, 20(4), 457–477. doi:10.1177/1469540517745707
- Theodoridis, P., & Chatzipanagiotou, K. (2009). Store image attributes and customer satisfaction across different customer profiles within the supermarket sector in Greece. *European Journal of Marketing*, 43(5-6), 708–734. doi:10.1108/03090560910947016
- Thomas, S. (2013). Linking customer loyalty to customer satisfaction and store image: A structural model for retail stores. *Decision (Washington, D.C.)*, 40(1-2), 15–25. doi:10.100740622-013-0007-z
- Toivonen, T., Norasakkunkit, V., & Uchida, Y. (2011). Unable to conform, unwilling to rebel? Youth, culture, and motivation in globalizing japan. *Frontiers in Psychology*, 2, 207. Advance online publication. doi:10.3389/fpsyg.2011.00207 PMID:21949510
- Wong, Y.-T., Osman, S., Jamaluddin, A., & Yin-Fah, B. C. (2012). Shopping motives, store attributes and shopping enjoyment among Malaysian youth. *Journal of Retailing and Consumer Services*, 19(2), 240–248. doi:10.1016/j.jretconser.2012.01.005
- Wuyts, W., Miatto, A., Sedlitzky, R., & Tanikawa, H. (2019). Extending or ending the life of residential buildings in Japan: A social circular economy approach to the problem of short-lived constructions. *Journal of Cleaner Production*, 231, 660–670. doi:10.1016/j.jclepro.2019.05.258
- Yacout, O. M., & Hefny, L. I. (2015). Use of Hofstede's cultural dimensions, demographics, and information sources as antecedents to cognitive and affective destination image for Egypt. *Journal of Vacation Marketing*, 21(1), 37–52. doi:10.1177/1356766714538444

Yan, R.-N., Bae, S. Y., & Xu, H. (2015). Second-hand clothing shopping among college students: The role of psychographic characteristics. *Young Consumers*, 16(1), 85–98. doi:10.1108/YC-02-2014-00429

Yeniaras, V., & Akarsu, T. N. (2017). Frugal doesn't mean ordinary: A religious perspective. *Journal of Islamic Marketing*, 8(2), 204–217. doi:10.1108/JIMA-06-2015-0046

Zwarthoed, D. (2015). Creating frugal citizens: The liberal egalitarian case for teaching frugality. *Theory and Research in Education*, 13(3), 286–307. doi:10.1177/1477878515606620

ADDITIONAL READING

Amasawa, E., Shibata, T., Sugiyama, H., & Hirao, M. (2020). Environmental potential of reusing, renting, and sharing consumer products: Systematic analysis approach. *Journal of Cleaner Production*, 242, 118487. Advance online publication. doi:10.1016/j.jclepro.2019.118487

Berry, B., & Isenhour, C. (2019). Linking rural and urban circular economies through reuse and repair. *Journal for the Anthropology of North America*, 22(2), 112–114. doi:10.1002/nad.12103

Castellani, V., Sala, S., & Mirabella, N. (2015). Beyond the throwaway society: A life cycle-based assessment of the environmental benefit of reuse. *Integrated Environmental Assessment and Management*, 11(3), 373–382. doi:10.1002/ieam.1614 PMID:25557152

Fortuna, L. M., & Diyamandoglu, V. (2017). Disposal and acquisition trends in second-hand products. *Journal of Cleaner Production*, 142(4), 2454–2462. doi:10.1016/j.jclepro.2016.11.030

Khandual, A., & Pradhan, S. (2019). Fashion brands and consumers approach towards sustainable fashion. In S. Muthu (Ed.), *Fast Fashion, Fashion Brands and Sustainable Consumption. Textile Science and Clothing Technology* (pp. 37–54). Springer. doi:10.1007/978-981-13-1268-7_3

Kim, N., Woo, H., & Ramkumar, B. (2021). The role of product history in consumer response to online second-hand clothing retail service based on circular fashion. *Journal of Retailing and Consumer Services*, 60, 102457. Advance online publication. doi:10.1016/j.jretconser.2021.102457

Pal, R., Shen, B., & Sandber, E. (2019). Circular fashion supply chain management: Exploring impediments and prescribing future research agenda. *Journal of Fashion Marketing and Management*, 23(3), 298–307. doi:10.1108/JFMM-07-2019-166

Ryding, D., Wang, M., Fox, C., & Xu, Y. (2017). A review of secondhand luxury and vintage clothing. In C. Henninger, P. Alevizou, H. Goworek, & D. Ryding (Eds.), *Sustainability in Fashion* (pp. 245–266). Palgrave Macmillan. doi:10.1007/978-3-319-51253-2_12

Turunen, L. L.-M., Leipämaa-Leskinen, H., & Sihvonen, J. (2018). Restructuring secondhand fashion from the consumption perspective. In D. Ryding, C. Henninger, & M. Blazquez Cano (Eds.), *Vintage Luxury Fashion. Palgrave Advances in Luxury* (pp. 11–27). Palgrave Macmillan. doi:10.1007/978-3-319-71985-6_2

The Projected Images of a Thrift Store Chain in Japan

Weber, S. (2019). A circular economy approach in the luxury fashion industry: A case study of Eileen Fisher. In M. Gardetti & S. Muthu (Eds.), *Sustainable Luxury. Environmental Footprints and Eco-design of Products and Processes* (pp. 127–160). Springer. doi:10.1007/978-981-13-0623-5_7

KEY TERMS AND DEFINITIONS

Frugality: The quality of being economical with resources.

Marketing Mix: The collection of necessary factors that a business unit uses to affect its customers' perceptions and behaviors.

Partnership: The relationships a business unit has with other partners.

People: The typical customers of a business unit.

Place: The methods a business unit uses to distribute its products.

Price: The monetary value given to a product.

Product: The items that a business unit sells or buys.

Promotion: The methods a business unit uses to advertise and promote its products.

Psychology: The atmospheric, emotional, and symbolic values that customers can feel about a business unit and its products.

Store Image: The perceptions that customers have of a store (perceived image), or the impression about the store that its manager wants to create (projected image).

Thrift: The quality of using resources not wastefully.

APPENDIX

Table 1. Links to the interviews

Interviewee	Portal	Link
Director	Financial Field	https://financial-field.com/interview/2019/11/11/entry-61679
Director	The Japan Journal of Remodeling	https://www.reform-online.jp/interview/16760.php
Director	IR Tsushin Online	https://www.ir-tsushin.jp/interview/treasurefactory.html
Director	The Remodeling Business Journal	https://www.recycle-tsushin.com/news/detail_4413.php
Staff	Treasure Factory	https://jobstory.jp/ohta-ftp/
Staff	Treasure Factory	https://jobstory.jp/matsui01-ftp/
Staff	Treasure Factory	https://jobstory.jp/matsui02-ftp/
Staff	Treasure Factory	https://jobstory.jp/nakajima01-ftp/
Staff	Treasure Factory	https://jobstory.jp/suginohara-ftp/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K109/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K114/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K122/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K125/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K118/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K126/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K116/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K124/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K113/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K129/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K130/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K131/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K132/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K133/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K134/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K135/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K136/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K137/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K138/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K121/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K140/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K142/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K143/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K144/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K145/
Staff	Recruit Career Co.	https://job.rikunabi.com/2021/company/r774010018/senior/K146/

Chapter 18

COVID–19 Health Pandemic: A Turnaround in Economic Infrastructure

Saibal Kumar Saha

 <https://orcid.org/0000-0002-7842-698X>

Sikkim Manipal Institute of Technology, Sikkim Manipal University, India

Bedanta Bora

Sikkim Manipal Institute of Technology, Sikkim Manipal University, India

Anindita Adhikary

Sikkim Manipal Institute of Technology, Sikkim Manipal University, India

Sangita Saha

 <https://orcid.org/0000-0002-4676-5370>

Sikkim Manipal Institute of Technology, Sikkim Manipal University, India

ABSTRACT

The COVID-19 pandemic has caused numerous deaths, drained resources, halted trade, and shattered economies across the world. Humankind is faced with the challenge of survival, putting a halt on the growth dynamics. Lockdowns imposed by governments have flattened the curve of COVID-19 victims, but only to delay the spread of the deadly virus. Till the time a complete cure is discovered, people have managed to find ways to prevent the spread of the virus by developing new norms of day-to-day survival. The study aims to highlight the COVID-19 crisis and measures to maintain sustainability in the new normal. The methodology used is primarily based on published literature and data. Findings of the study indicate that there is absolute uncertainty on ‘What Next’ and ‘How’. Hence, it is concluded that any resurgence attempt to equipoise this catastrophe is predicted to be prolonged and so its end results.

DOI: 10.4018/978-1-7998-9664-7.ch018

INTRODUCTION

The Novel Corona Virus Disease (abbreviated as Covid-19), an alien phrase in world literature, becomes a buzzword now towards changing face of the globe. It results in an unusual impact with 240,260,449 confirmed infected cases and 4,890,424 subsequent fatalities globally as per as of 5:09pm CEST, 18 October 2021. (“WHO Coronavirus (COVID-19) Dashboard | WHO Coronavirus (COVID-19) Dashboard With Vaccination Data,” n.d.). As per WHO region wise statistics the highest number of confirmed infections are in America - 91,875,767 cases, followed by Europe - 73,444,357 cases, South-East Asia - 43,609,567 cases, Eastern Mediterranean - 16,125,685 cases, Western Pacific - 9,093,100 cases and Africa - 6,111,209 cases. Our lifestyle is being re-defined by this Covid-19 Health Pandemic that had its root in Wuhan city in China during late December 2019 (Shen, 2021). A few identified basis indicates some relevant evidence connected with Covid-19. Covid-19 belongs to a cluster of virus that includes Ebola, Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS) and seasonal flu originating from time to time (Pardo, Shukla, Chamarthi, & Gupte, 2020). The SARS out-broke in 2003 (Long & Zhao, 2021) and the MERS in the year 2012 (Anbarasu & Bhuvanawari, 2020). The fatality rate of coronavirus is 2.3%, lower than SARS (9.5%) and further lower than MERS (34.4%) (Petrosillo, Viceconte, Ergonul, Ippolito, & Petersen, 2020). Pandemics are originally epidemics, which spread rapidly across different geographic regions. For example, the Zika out-broke as an epidemic in Brazil in 2014 and reached across Latin America and the Caribbean (Qureshi, 2017). Likewise, the Ebola viral disease that arose in West Africa affected 28,424 people and caused 11,311 deaths (39.8% case-fatality rate). In Guinea there were 3,805 reported cases (13.4% of total), in Sierra Leone there were 13,911 reported cases (48.9% of total), in Liberia there were 10,672 reported cases (Ladner et al., 2015). The disease eventually spread to Senegal, Mali, Nigeria and many other countries (Manguvo & Mafuvadze, 2015).

In the case of Covid-19, the primary source of any virus happens to be animals, which eventually passes through the human transmission (Peeri et al., 2020). Further, the Covid-19 spreads at a very higher pace as compared with other epidemics. Covid-19 currently is a health pandemic and the World Health Organization (WHO) defines ‘Pandemic’ as “Worldwide spread of a new disease.” Recent twit on media perceives that health pandemics rejoice diamond jubilee. 1720 — Plague; 1820 — Cholera Outbreak; 1920 — Spanish Flu; and 2020 — Chinese Corona seems to support this perception to a noticeable extent. Mankind is now with distinct efforts to cope with this global disaster and accordingly adopt ‘Social Distancing’ as a ‘New Normal’. The challenge is indisputably extraordinary, and conceivably the biggest since World War II. The study aims to highlight the crisis born by COVID 19 and measures to maintain sustainability in the new normal.

METHODOLOGY

The methodology adopted for this study consists of secondary data obtained from the review of published literature, periodicals and web databases. The study is based on the Indian economy with a semi-statistical emphasis on world parameters. The potentials of derived information and perception of social distancing are maintained for concept building and analysis. Virtual meetings with different stakeholders from different parts of the country were conducted to obtain their viewpoints related to the changing dynamics of the world economy due to the effect of Covid-19. The approach is micro-level worked out as a case review to validate itself.

SOCIO-ECONOMIC IMPACTS OF COVID-19

Covid-19 is as an unexpected event with surprising conditions. Researchers across the globe have made attempts to address this issue with different viewpoints. The world economy has been greatly affected and different sectors are shattered as a consequence of Covid-19 (Barichello, 2020; Donthu & Gustafsson, 2020; Fernandes, 2020; Haleem, Javaid, & Vaishya, 2020). Abiad, Arao, & Dagli, (2020) predicted the impact of Covid-19 outbreak into three different scenarios, worst-case, moderate case and best case. According to the prediction, the world GDP would fall at -0.404% and suffer losses of \$346,975 million in the worst case scenario and -0.089% GDP and losses of \$76,693 million in the best case scenario.

Mehta & Jha, (2020) reported that the business of nearly 162 countries was a standstill. Barbate, Gade, & Raibagkar, (2021) highlighted the factors of Covid-19 and its effect on the Indian economy . Gurusurthy, Priya, & Don, (2021) assessed the effect of lockdown and reported that the Indian economy will be greatly affected. The service industries comprising of hospitality, retail, tourism, amusement parks and transport will suffer due to the effects of it. Methods of ‘Social Distancing’ and ‘Self-quarantine’ were used extensive all over the world to stop the spread of virus. However, these became the source of depression, anxiety and distress among many adults (Benke, Autenrieth, Asselmann, & Pané-Farré, 2020). Mair, (2020) proposed several probable plans concerning regulatory bodies and societies which may work out in the era of Covid-19. The importance of the rural economy was also given impetus.

At the global level, oil prices continued to fall due to lockdown and due to low demand the storage capacity of the major oil producers faced challenges (“Coronavirus: Oil price collapses to lowest level for 18 years - BBC News,” n.d.). Figure 1 depicts the global impact of COVID-19 on crude oil prices.

Due to stringent lockdowns imposed by the Government, India witnessed its highest unemployment rates in 2020 and 2021. On 23rd May 2020 the unemployment rate for India was 24.6%, for urban it was 26.09% and for rural India it was 23.94% (“Unemployment,” n.d.) as shown in figure 2. The measures to spread coronavirus affected the lives and livelihood of millions of people.

SOCIAL DISTANCING: A NEW NORMAL

Social distancing is defined as a practice of keeping a physical distance 1.6–3.0 meters from others (Sun & Zhai, 2020). It is to evade direct contact with humans and contaminated surfaces or address in public gatherings during the outbreak of an infectious disease (Warnes, Little, & Keevil, 2015). The basic purpose is to lessen the exposure and minimize transmission of a contagious spread. Social distancing makes utmost sense for human beings with lower immunity and minimal physical resistance against any viral transmission. The term may be weird to mankind, but the concept has been in practice since long during any viral transmission across the world.

Covid-19 is one of the worst disasters that the world has ever seen. Governments of different countries were compelled to shut down their trade, transport, public events, social gathering, meetings, and entertainment, barring essential services. The shutdown of all non-essential services helped in slowing the spread of Covid-19, in the absence of which the spread would have happened exponentially. Figure 3 depicts a graphical representation of daily new confirmed COVID-19 cases per million people.

Figure 1. Global impact of COVID-19 on crude oil prices

Source: <https://www.bbc.com/news/business-52089127>

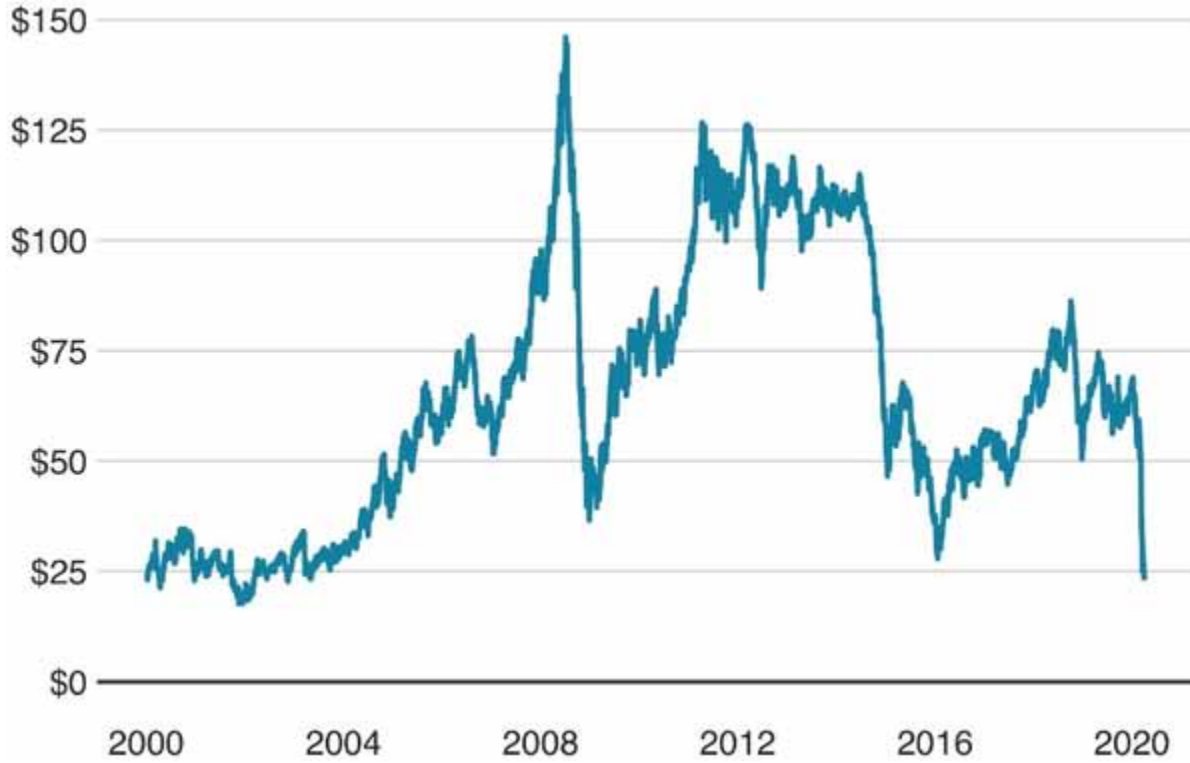
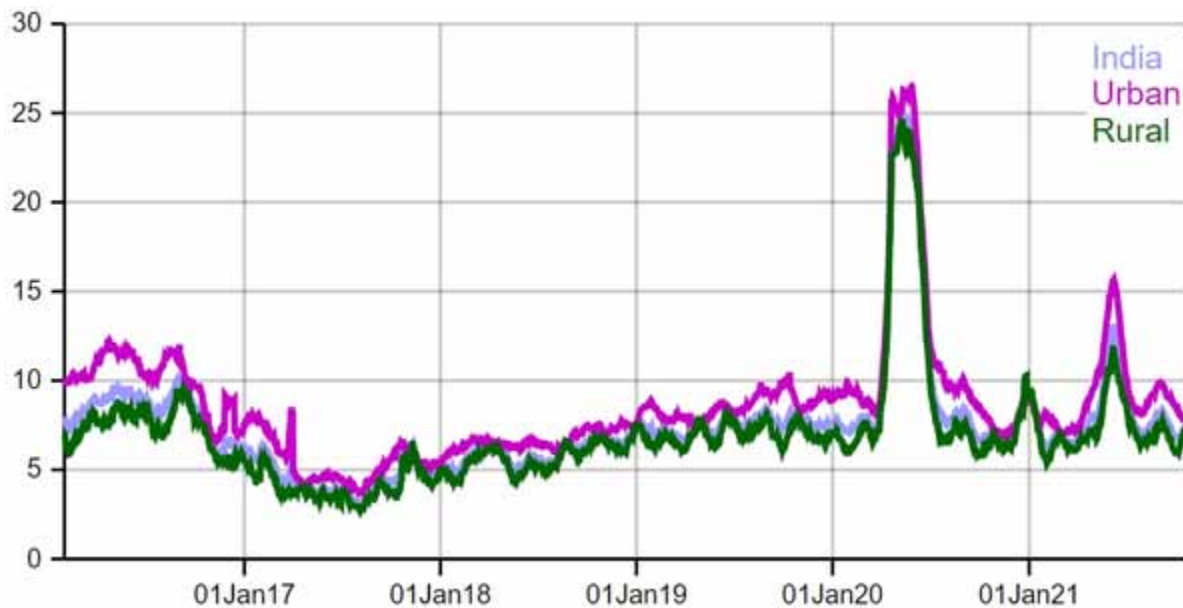


Figure 2. Unemployment rate in India.

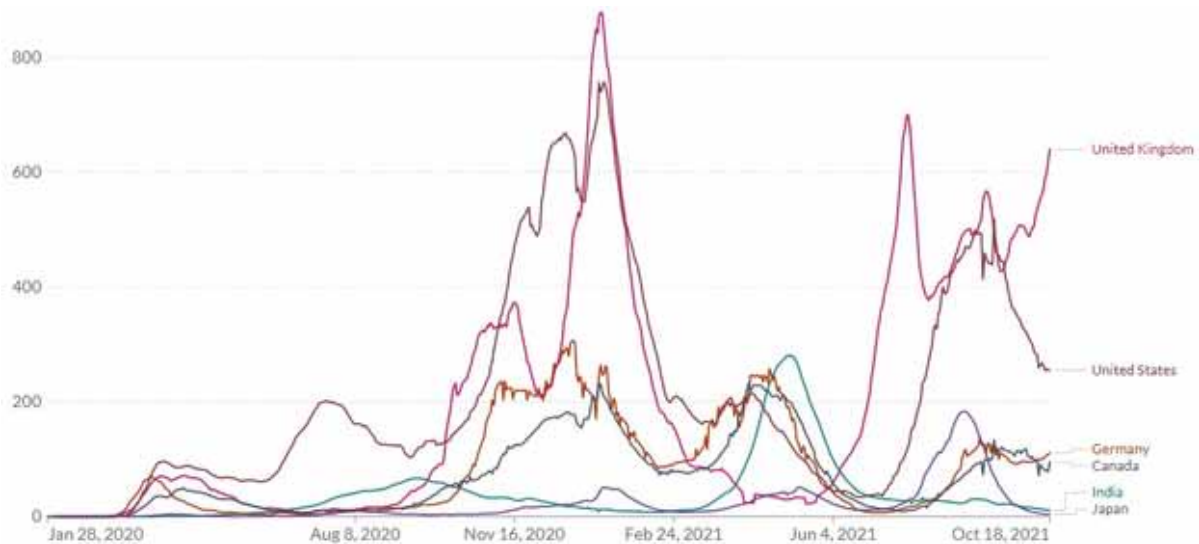
Source: <https://unemploymentinindia.cmie.com/>



COVID-19 Health Pandemic

Figure 3. Daily new confirmed COVID-19 cases per million people

Source: Statistics and Research-Coronavirus Pandemic (Covid-19) Updated: 10th Oct, 2021, <https://ourworldindata.org/coronavirus>



INFRASTRUCTURE STANDSTILL – AN ECONOMIC INSIGHT

The International Monetary Fund (IMF) predicted economic downfall because of recession in the pandemic situation. “Today we are confronted with a crisis like no other. Covid-19 has disrupted our social and economic order at lightning speed and on a scale that we have not seen in living memory,” said, the IMF Managing Director.

Consumer Behaviour Dynamics

Due to restrictions imposed by the Government, there has been a shift in the consumers’ buying behaviour. The ban on public gathering has impacted businesses of concerts, fitness parlours, cinemas, restaurants, lifestyles, sports centres, clubs, grooming stalls, guided tours, spa therapies, homestays, hotels to name a few. As these industries cannot be transferred in the virtual mode, they are the worst hit. Many small and medium-sized organizations have shut their operation. Consumers’ priorities have shifted from luxury items to the prevention of disease and sustenance of necessities. Prices for commodities increased: tomato (78.2%), mung bean (5.2%) and chickpea (4.8%) in India (Cariappa, Acharya, Adhav, Sendhil, & Ramasundaram, 2021).

Air Travel for Civilians

Global tourism and civil aviation are the first to get hit due to Covid-19 (Dube, Nhamo, & Chikodzi, 2021). The first segment to lockdown was international aviation. It was done to stop the inflow of the virus into the country. The counterfactual analysis on frequency of flights in the EU market found that with 1% decrease in flight frequency, the number of confirmed cases for covid-19 could be reduced by

0.908%. The cancellation of over 795,000 flights, averted an additional six million people from getting infected which helped to save 101,309 lives (Liu, Kim, & O'Connell, 2021). Only evacuation flights for stranded tourists and countrymen were allowed for a few days. Post which the international aviation was completely shut. This was followed by the lockdown of the domestic civil aviation sector. Apart from military and cargo flights, there were no flights in the air. Shutting down of this sector effected the associated sectors and business of hotels, cafeteria, travel agents and related services. Delta Airline alone witnessed 60% reduction of passengers (2,699 million) and around USD371 billion loss of gross passenger operating revenues in 2020 compared to 2019. The loss for 2021 compared to 2019 was 41% to 49% reduction of passengers (1,848 to 2,197 million) and around USD278 to USD327 billion loss of gross passenger operating revenues (Guo, Liu, & Liu, 2021).

Immovable Property

The real estate sector was badly hit due to Covid-19 in India. The lockdown forced customers to delay their purchase of immovable's like real estate properties. Many people lost their jobs and had to cancel the already booked plots or flats to use their savings for sustaining their daily livelihood. The construction of projects saw a halt due to the lockdown and unavailability of workers. The absence of materials and dependency on Chinese markets for different types of products made the situation worse.

The sector suffered a setback during both the first and the second wave of the deadly disease. This deceleration in demand for the housing sector has led to postponement in project launches coupled with drastic rise in property prices and drop in the sales of houses during the lockdown from March to June 2020 in the whole country. The initial three months of the financial year 2020-21 observed a remarkable increase in the unsold property as fresh launches surpassed sales by a notable figure. The unsold property has risen to 4,55,351 in the first quarter of the financial year 2020-21 from 4,42,228 units in fourth quarter of financial year 2019-20 (Pusarla & Mamillapalli, 2020).

Migrant Labours

The unorganized sector of India has a large population. Around 100 million make their living in an unorganized way. The unorganized sector consists of contractual workers, day labours, hawkers, craftsmen and self-employed earners. With State Governments imposing lockdown, there is little left for these workers to survive in their natural way. Many have shifted to their base location. With no provision of transport, they are compelled to travel long distances on foot (Khanna, 2020). During May and June 2020, MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act), an initiative of the Government of India observed a demand for employment. During the lockdown, there was a boost in households demanding work under MGNREGA that increased from 33.3 million in May 2020 to 41 million in June 2020 (Bhattacharyyaa, Sarmab, & Nathc, 2020). The households demanding work under MGNREGA touched 27.3 million in April 2021 as migrant labourers for a second time returned to base locations due to the second wave of Covid-19 and quite a few urban places declared lockdowns ("27 mn households sought work under employment guarantee scheme last month | Business Standard News," n.d.).

Automotive Industry

According to Divyanshi Bhardwaj, Editor, Cars-24 (“The Impact of Coronavirus On The Indian Auto Industry,” n.d.) “The Indian automotive supply is heavily contingent on our Chinese partners. And we don’t say that lightly. An estimated USD 4.5 billion worth of auto-component imports was seen from China in 2018-19. A whopping 27% of the automotive parts are manufactured in China and imported to the Indian -companies valued at, as we said, 4.5 billion. Even a minor blow to this relationship can lead to us paying a very heavy price as far as the growth of the industry is concerned”.

The restrictions on import of automotive parts from China and lockdown imposed by the Government added to the downfall of the automotive industry in India. Job cuts and salary reduction forced people to delay their plans for vehicle purchase. The Covid-19 situation serves as an eye-opener on India’s heavy dependency on China for automotive parts. Perhaps India should look for alternate sources for vendor support or utilize the initiative of Government’s “Make in India” and set up domestic plants.

Financial System

According to Yagnesh Kansara (“Down, Down, Down! Why Coronavirus Will Lockdown Indian Stock Market Indefinitely | Outlook India Magazine,” n.d.) “It is difficult to predict how the stock market will move. When there is panic, investors tend to make their decisions emotionally, rather than rationally. This is a Black Swan event, whose impact may be deeper and longer than what was estimated a few weeks ago”.

The global economic crisis is one of the effects of Covid-19. Due to the halt of trade, salary adjustments, drop-in bank interest rates and retrenchment appetite for non-priorities has come down. There is a lack of start-ups, venture capitalists and very fewer stake-holders in the financial system. The pandemic situation had turned into a financial pandemic affecting the lives of people involved with the securities market. Due to this, there is a collapse in the Indian financial system and the indices are running at extremely low rates.

Bank deposits were also severely affected during the second wave of Covid-19 as there were huge withdrawals in order to meet the hospital and medicinal expenditures of infected masses. Bank deposits which had a share of 55% in the aggregate assets of households declined by 0.1% in April 2021 on a month-to-month basis as compared to 11% in April 2020 (“Second Covid wave impacts bank deposits, currency holding with public: RBI article - Times of India,” n.d.).

Supply Chain Dynamics

The reliance of India’ import on China is notable. Textiles, pharmaceutical products, automobile parts, organic chemicals, apparel and many other commodities are imported to India from China. 45% of India’s electronic needs and 70% of pharmaceutical ingredients are fulfilled by China. 1/3rd of machinery and 2/5th of organic chemicals are imported to India from China. India stands out to be the 3rd largest export partner for China. As a consequence of this logistic structure, India is one of the most impacted economies in the era of Covid-19. As pointed out by Arun Singh, Chief Economist, Dun & Bradstreet India, “As lockdowns are imposed in other global manufacturing hubs, besides China, the extent of impairment to global supply chain and global growth is likely to increase”.

Online Shopping

Covid-19 pandemic proved to be a boon for on-line sector. Remarkably, during the lock down phase, the demand for online merchandises reflected diverse aspects of life. New business models were developed where suppliers on e-commerce platforms collaborated with local vendors and enabled the distribution of essentials at different locations. This was done based on the directives of the Government. After initial shut down of the business throughout the country, the e-retail business became the only lifeline of people of remote locations and for those who were unable to come out of their houses. The corona virus led to a “structural shift” in shopping trend with increasing number of Indians and business houses depending on e-commerce (Yadav, Misra, & Ranjan, 2021).

Demand for online shopping increased in products like regular household needs, home or workplace essentials like laptops and headphones, medicines, apparel, etc. Even supply of medicines and fitness consultants were done with the help of online services. Some local vendors also expanded their business by means of ‘WhatsApp’, ‘Tele Calling’ and other apps to generate orders online and supply of the materials at the doorstep of customers. E-commerce players like Flipkart and Amazon witnessed a surge of new user. Amazon registered 50% new customers immediately after the lockdown and even observed new buyers in tier III areas and beyond registering an escalation of 65% during July to September in 2020 (“Lockdown proved inflection point for e-commerce in India - The Economic Times,” n.d.).

CRISIS TO LEARNING

Covid-19 brought along with it a number of crisis situations and discomfort in the normal life-style of people. The daily unhealthy habits were to be undone and something more robust, contact-free needed to be developed and adopted to ensure that life continues and does not come to a standstill. The challenge was accepted and numerous new normal norms were framed and adopted by people. These new norms were healthy and more challenging, innovative and made use of technology. Although learning new normal was not easy but masses slowly started adopting the same to ensure the safety of themselves and their loved ones.

Use of Face Cover or Mask

Face cover is traditionally used by married women in the form of ‘Gunghat’ when they meet new people or elders. A norm which is so traditional was a need to be adopted by every individual to keep themselves safe from the human to human spread of the coronavirus. Use of face covers/masks gained popularity and this became a business opportunity for many.

‘Namaste’ – A World-Wide Norm Now- a-Days

Indigenous form of greeting with folded hands, ‘Namaste’ gained popularity as it ensured no contact between people. Hugs, handshakes and physical contacts were a strict ‘No’ to curb the spread of corona virus. The alternative, ‘Namaste’ became a new global norm which was widely accepted by people.

Ban on Crowding

Restrictions issued by the Government on public assembly whether it is the event of rejoicing or mourning was an attempt to curb the spread of coronavirus. Bars, restaurants, food joints, saloons and many other business ventures had to shut their doors for customers and were forced to stop their business. Mushrooming of app-based stores and online shopping sites helped customers to order their daily necessities from the digital platform in the comfort and safety of their homes. Prohibition of public crowd ensured no celebration of festivals and movement of relatives to each other houses. The concepts of 'e' festivals and meeting in virtual space to keep oneself connected with the near and dear ones was common in the era of the pandemic.

Work from Home

With lockdown being initiated by the Government and its prolonged extension has left no choices for the business houses but to frame a contingency plan and ask its employees to 'work from home'. Although the concept of 'work from home' is not new, its wide acceptance in the pandemic situation has changed the dimensions of business. Use of virtual meeting platforms and completion of projects with the use of 'cloud' based software have enabled the industries to operate even in this situation. Certain sectors like healthcare, manufacturing, agriculture, transport and law and order administration cannot be performed online. Hence, the period of lockdown witnessed operations and movement of such sectors in the traditional model.

Online Education

'Online Education is defined as "Education in which students receive instruction over the Internet, from a video, etc., instead of going to school." The Covid-19 forced the education system to go completely online and the vulnerable young generation kept enriching their minds with school and college education in the online mode (Chakraborty, Mittal, Gupta, Yadav, & Arora, 2021). Online teaching, simulated laboratory experiments, projects, Ph.D defence and even convocations were held online by prominent institutions and helped the young generation to complete their education amidst Covid-19 pandemic crisis but lockdown has immensely effected the unprivileged and poor sections of the society who do not have access to the gadgets and technology to avail these facilities. A study conducted in Nepal reveals that although online education could be beneficial for mitigating the crisis brought down by Covid-19 and can be helpful for teachers and students but the internet connectivity and availability of required infrastructure are essential for obtaining the benefits (Paudel, 2021). Doyumgaç, Tanhan, & Kiyamaz, (2021) highlighted that facilitators and barriers for online education during COVID-19. Technology, internet, communication, emotions and economic resources were identified as facilitators and lacks of technological resources, internet, proper learning environments and opportunity, interaction and resources were identified as the barriers.

Panic Purchase

When WHO declared Covid-19 as pandemic consumers across the world started stocking the essential items for their household. Social media reported and displayed images of people stocking important

commodities of their daily life. Few countries released advisory to educate their citizens not to panic and stop over purchases. Even supermarkets urged their customers not to make over purchase and limited the amount that one person could buy at a time. One of the statement displayed: “We understand your concerns, but buying more than is needed can sometimes mean that others will be left without”. The Covid-19 situation has made citizens lead a proactive life. In many countries, consumers resorted to panic buying of food and sanitary products (Sim, Chua, Vieta, & Fernandez, 2020). The panic purchase behaviour was further fuelled by social media (Depoux et al., 2020).

Fear of Unknown

According to Dr. Anne Maria Albano, Professor of Medical Psychology, Columbia University, “With day-to-day life at a standstill, anxieties around the disease and the future have been heightened”. As a result of exaggeration, the levels of anxiety and fear have arisen among the people. The doubt of “Who will be next” or from which source the disease may spread has made the people anxious. The fear of unknown and deadly consequences has crept into the minds of people affecting their lives. Curfews and extended quarantine periods have increased both psychological and physical problems. A study conducted in Turkey with 3287 participants reveal that women and youths in the age group of 16–25 years have higher COVID-19-related fear, stress, depression and anxiety. There was a significant moderation effect of illness and infection or death of a family member or friend (Koçak, Koçak, & Younis, 2021). The workforce is depressed from COVID-19 and anxious about their career. This is creating a long-term negative effect on their psychology (Mahmud, Talukder, & Rahman, 2021).

Prospects amidst Covid-19

“Loss of one is gain of another” is a common proverb which embodied itself among many industries in Covid-19. Industries like transport, tourism, event organizers, and textile took a downturn while there was a boom in healthcare, pharmaceutical and local stores with facilities like home delivery and well-knit supply chain (Saxena, Anuragi, Arvind, Dorshetwar, & Singh, 2021). Industries which could transform its working from home continued and was unaffected by Covid-19 and even lockdown. Information Technology, Education (Ahmed et al., 2021), Consulting and Banking (Agnihotri, Kulshreshtha, & Tripathi, 2021) was done seamlessly in the virtual model where both the recipient and the provider were well equipped with the technologies and infrastructural requirements. The development of various innovations, technologies and applications helped to fight the coronavirus pandemic (He, Zhang, & Li, 2021). There was a growth in the e-commerce industry as shopping, sitting in the comfort of home proved beneficial for many (Pratisha Akar, 2021).

CONCLUSION

‘Covid-19’ is an event which has happened as a pandemic of a 100-year cycle. ‘Social distancing’, mushrooming of e-services and following the new normal norms have become a necessity to mitigate the challenges posed by Covid-19. Studies are being conducted worldwide to counteract this disaster. Business houses are trying to figure out ways to make up for the suffered losses and framing strategies to face the challenges post Covid-19 pandemic. The new norms of Covid-19 require the robust supply

chain to meet the demands of customer amalgamated with online-based services. The targeted growth of 2.9% in the economy will not be achieved, rather the bottom of the downfall curve could be prolonged.

Many critics claim Covid-19 as a stage of revival for the planet earth. Damage caused due to deforestation, urbanization and pollution over the years saw a halt. Lockdown enforced by Government ensured restricted movement of vehicles and the workforce. The carbon emission levels prove that the era of Covid-19 has helped the increase of forest cover and greenery.

After almost one and half years of the outbreak of Covid-19, the economic condition of countries across the world is trembling. Will the 'Corona' pandemic continue and keep effecting the economy or will it get revived? A novel disease has shaken the entire world, devastated lives, work and relations between countries. 'Social Distancing', 'Work from Home', 'Virtual Meetings' and 'Use of Masks and Sanitizers' has become a new normal. Nations will take years to revive their economy and get back to normalcy.

REFERENCES

- Abiad, A., Arao, R. M., & Dagli, S. (2020). The economic impact of the COVID-19 outbreak on developing. *Asia*.
- Agnihotri, D., Kulshreshtha, K., & Tripathi, V. (2021). Emergence of social media as new normal during COVID-19 pandemic: A study on innovative complaint handling procedures in the context of banking industry. *International Journal of Innovation Science*.
- Ahmed, S., Taqi, H. M. M., Farabi, Y. I., Sarker, M., Ali, S. M., & Sankaranarayanan, B. (2021). Evaluation of Flexible Strategies to Manage the COVID-19 Pandemic in the Education Sector. *Global Journal of Flexible Systems Management 2021*, 1–25. doi:10.1007/S40171-021-00267-9
- Anbarasu, M. A., & Bhuvanewari, D. M. (2020). Challenges of the COVID-19 pandemic for child and adolescent mental health: Promoting psychosocial and positive well-being. *European Journal of Molecular & Clinical Medicine*, 7(7), 326–333.
- Barbate, V., Gade, R. N., & Raibagkar, S. S. (2021). *COVID-19 and Its Impact on the Indian Economy*-Error! Hyperlink reference not valid.. doi:10.1177/0972262921989126
- Barichello, R. (2020). The COVID-19 pandemic: Anticipating its effects on Canada's agricultural trade. *Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie*, 68(2), 219–224. doi:10.1111/CJAG.12244
- Benke, C., Autenrieth, L. K., Asselmann, E., & Pané-Farré, C. A. (2020). Lockdown, quarantine measures, and social distancing: Associations with depression, anxiety and distress at the beginning of the COVID-19 pandemic among adults from Germany. *Psychiatry Research*, 293, 113462. <https://doi.org/10.1016/J.PSYCHRES.2020.113462>
- Bhattacharyya, R., Sarmab, P. K., & Nathc, M. M. (2020). COVID-19 and India's Labour Migrant Crisis. *International Journal of Innovation, Creativity and Change*.

- Cariappa, A. A., Acharya, K. K., Adhav, C. A., Sendhil, R., & Ramasundaram, P. (2021). COVID-19 induced lockdown effects on agricultural commodity prices and consumer behaviour in India – Implications for food loss and waste management. *Socio-Economic Planning Sciences*, 101160. doi:10.1016/J.SEPS.2021.101160
- Chakraborty, P., Mittal, P., Gupta, M. S., Yadav, S., & Arora, A. (2021). Opinion of students on online education during the COVID-19 pandemic. *Human Behavior and Emerging Technologies*, 3(3), 357–365.
- Coronavirus, W. H. O. (COVID-19) Dashboard | WHO Coronavirus (COVID-19) Dashboard With Vaccination Data. (n.d.). Retrieved October 19, 2021, from <https://covid19.who.int/>
- Coronavirus: Oil price collapses to lowest level for 18 years - BBC News. (n.d.). Retrieved October 19, 2021, from <https://www.bbc.com/news/business-52089127>
- Depoux, A., Martin, S., Karafillakis, E., Preet, R., Wilder-Smith, A., & Larson, H. (2020). *The pandemic of social media panic travels faster than the COVID-19 outbreak*. Oxford University Press.
- Donthu, N., & Gustafsson, A. (2020). Effects of COVID-19 on business and research. *Journal of Business Research*, 117, 284–289. <https://doi.org/10.1016/J.JBUSRES.2020.06.008>
- Down, D. Down! Why Coronavirus Will Lockdown Indian Stock Market Indefinitely | Outlook India Magazine. (n.d.). Retrieved October 25, 2021, from <https://www.outlookindia.com/magazine/story/business-news-down-down-down-why-coronavirus-will-lockdown-indian-stock-market-indefinitely/302995>
- Doyumgaç, I., Tanhan, A., & Kiyamaz, M. S. (2021). Understanding the most important facilitators and barriers for online education during COVID-19 through online photovoice methodology. *International Journal of Higher Education*, 10(1), 166–190.
- Dube, K., Nhamo, G., & Chikodzi, D. (2021). COVID-19 pandemic and prospects for recovery of the global aviation industry. *Journal of Air Transport Management*, 92, 102022. <https://doi.org/10.1016/J.JAIRTRAMAN.2021.102022>
- Fernandes, N. (2020). Economic Effects of Coronavirus Outbreak (COVID-19) on the World Economy. *SSRN Electronic Journal*. doi:10.2139/SSRN.3557504
- Guo, X., Liu, Y., & Liu, Z. (2021). Study on Value Portfolio from the Perspective of COVID-19: A Case Study of Aviation, E-commerce and Retail Industry. *2021 International Conference on Financial Management and Economic Transition (FMET 2021)*, 255–259.
- Gurumurthy, K., Priya, A. J., & Don, K. R. (2021). Effect of Lockdown on Indian Economy. *Annals of the Romanian Society for Cell Biology*, 5880–5890.
- Haleem, A., Javaid, M., & Vaishya, R. (2020). Effects of COVID-19 pandemic in daily life. *Current Medicine Research and Practice*, 10(2), 78. doi:10.1016/J.CMRP.2020.03.011
- He, W., Zhang, Z., & Li, W. (2021). Information technology solutions, challenges, and suggestions for tackling the COVID-19 pandemic. *International Journal of Information Management*, 57, 102287. doi:10.1016/J.IJINFOMGT.2020.102287

COVID-19 Health Pandemic

Khanna, A. (2020). Impact of migration of labour force due to global COVID-19 pandemic with reference to India. *Journal of Health Management*, 22(2), 181–191.

Koçak, O., Koçak, Ö. E., & Younis, M. Z. (2021). The Psychological Consequences of COVID-19 Fear and the Moderator Effects of Individuals' Underlying Illness and Witnessing Infected Friends and Family. *International Journal of Environmental Research and Public Health* 2021, 18(4), 1836. doi:10.3390/IJERPH18041836

Ladner, J. T., Wiley, M. R., Mate, S., Dudas, G., Prieto, K., & Lovett, S. ... Palacios, G. (2015). Evolution and Spread of Ebola Virus in Liberia, 2014–2015. *Cell Host & Microbe*, 18(6), 659–669. doi:10.1016/J.CHOM.2015.11.008

Liu, A., Kim, Y. R., & O'Connell, J. F. (2021). COVID-19 and the aviation industry: The interrelationship between the spread of the COVID-19 pandemic and the frequency of flights on the EU market. *Annals of Tourism Research*, 91, 103298. <https://doi.org/10.1016/J.ANNALS.2021.103298>

Lockdown proved inflection point for e-commerce in India - The Economic Times. (n.d.). Retrieved October 25, 2021, from <https://economictimes.indiatimes.com/industry/services/retail/lockdown-proved-inflection-point-for-e-commerce-in-india/articleshow/81665377.cms?from=mdr>

Long, H., & Zhao, J. (2021). The Impact of SARS Epidemic and Financial Crisis on China's Economy Structure Referenced to the Potential Impact of COVID-19. *SSRN 3810413*.

Mahmud, M. S., Talukder, M. U., & Rahman, S. M. (2021). Does 'Fear of COVID-19' trigger future career anxiety? An empirical investigation considering depression from COVID-19 as a mediator. *The International Journal of Social Psychiatry*, 67(1), 35. <https://doi.org/10.1177/0020764020935488>

Mair, S. (2020). How will coronavirus change the world? *BBC Future*, 31.

Manguvo, A., & Mafuvadze, B. (2015). The impact of traditional and religious practices on the spread of Ebola in West Africa: Time for a strategic shift. *The Pan African Medical Journal*, 22(Suppl 1), 9. <https://doi.org/10.11694/PAMJ.SUPP.2015.22.1.6190>

Mehta, K., & Jha, S. S. (2020). COVID-19: A Nightmare for the Indian Economy. *SSRN Electronic Journal*. doi:10.2139/SSRN.3612676

mn households sought work under employment guarantee scheme last month. (n.d.). *Business Standard News*. Retrieved October 25, 2021, from https://www.business-standard.com/article/economy-policy/27-mn-households-sought-work-under-employment-guarantee-scheme-last-month-121050401356_1.html

Pardo, J., Shukla, A. M., Chamarthi, G., & Gupte, A. (2020). The journey of remdesivir: From Ebola to COVID-19. *Drugs in Context*, 9.

Paudel, P. (2021). Online Education: Benefits, Challenges and Strategies During and After COVID-19 in Higher Education. *International Journal on Studies in Education*, 3(2), 70–85. <https://doi.org/10.46328/IJONSE.32>

- Peeri, N. C., Shrestha, N., Rahman, M. S., Zaki, R., Tan, Z., & Bibi, S. ... Haque, U. (2020). The SARS, MERS and novel coronavirus (COVID-19) epidemics, the newest and biggest global health threats: what lessons have we learned? *International Journal of Epidemiology*, 49(3), 717–726. doi:10.1093/IJE/DYAA033
- Petrosillo, N., Viceconte, G., Ergonul, O., Ippolito, G., & Petersen, E. (2020, June). COVID-19, SARS and MERS: Are they closely related? *Clinical Microbiology and Infection*, 26, 729–734. <https://doi.org/10.1016/j.cmi.2020.03.026>
- Pratisha Akar, D. N. M. (2021). Influence of E-Commerce Growth on Retail Market along with Covid Impact. *International Journal of Modern Agriculture*, 10(2), 4311–4318. <http://www.modern-journals.com/index.php/ijma/article/view/1335>
- Pusarla, H. R., & Mamillapalli, R. S. (2020). Impact of COVID-19 on Real Estate Sector in India. *J-GIBS*, 12(1).
- Qureshi, A. I. (2017). Zika virus disease: From origin to outbreak. Academic Press.
- Saxena, T., Anuragi, P., Arvind, S., Dorshetwar, K., & Singh, A. (2021). Coronavirus and Its Impact on Indian Sectors. *SSRN Electronic Journal*. doi:10.2139/SSRN.3936285
- Second Covid wave impacts bank deposits, currency holding with public: RBI article - Times of India. (n.d.). Retrieved October 25, 2021, from <https://timesofindia.indiatimes.com/business/india-business/second-covid-wave-impacts-bank-deposits-currency-holding-with-public-rbi-article/articleshow/83582606.cms>
- Shen, J. (2021). What Roles Do Population and Migration Flows Play in the Spatial Diffusion of COVID-19 from Wuhan City to Provincial Regions in China? *China Review*, 21(3), 189–220.
- Sim, K., Chua, H. C., Vieta, E., & Fernandez, G. (2020). The anatomy of panic buying related to the current COVID-19 pandemic. *Psychiatry Research*, 288, 113015. <https://doi.org/10.1016/J.PSYCHRES.2020.113015>
- Sun, C., & Zhai, Z. (2020). The efficacy of social distance and ventilation effectiveness in preventing COVID-19 transmission. *Sustainable Cities and Society*, 62, 102390. <https://doi.org/10.1016/J.SCS.2020.102390>
- The Impact of Coronavirus On The Indian Auto Industry. (n.d.). Retrieved October 25, 2021, from <https://www.cars24.com/blog/impact-of-coronavirus-on-indian-auto-industry/>
- Unemployment. (n.d.). Retrieved October 19, 2021, from <https://unemploymentinindia.cmie.com/>
- Warnes, S. L., Little, Z. R., & Keevil, C. W. (2015). Human coronavirus 229E remains infectious on common touch surface materials. *mBio*, 6(6). <https://doi.org/10.1128/MBIO.01697-15>
- Yadav, J., Misra, M., & Ranjan, A. (2021). *Online Shopping Behavior during COVID-19 Pandemic: An Indian Perspective*. Available at SSRN 3874348.

Compilation of References

- mn households sought work under employment guarantee scheme last month. (n.d.). *Business Standard News*. Retrieved October 25, 2021, from https://www.business-standard.com/article/economy-policy/27-mn-households-sought-work-under-employment-guarantee-scheme-last-month-121050401356_1.html
- Abdelradi, F. (2018). Food waste behaviour at the household level: A conceptual framework. *Waste Management (New York, N.Y.)*, *71*, 485–493. doi:10.1016/j.wasman.2017.10.001 PMID:29037881
- Abdillah, G., Harahap, W., & Muda, I. (2019). Future electronics payment system model. *Journal of Physics: Conference Series*, *1230*(1), 012068. doi:10.1088/1742-6596/1230/1/012068
- Abdullah, F., Ward, R., & Ahmed, E. (2016). Investigating the influence of the most commonly used external variables of TAM on students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of e-portfolios. *Computers in Human Behavior*, *63*, 75–90. doi:10.1016/j.chb.2016.05.014
- Abiad, A., Arao, R. M., & Dagli, S. (2020). The economic impact of the COVID-19 outbreak on developing. *Asia*.
- Achour, N., Pantartzis, E., Pascale, F., & Price, A. D. (2015). Integration of resilience and sustainability: From theory to application. *International Journal of Disaster Resilience in the Built Environment*, *6*(3), 347–362. doi:10.1108/IJDRBE-05-2013-0016
- Acioli, C., Scavarda, A., & Reis, A. (2021). Applying Industry 4.0 technologies in the COVID–19 sustainable chains. *International Journal of Productivity and Performance Management*, *70*(5), 988–1016. doi:10.1108/IJPPM-03-2020-0137
- Acs, Z. J., Audretsch, D. B., & Lehmann, E. E. (2013). The knowledge spillover theory of entrepreneurship. *Small Business Economics*, *41*(4), 757–774. doi:10.1007/11187-013-9505-9
- Acs, Z. J., Audretsch, D. B., Lehmann, E. E., & Licht, G. (2017). National systems of innovation. *The Journal of Technology Transfer*, *42*(5), 997–1008. doi:10.1007/10961-016-9481-8
- Adelodun, B., Kim, S. H., & Choi, K. S. (2021). Assessment of food waste generation and composition among Korean households using novel sampling and statistical approaches. *Waste Management (New York, N.Y.)*, *122*, 71–80. doi:10.1016/j.wasman.2021.01.003 PMID:33486305
- Adisasmito, S., Rasrendra, C. B., Chandra, H., & Gunartono, M. A. (2018). Anaerobic reactor for Indonesian tofu wastewater treatment. *IACSIT International Journal of Engineering and Technology*, *7*(3), 30–32. doi:10.14419/ijet.v7i3.26.17456
- Affia, I., Yani, L. P. E., & Aamer, A. M. (2019). Factors affecting IoT adoption in food supply chain management. In *9th International Conference on Operations and Supply Chain Management* (pp. 19–24). Academic Press.
- AFTECH. (2020). *Daftar Member Asosiasi Fintech Indonesia*. Retrieved September 4, 2020, from <https://fintech.id/id>

- Afthanorhan, A., Awang, Z., & Mamat, M. (2016). A comparative study between GSCA-SEM and PLS-SEM. *MJ Journal on Statistics and Probability*, 1(1), 63–72.
- Agag, G. M., & El-Masry, A. A. (2017). Why do consumers trust online travel websites? Drivers and outcomes of consumer trust toward online travel websites. *Journal of Travel Research*, 56(3), 347–369. doi:10.1177/0047287516643185
- Aghekyan-Simonian, M., Forsythe, S., Kwon, W. S., & Chattaraman, V. (2012). The role of product brand image and online store image on perceived risks and online purchase intentions for apparel. *Journal of Retailing and Consumer Services*, 19(3), 325–331. doi:10.1016/j.jretconser.2012.03.006
- Agnihotri, D., Kulshreshtha, K., & Tripathi, V. (2021). Emergence of social media as new normal during COVID-19 pandemic: A study on innovative complaint handling procedures in the context of banking industry. *International Journal of Innovation Science*.
- Ahmed, S., Taqi, H. M. M., Farabi, Y. I., Sarker, M., Ali, S. M., & Sankaranarayanan, B. (2021). Evaluation of Flexible Strategies to Manage the COVID-19 Pandemic in the Education Sector. *Global Journal of Flexible Systems Management* 2021, 1–25. doi:10.1007/S40171-021-00267-9
- Aigbe, P., & Akpojaro, J. (2014). Analysis of security issues in electronic payment systems. *International Journal of Computers and Applications*, 108(10).
- Aizstrauta, D., Ginters, E., & Eroles, M. A. P. (2015). Applying theory of diffusion of innovations to evaluate technology acceptance and sustainability. *Procedia Computer Science*, 43(1), 69–77. doi:10.1016/j.procs.2014.12.010
- Ajjah, N., Tjandra, B. C., Hamidah, U., Widyarani, & Sintawardani, N. (2020). Utilization of tofu wastewater as a cultivation medium for *Chlorella vulgaris* and *Arthrospira platensis*. *IOP Conference Series: Earth and Environmental Science*, 483(1), 0–9. doi:10.1088/1755-1315/483/1/012027
- Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. doi:10.1016/0749-5978(91)90020-T
- Aktas, E., Sahin, H., Topaloglu, Z., Oledinma, A., Huda, A. K. S., Irani, Z., ... Kamrava, M. (2018). A consumer behavioural approach to food waste. *Journal of Enterprise Information Management*.
- Akter, S., Fosso Wamba, S., & Dewan, S. (2017). Why PLS-SEM is suitable for complex modelling? An empirical illustration in big data analytics quality. *Production Planning and Control*, 28(11-12), 1011–1021. doi:10.1080/09537287.2016.1267411
- Akter, S., Wamba, S. F., Gunasekaran, A., Dubey, R., & Childe, S. J. (2016). How to improve firm performance using big data analytics capability and business strategy alignment? *International Journal of Production Economics*, 182, 113–131. doi:10.1016/j.ijpe.2016.08.018
- Akther, F. (2018). Intermediaries and intermediating tools as instruments for digital literacy in Bangladesh. In *Designing for Learning in a Networked World* (pp. 251–272). Routledge. doi:10.4324/9781351232357-14
- Al Mashagba, F. F., & Nassar, M. O. (2012). Modified UTAUT model to study the factors affecting the adoption of mobile banking in Jordan. *International Journal of Sciences, Basic and Applied Research*, 6(1), 83–94.
- Al-Amin, S., Sharkar, S. R., Kaiser, M. S., & Biswas, M. (2021). Towards a blockchain-based supply chain management for e-agro business system. *Proceedings of International Conference on Trends in Computational and Cognitive Engineering*. 10.1007/978-981-33-4673-4_26
- Albashrawi, M., & Yu, J. (2020). *Usage Behavior of M-Banking: An Analytical Perspective*. Academic Press.

Compilation of References

- Alfonso, V., Boar, C., Frost, J., Gambacorta, L., & Liu, J. (2021). E-commerce in the pandemic and beyond. *BIS Bulletin*, 36.
- Alhaimer, R. (2021). Fluctuating Attitudes and Behaviors of Customers toward Online Shopping in Times of Emergency: The Case of Kuwait during the COVID-19 Pandemic. *Journal of Internet Commerce*, 1–26. doi:10.1080/15332861.2021.1882758
- Al-Jabri, I. M., & Sohail, M. S. (2012). Mobile banking adoption: Application of diffusion of innovation theory. *Journal of Electronic Commerce Research*, 13(4), 379–391.
- Al-Maghrabi, T., Dennis, C., & Halliday, S. V. (2011). Antecedents of continuance intentions towards e-shopping: The case of Saudi Arabia. *Journal of Enterprise Information Management*, 24(1), 85–111. doi:10.1108/17410391111097447
- Alnoukari, M. (2021). From Business Intelligence to Big Data: The Power of Analytics. In *Integration Challenges for Analytics, Business Intelligence, and Data Mining* (pp. 44–62). IGI Global.
- Alrasheedi, M., Mardani, A., Mishra, A. R., Streimikiene, D., Liao, H., & Al-nefaie, A. H. (2021). Evaluating the green growth indicators to achieve sustainable development: A novel extended interval-valued intuitionistic fuzzy-combined compromise solution approach. *Sustainable Development*, 29(1), 120–142. doi:10.1002/d.2136
- Al-Sharafi, A., Arshah, R.A., Herzallah, A.T., & Abu-Shanab, E.A. (2018). *The Impact of Customer Trust and Perception of Security and Privacy on The Acceptance of Online Banking Services: Structural Equation Modelling Approach*. Academic Press.
- Al-Somali, S. A., Gholami, R., & Clegg, B. (2009). An investigation into the acceptance of online banking in Saudi Arabia. *Technovation*, 29(2), 130–141. doi:10.1016/j.technovation.2008.07.004
- Altaf, A., Abbas, H., Iqbal, F., Khan, M. M. Z. M., Rauf, A., & Kanwal, T. (2021). Mitigating service-oriented attacks using context-based trust for smart cities in IoT networks. *Journal of Systems Architecture*, 115, 102028. doi:10.1016/j.sysarc.2021.102028
- Altaf, M. A., & Deshazo, J. R. (1996). Household demand for improved solid waste management: A case study of Gujranwala, Pakistan. *World Development*, 24(5), 857–868. doi:10.1016/0305-750X(96)00006-X
- Alves, G. M., Sousa, B. B., & Belino, M. (2021). Understanding the Brand Management and Rebranding Processes in Specific Contexts of Medical Tourism. In *New Techniques for Brand Management in the Healthcare Sector* (pp. 124–141). IGI Global. doi:10.4018/978-1-7998-3034-4.ch008
- Alwan, H. A., & Al-Zubi, A. I. (2016). Determinants of internet banking adoption among customers of commercial banks: An empirical study in the Jordanian banking sector. *International Journal of Business and Management*, 11(3), 95. doi:10.5539/ijbm.v11n3p95
- Alzaidi, A. A. (2018). Impact of artificial intelligence on performance of banking industry in Middle East. *International Journal of Computer Science and Network Security*, 18(10), 140–148.
- Amasawa, E., Suzuki, Y., Moon, D., Nakatani, J., Sugiyama, H., & Hirao, M. (2018). Designing interventions for behavioral shifts toward product sharing: The case of laundry activities in Japan. *Sustainability*, 10(8), 2687. Advance online publication. doi:10.3390/u10082687
- Amin, H., Hamid, M. R. A., Lada, S., & Anis, Z. (2008). The adoption of mobile banking in Malaysia: The case of Bank Islam Malaysia Berhad (BIMB). *International Journal of Business and Society*, 9(2), 43.
- Aminoff, A., & Kettunen, O. (2016). Sustainable supply chain management in a circular economy— towards supply circles. In R. Setchi, R. Howlett, & Y. T. P. Liu (Eds.), *Sustainable Design and Manufacturing* (pp. 61–72). Springer.

- Ammar Haider, N. N. (2016). Factors Affecting Online Shopping Behavior of Consumers in Lahore, Pakistan. *Journal of Management Engineering and Information Technology*, 3(6), 9–14. www.jmeit.com
- Anbalagan, G. (2017). New technological changes in Indian banking sector. *International Journal of Scientific Research and Management*, 5(9), 7015–7021. doi:10.18535/ijstrm/v5i9.11
- Anbarasu, M. A., & Bhuvanewari, D. M. (2020). Challenges of the COVID-19 pandemic for child and adolescent mental health: Promoting psychosocial and positive well-being. *European Journal of Molecular & Clinical Medicine*, 7(7), 326–333.
- Andayani, S. N., Lioe, H. N., Wijaya, C. H., & Ogawa, M. (2020). Umami fractions obtained from water-soluble extracts of red oncom and black oncom—{Indonesian} fermented soybean and peanut products. *Journal of Food Science*, 85(3), 657–665. doi:10.1111/1750-3841.14942 PMID:32052448
- Anderson, C. L., & Nevitte, N. (2006). Teach your children well: Values of thrift and saving. *Journal of Economic Psychology*, 27(2), 247–261. doi:10.1016/j.joep.2005.08.001
- Andriani, D., Apriyana, A. Y., & Karina, M. (2020). The optimization of bacterial cellulose production and its applications: A review. *Cellulose (London, England)*, 27(12), 6747–6766. doi:10.1007/10570-020-03273-9
- Androschuk, G. (2021). Global innovation index 2020: who will finance innovations. *Law and Innovations*, 1(33).
- Anggraeni, A., Hasibuan, S., Malik, B., & Wijaya, R. (2013). Improving the quality of tofu waste as a source of feed through fermentation using the *Bacillus amyloliquefaciens* culture. *Int J Adv Sci Eng Inf Technol*, 3, 285–288. doi:10.18517/ijaseit.3.4.305
- Anke, M., Tobias, M., & Gerd, Z. (2019). Economy 4.0 – Digitalisation and Its Effect on Wage Inequality. *Journal of Economics and Statistics*, 239(3), 363–398. <https://econpapers.repec.org/scripts/redir.pf?u=https%3A%2F%2Fdoi.org%2F10.1515%2Fjbnst-2017-0151;h=repec:jns:jbstat:v:239:y:2019:i:3:p:363-398:n:1>
- APJII. (2017). *Survei Penetrasi dan Perilaku Pengguna Internet Indonesia tahun 2017*. Asosiasi Penyelenggara Jasa Internet Indonesia.
- Araújo, W. M., Montebello, N. P., Botelho, R. B. A., & Borgo, L. A. (2014). *Alquimia dos Alimentos*. SENAC.
- Aref, M. M., & Okasha, A. E. (2020). Evaluating the online shopping behavior among Egyptian college-educated community. *Review of Economics and Political Science*, 5(1), 21–37. doi:10.1108/REPS-10-2018-0013
- Aresta, M., & Dibenedetto, A. (2021). The Atmosphere, the Natural Cycles, and the “Greenhouse Effect”. In *The Carbon Dioxide Revolution* (pp. 31–43). Springer. doi:10.1007/978-3-030-59061-1_3
- Ariffin, S. K., Mohan, T., & Goh, Y. N. (2018). Influence of consumers’ perceived risk on consumers’ online purchase intention. *Journal of Research in Interactive Marketing*, 12(3), 309–327. doi:10.1108/JRIM-11-2017-0100
- Ariff, M. S. M., Yeow, S. M., Zakuan, N., Jusoh, A., & Bahari, A. Z. (2012). The effects of computer self-efficacy and technology acceptance model on behavioural intention in internet banking systems. *Procedia: Social and Behavioral Sciences*, 57, 448–452. doi:10.1016/j.sbspro.2012.09.1210
- Armstrong, H. W., & Read, R. (2003). The determinants of economic growth in small states. *The Round Table*, 92(368), 99–124. doi:10.1080/750456745
- Arner, D. W., Barberis, J., & Buckley, R. P. (2015). The evolution of Fintech: A new post-crisis paradigm. *Geo. J. Int’l L.*, 47, 1271. doi:10.2139/ssrn.2676553

Compilation of References

- Arpaci, I. (2016). Understanding and predicting students' intention to use mobile cloud storage services. *Computers in Human Behavior*, 58, 150–157. doi:10.1016/j.chb.2015.12.067
- Arunachalam, L. D. M. S., & Sivasubramanian, M. (2007). The future of internet banking in India. *Academic Open Internet Journal*, 20.
- Asadi, S., Nilashi, M., Husin, A. R. C., & Yadegaridehkordi, E. (2017). Customers perspectives on adoption of cloud computing in banking sector. *Information Technology Management*, 18(4), 305–330. doi:10.1007/10799-016-0270-8
- Ashe, J. W. (2005). *Tourism investment as a tool for development and poverty reduction. In The experience in Small Island Developing States*. SIDS.
- Asian Banking & Finance. (2016). *APAC banks' IT spending to hit US\$19.1b in 2017*. Available from: <https://asianbankingandfinance.net/banking-technology/in-focus/apac-banks-it-spending-hit-us191b-in-2017>
- Asian Development Bank. (2020). *Innovate Indonesia: Unlocking Growth through Technological Transformation*. Asian Development Bank. doi:10.22617/SGP200085-2
- Aslam, F., Aimin, W., Li, M., & Ur Rehman, K. (2020). Innovation in the Era of IoT and Industry 5.0: Absolute Innovation Management (AIM) Framework. *Information (Basel)*, 11(2), 124. doi:10.3390/info11020124
- Astuti, A. D., & Ayu, D. I. (2019). Treatment of Tofu Industry Wastewater using Bioreactor Anaerobic-Aerobic and Bioball as Media with Variation of Hydraulic Retention Time. *Reaktor*, 19(1), 18–25.
- Awang, Z. (2012). *Structural equation modeling using AMOS graphic*. Penerbit Universiti Teknologi MARA.
- Ayaz, S. T., Aktaş, Ö., Akça, L., & Findik, N. (2015). Effluent quality and reuse potential of domestic wastewater treated in a pilot-scale hybrid constructed wetland system. *Journal of Environmental Management*, 156, 115–120. doi:10.1016/j.jenvman.2015.03.042
- Ayres, R. U. (2021). Extensions of the Body. In *The History and Future of Technology* (pp. 33–56). Springer. doi:10.1007/978-3-030-71393-5_3
- Bach, M. P., Čeljo, A., & Zoroja, J. (2016). Technology acceptance model for business intelligence systems: Preliminary research. *Procedia Computer Science*, 100, 995–1001. doi:10.1016/j.procs.2016.09.270
- Balkau, F., & Sonnemann, G. (2011). *Addressing sustainability issues through enhanced supply chain management*. Academic Press.
- Baloglu, S., & Brinberg, D. (1997). Affective images of tourism destinations. *Journal of Travel Research*, 35(4), 11–15. doi:10.1177/004728759703500402
- Baloglu, S., & McCleary, K. W. (1999). A model of destination image formation. *Annals of Tourism Research*, 26(4), 868–897. doi:10.1016/S0160-7383(99)00030-4
- Banaité, D. (2016). Towards circular economy: Analysis of indicators in the context of sustainable development. *Social Transformation in Contemporary Society*, 4(9), 142–150.
- Banerjee, S., Bhattacharya, S., Dave, S., & Koner, S. (2018). Impact of mobile phones on international trade: The experience of South and South East Asia. *International Journal Of Business And Development Research*, 7(1), 40–53.
- Bank Indonesia. (2021). *Statistik Ekonomi dan Keuangan Indonesia*. Dipetik August 2021, dari Bank Indonesia: <https://www.bi.go.id/id/statistik/ekonomi-keuangan/seki/Default.aspx#headingFour>

- Bank of Indonesia. (2017). *Bank of Indonesia Regulation Number 19/12/PBI/2017 concerning Implementation of Financial Technology*. Author.
- Bao, Y., Bao, Y., & Sheng, S. (2011). Motivating purchase of private brands: Effects of store image, product signature-ness, and quality variation. *Journal of Business Research*, 64(2), 220–226. doi:10.1016/j.jbusres.2010.02.007
- Barbate, V., Gade, R. N., & Raibagkar, S. S. (2021). *COVID-19 and Its Impact on the Indian Economy*! Hyperlink reference not valid.. doi:10.1177/0972262921989126
- Bardhi, F. (2003). Thrill of the hunt: Thrift shopping for pleasure. *Advances in Consumer Research*. Association for Consumer Research (U. S.), 30, 375–376.
- Barhoumi, C. (2016). User Acceptance of the e-Information Service as Information Resource: A New Extension of the Technology Acceptance Model. *New Library World*, 117(9/10), 626–643. doi:10.1108/NLW-06-2016-0045
- Barichello, R. (2020). The COVID-19 pandemic: Anticipating its effects on Canada's agricultural trade. *Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie*, 68(2), 219–224. doi:10.1111/CJAG.12244
- Barr, S. (2017). *Household waste in social perspective: values, attitudes, situation and behaviour*. Taylor & Francis. doi:10.4324/9781315253206
- Barsky, D., Carbonell, E., Sala-Ramos, R., de Castro, J. M. B., & García-Vadillo, F. J. (2021). Late Acheulian multiplicity in the manufactured stone culture at the end of the Middle Pleistocene in Western Europe. *Quaternary International*, 601, 66–81. doi:10.1016/j.quaint.2021.04.017
- Batra, L. (2009). *A review of urbanisation and urban policy in post-independent India*. Centre for the Study of Law and Governance.
- Baumeister, P., Tosi, N., MacKenzie, J., Grenfell, J., & Godolt, M. (2020). Shaping atmospheres of terrestrial planets with interior-atmosphere feedback processes. *Matter Under Extreme Conditions*, 117, 18264-18271.
- Becker, J.-M., Klein, K., & Wetzels, M. (2012). Hierarchical latent variable models in PLS-SEM: Guidelines for using reflective-formative type models. *Long Range Planning*, 45(5-6), 359–394. doi:10.1016/j.lrp.2012.10.001
- Becker, N. (2014). *Increasing High Recycling Rates: Socio-demographics as an additional layer of information to improve waste management*. IIIIEE.
- Belal, H. M., Shirahada, K., & Kosaka, M. (2013). Value co-creation with customer through recursive approach based on Japanese omotenashi service. *International Journal of Business Administration*, 4(1), 28–38. doi:10.5430/ijba.v4n1p28
- Belanche, D., Casaló, L. V., & Flavián, C. (2019). Artificial Intelligence in FinTech: Understanding robo-advisors adoption among customers. *Industrial Management & Data Systems*, 119(7), 1411–1430. doi:10.1108/IMDS-08-2018-0368
- Benke, C., Autenrieth, L. K., Asselmann, E., & Pané-Farré, C. A. (2020). Lockdown, quarantine measures, and social distancing: Associations with depression, anxiety and distress at the beginning of the COVID-19 pandemic among adults from Germany. *Psychiatry Research*, 293, 113462. <https://doi.org/10.1016/J.PSYCHRES.2020.113462>
- Bergendahl, G., & Lindblom, T. (2007). Pricing of payment services: A comparative analysis of paper-based banking and electronic banking. *Service Industries Journal*, 27(6), 687–707. doi:10.1080/02642060701453148
- Bergström Stacey, I., Svenningsson, P. & Thoresson, A. (2018). *The Era of Artificial Intelligence in Swedish Banking: Exploring Customer Attitudes Towards AI as a Substitute to Brick-and-Mortar Offices*. Academic Press.
- Berkhout, F., & Hertin, J. (2004). De-materialising and re-materialising: Digital technologies and the environment. *Futures*, 36(8), 903–920. doi:10.1016/j.futures.2004.01.003

Compilation of References

- Berna-Martinez, J., & Maciá Pérez, F. (2012). Overcoming resistance to change in business innovation processes. *IACSIT International Journal of Engineering and Technology*, 4, 148.
- Bertino, E. (2015, June). Big data-security and privacy. In *Big Data (BigData Congress), 2015 IEEE International Congress on* (pp. 757-761). IEEE. 10.1109/BigDataCongress.2015.126
- Bertrand, P., & Legendre, L. (2021). The Living Earth: Our Home in the Solar System and the Universe. In *Earth, Our Living Planet* (pp. 1–47). Springer. doi:10.1007/978-3-030-67773-2_1
- Bhatnagar, A., Misra, S., & Rao, H. R. (2000). On risk, convenience, and Internet shopping behavior. *Communications of the ACM*, 43(11), 98–105. doi:10.1145/353360.353371
- Bhatta, B. (2010). Causes and consequences of urban growth and sprawl. In *Analysis of urban growth and sprawl from remote sensing data* (pp. 17–36). Springer. doi:10.1007/978-3-642-05299-6_2
- Bhattacharyya, R., Sarmab, P. K., & Nathc, M. M. (2020). COVID-19 and India's Labour Migrant Crisis. *International Journal of Innovation, Creativity and Change*.
- Bhatti, A., Akram, H., & Khan, A. U. (2020). E-commerce trends during COVID-19 Pandemic. *International Journal of Future Generation Communication and Networking*, 13(2), 1449–1452.
- Birtwistle, G., Clarke, I., & Freathy, P. (1999). Store image in the UK fashion sector: Consumer versus retailer perceptions. *International Review of Retail, Distribution and Consumer Research*, 9(1), 1–16. doi:10.1080/095939699342651
- Bisht, R. S., Jain, S., & Tewari, N. (2021). *Study of Wearable IoT devices in 2021: Analysis & Future Prospects*. Paper presented at the 2021 2nd International Conference on Intelligent Engineering and Management (ICIEM). 10.1109/ICIEM51511.2021.9445334
- Blackwell, R. D., Miniard, P. W., Engel, J. F., Pai, D. C., Norjaya, M. Y., & Wan Jooria, H. (2012). *Consumer behaviour*. Cengage Learning Asia Pte Ltd.
- BNM. (2018). *Financial stability and payment systems report 2017*. Bank Negara Malaysia.
- Bohutskyi, P., Keller, T. A., Phan, D., Parris, M. L., & Li, M. (2019). *Co-digestion of Wastewater-Grown Filamentous Algae With Sewage Sludge Improves Biomethane Production and Energy Balance Compared to Thermal, Chemical, or Thermochemical Pretreatments*. doi:10.3389/fenrg.2019.00047
- Bongju, C. (2019). *Study on Factors Affecting Financial Investors' Acceptance Intention to Robo-Advisor based on UTAUT*. Academic Press.
- Borborah, P., & Das, J. (2021). Bringing the World Inside Home: Media, Advertisements and Changing Forms of Consumerism. In *Sociological Reflections on the Covid-19 Pandemic in India* (pp. 51–74). Springer. doi:10.1007/978-981-16-2320-2_4
- Bowel, D., & Weinz, W. (2008). *Reducing Poverty through Tourism*. International Labour Office.
- Brander, J., Egan, E., & Hellmann, T. (2008). *Government sponsored versus private venture capital: Canadian evidence*. NBER Working Paper, 14029.
- Bravi, L., Murmura, F., Savelli, E., & Viganò, E. (2019). Motivations and Actions to Prevent Food Waste among Young Italian Consumers. *Sustainability*, 11(4), 1110. doi:10.3390u11041110
- Brengman, M., Geuens, M., & Fasseur, T. (2002). Capturing the image of second-hand stores: Investigating the underlying image dimensions. In R. Zwick & T. Ping (Eds.), *Asia Pacific Advances in Consumer Research* (Vol. 5, pp. 387–393). Association for Consumer Research.

Brinkerhoff, M. B., & Jacob, J. C. (1987). Quasi-religious meaning systems, official religion, and quality of life in an alternative lifestyle: A survey from the back-to-the-land movement. *Journal for the Scientific Study of Religion*, 26(1), 63–80. doi:10.2307/1385841

Brizi, A., & Biraglia, A. (2021). “Do I have enough food?” How need for cognitive closure and gender impact stockpiling and food waste during the COVID-19 pandemic: A cross-national study in India and the United States of America. *Personality and Individual Differences*, 168, 110396. doi:10.1016/j.paid.2020.110396 PMID:32982000

Brundtland, G. (1987). *Report of the World Commission on Environment and Development: Our Common Future*. Sustainabledevelopment.un.org

Bruner, G. C. II, & Kumar, A. (2005). Explaining consumer acceptance of handheld Internet devices. *Journal of Business Research*, 58(5), 553–558. doi:10.1016/j.jbusres.2003.08.002

Budiarto, R., Kholid, M., & Haryoko, A. (2013). The 3 rd International Conference on Sustainable Future for Human Security Sustainability challenge for small scale renewable energy use in Yogyakarta. *Procedia Environmental Sciences*, 17, 513–518. doi:10.1016/j.proenv.2013.02.066

Budiyono, B., & Syaichurrozi, I. (2020). A review: Biogas production from tofu liquid waste. *IOP Conference Series. Materials Science and Engineering*, 845(1), 012047. Advance online publication. doi:10.1088/1757-899X/845/1/012047

Burton-Jones, A., & Hubona, G. (2005). Individual differences and usage behavior: Revisiting a Technology Acceptance Model assumption. *ACM SIGMIS Database*, 36(2), 58–77. doi:10.1145/1066149.1066155

Busher, P. E., Mayer, M., Ulevičius, A., Samus, A., Hartman, G., & Rosell, F. (2020). Food caching behavior of the Eurasian beaver in northern Europe. *Wildlife Biology*, 2020(3).

Cacicedo, M. L., Castro, M. C., Servetas, I., Bosnea, L., Boura, K., Tsafrakidou, P., Dima, A., Terpou, A., Koutinas, A., & Castro, G. R. (2016). Progress in bacterial cellulose matrices for biotechnological applications. *Bioresource Technology*, 213, 172–180. doi:10.1016/j.biortech.2016.02.071 PMID:26927233

Cadario, R., & Chandon, P. (2018). Which healthy eating nudges work best? A meta-analysis of field experiments. *Appetite*, 130, 300–301. doi:10.1016/j.appet.2018.05.170

Cai, T., Park, S. Y., & Li, Y. (2013). Nutrient recovery from wastewater streams by microalgae : Status and prospects. *Renewable & Sustainable Energy Reviews*, 19, 360–369. doi:10.1016/j.rser.2012.11.030

Cai, T., Park, S. Y., Racharaks, R., & Li, Y. (2013). Applied Energy Cultivation of Nannochloropsis salina using anaerobic digestion effluent as a nutrient source for biofuel production. *Applied Energy*, 108, 486–492. doi:10.1016/j.apenergy.2013.03.056

Cai, Y. (2014). Implementing the triple helix model in a non-western context: An institutional logics perspective. *Triple Helix (Heidelberg)*, 1(1), 1–20. doi:10.1186/40604-014-0001-2

Cai, Y., & Etzkowitz, H. (2020). Theorising the triple helix model: Past, present, and future. *Triple Helix Journal*, (June), 1–38. doi:10.1163/21971927-bja10003

Camprubí, E., de Leeuw, J., House, C., Raulin, F., Russell, M., Spang, A., Tirumalai, M. R., & Westall, F. (2019). The Emergence of Life. *Space Science Reviews*, 215(8), 56. Advance online publication. doi:10.1007/11214-019-0624-8

Cantaragiu, R. (2019). The Impact of Gender on Food Waste at the Consumer Level. *Studia Universitatis, “Vasile Goldis” Arad – Economics Series*, 29(4), 41-57.

Capri, A. (2017). *Micro and Small Businesses in Indonesia’s Digital Economy*. Academic Press.

Compilation of References

- Cariappa, A. A., Acharya, K. K., Adhav, C. A., Sendhil, R., & Ramasundaram, P. (2021). COVID-19 induced lockdown effects on agricultural commodity prices and consumer behaviour in India – Implications for food loss and waste management. *Socio-Economic Planning Sciences*, 101160. doi:10.1016/J.SEPS.2021.101160
- Carlsson, B., Jacobsson, S., Holmen, M., & Rickne, A. (2002). Innovation systems: Analytical and methodological issues. *Research Policy*, 31(2), 233–245. doi:10.1016/S0048-7333(01)00138-X
- Caron, X., Bosua, R., Maynard, S. B., & Ahmad, A. (2016). The Internet of Things (IoT) and its impact on individual privacy: An Australian perspective. *Computer Law & Security Review*, 32(1), 4–15. doi:10.1016/j.clsr.2015.12.001
- Carroll, A. B. (1979). A three-dimensional conceptual model of corporate performance. *Academy of Management Review*, 4(4), 497–505. doi:10.2307/257850
- Carter, B. (2008). Five- or six-step scenario for evolution? *International Journal of Astrobiology*, 7(2), 177–182. doi:10.1017/S1473550408004023
- Cea-barca, G., & López-caamal, F. (2018). *Biogas Purification Via Optimal Microalgae Growth: A Literature Review*. doi:10.1002/btpr.2686
- Celik, H. (2016). Customer online shopping anxiety within the Unified Theory of Acceptance and Use Technology (UTAUT) framework. *Asia Pacific Journal of Marketing and Logistics*, 28(2), 278–307. doi:10.1108/APJML-05-2015-0077
- Centobelli, P., Cerchione, R., & Esposito, E. (2020). Pursuing supply chain sustainable development goals through the adoption of green practices and enabling technologies: A cross-country analysis of LSPs. *Technological Forecasting and Social Change*, 153, 119920. doi:10.1016/j.techfore.2020.119920
- Chaffey, D., & Ellis-Chadwick, F. (2016). *Digital Marketing Strategy, Implementation and Practice* (6th ed., Vol. 53). Pearson education Limited. doi:10.1017/CBO9781107415324.004
- Chai, X., Mi, Y., Yue, P., & Chen, G. (1999). *Bean curd wastewater treatment by membrane separation*. Academic Press.
- Chaimaa, B., Najib, E., & Rachid, H. (2021). E-banking Overview: Concepts, Challenges and Solutions. *Wireless Personal Communications*, 117(2), 1059–1078. doi:10.1007/11277-020-07911-0
- Chakraborty, I., & Maity, P. (2020). COVID-19 outbreak: Migration, effects on society, global environment and prevention. *The Science of the Total Environment*, 728, 138882. doi:10.1016/j.scitotenv.2020.138882 PMID:32335410
- Chakraborty, P., Mittal, P., Gupta, M. S., Yadav, S., & Arora, A. (2021). Opinion of students on online education during the COVID-19 pandemic. *Human Behavior and Emerging Technologies*, 3(3), 357–365.
- Chan, C.-S., & Zhang, Y. (2018). Matching projected image with perceived image for geotourism development: A qualitative-quantitative integration. *Asian Geographer*, 35(2), 143–160. doi:10.1080/10225706.2018.1527235
- Chancellor, J., & Lyubomirsky, S. (2011). Happiness and thrift: When (spending) less is (hedonically) more. *Journal of Consumer Psychology*, 21(2), 131–138. doi:10.1016/j.jcps.2011.02.004
- Chancellor, J., & Lyubomirsky, S. (2014). Money for happiness: The hedonic benefits of thrift. In M. Tatzel (Ed.), *Consumption and Well-Being in the Material World* (pp. 13–47). Springer. doi:10.1007/978-94-007-7368-4_2
- Chan, E. H. W., Qian, Q. K., & Lam, P. T. I. (2009). The market for green building in developed Asian cities-the perspectives of building designers. *Energy Policy*, 37(8), 3061–3070. doi:10.1016/j.enpol.2009.03.057
- Chang, E.-C., & Tseng, Y.-F. (2013). E-store image, perceived value and perceived risk. *Journal of Business Research*, 66(7), 864–870. doi:10.1016/j.jbusres.2011.06.012

- Chan, W., & Liu, S. (2016). Trends in Food Science & Technology Biovalorisation of okara (soybean residue) for food and nutrition. *Trends in Food Science & Technology*, 52, 139–147. doi:10.1016/j.tifs.2016.04.011
- Chan, W.-M., & Ma, C.-Y. (1999). Acid modification of proteins from soymilk residue (okara). *Food Research International*, 32(2), 119–127. doi:10.1016/S0963-9969(99)00064-2
- Chaouche, S. (2020). Consumer Credit Traps and Student Consumerism. In *Student Consumer Culture in Nineteenth-Century Oxford* (pp. 159–196). Palgrave Macmillan. doi:10.1007/978-3-030-46387-8_6
- Chauhan, E. (2020). Challenges to community participation in heritage tourism development: Case studies of shahjahanabad and nizamuiddin basti in new delhi, india. *WIT Trans Ecol Environ*, 248, 225–233.
- Cheah, J.-H., Memon, M. A., Chuah, F., Ting, H., & Ramayah, T. (2018). Assessing reflective models in marketing research: A comparison between pls and plsc estimates. *International Journal of Business and Society*, 19(1), 139–160.
- Chen, C. K., Susanto, H., & Leu, F. Y. (2019). Managing Online Learning: Big Data, Social Networks, and Cloud Computing. In *The Emerging Technology of Big Data* (pp. 229–252). Apple Academic Press.
- Chen, G., Zhao, L., & Qi, Y. (2015). Enhancing the productivity of microalgae cultivated in wastewater toward biofuel production : A critical review. *Applied Energy*, 137, 282–291. doi:10.1016/j.apenergy.2014.10.032
- Cheng, E. W. (2019). Choosing between the theory of planned behaviour (TPB) and the technology acceptance model (TAM). *Educational Technology Research and Development*, 67(1), 21–37. doi:10.1007/11423-018-9598-6
- Chen, R., Zheng, Y., Xu, W., Liu, M., & Wang, J. (2018). Secondhand seller reputation in online markets: A text analytics framework. *Decision Support Systems*, 108, 96–106. doi:10.1016/j.dss.2018.02.008
- Chen, X., & Lin, B. Q. (2021). Towards carbon neutrality by implementing carbon emissions trading scheme: Policy evaluation in China. *Energy Policy*, 157, 112510. doi:10.1016/j.enpol.2021.112510
- Chesbrough, H. W. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Boston, MA: Harvard Business School and Maidenhead: McGraw-Hill
- Chiarenza, A. A., Farnsworth, A., Mannion, P. D., Lunt, D. J., Valdes, P. J., Morgan, J. V., & Allison, P. A. (2020). Asteroid impact, not volcanism, caused the end-Cretaceous dinosaur extinction. *Proceedings of the National Academy of Sciences of the United States of America*, 117(29), 17084–17093. doi:10.1073/pnas.2006087117 PMID:32601204
- Chin, W. W. (1998). The partial least squares approach to structural equation modeling. *Modern Methods for Business Research*, 295(2), 295–336.
- Chin, W. W. (2001). *PLS-Graph user's guide*. CT Bauer College of Business, University of Houston.
- China Building Energy Conservation Association and Energy Consumption Statistics Professional Committee. (2020). *China Building Energy Research Report 2020. Achievements Released*. Author.
- China Building Energy Conservation Association Climate Bonds Initiative. (2019). *Chinese Green bond market 2019*. Climate Bonds Initiative and China National Debt Registration and Settlement Co., Ltd.
- Chin, W. W. (2010). How to write up and report PLS analyses. In *Handbook of partial least squares* (pp. 655–690). Springer. doi:10.1007/978-3-540-32827-8_29
- Choi, S., Lehto, X., & Morrison, A. (2007). Destination image representation on the web: Content analysis of Macau travel related websites. *Tourism Management*, 28(1), 118–129. doi:10.1016/j.tourman.2006.03.002

Compilation of References

- Chong, A. Y. L. (2013). Predicting m-commerce adoption determinants: A neural network approach. *Expert Systems with Applications*, 40(2), 523–530. doi:10.1016/j.eswa.2012.07.068
- Chow, P. K. Y., Uchida, K., von Bayern, A. M., & Koizumi, I. (2021). Characteristics of urban environments and novel problem-solving performance in Eurasian red squirrels. *Proceedings of the Royal Society B*, 288(1947), 20202832. doi:10.1098/rspb.2020.2832
- Chowdhary, N., Kaurav, R. P. S., & Sharma, S. (2020). Segmenting the domestic rural tourists in India. *Tourism Review International*, 24(1), 23–36. doi:10.3727/154427220X15791346544761
- Chrismastianto, I. A. W. (2017). Analisis SWOT implementasi teknologi finansial terhadap kualitas layanan perbankan di Indonesia. *Jurnal Ekonomi Dan Bisnis*, 20(1), 134–136. doi:10.24914/jeb.v20i1.641
- Chua, J.-Y., & Liu, S.-Q. (2020). Effect of single amino acid addition on growth kinetics and flavor modulation by *Torulaspora delbrueckii* in soy (tofu) whey alcoholic beverage fermentation. *Food Research International*, 135, 109283. doi:10.1016/j.foodres.2020.109283 PMID:32527478
- Chu, J., Arce-Urriza, M., Cebollada-Calvo, J. J., & Chintagunta, P. K. (2010). An empirical analysis of shopping behavior across online and offline channels for grocery products: The moderating effects of household and product characteristics. *Journal of Interactive Marketing*, 24(4), 251–268. doi:10.1016/j.intmar.2010.07.004
- Chuttur, M. (2009). Overview of the Technology Acceptance Model: Origins, Developments and Future Directions. *Sprouts: Working Papers on Information Systems*, 9.
- Civi, E., & Jolliffe, L. (2013). Thrift shopping as a post-recession leisure and tourism pursuit. *Tourism Today (Nicosia)*, 13, 20–30.
- Clarke, J. (2005). Effective marketing for rural tourism. *Rural Tourism and Sustainable Business*, 26, 87–103.
- Clark, G. L., Feiner, A., Viehs, M. (2015). From the stockholder to the stakeholder: How sustainability can drive financial outperformance. Available at SSRN 2508281.
- Class, B., Masoero, G., Terraube, J., & Korpimäki, E. (2021). Estimating the long-term repeatability of food-hoarding behaviours in an avian predator. *Biology Letters*, 17(7), 20210286. doi:10.1098/rsbl.2021.0286 PMID:34256584
- Cleuziou, S., & Tosi, M. (2021). *In the Shadow of the Ancestors: The Prehistoric Foundations of the Early Arabian Civilization in Oman: Second Expanded Edition*. Archaeopress Publishing Ltd. doi:10.2307/j.ctv1dwq0rp
- Climate Transparency. (2020). *Climate Transparency Report: Comparing G20 Climate Action and Responses to the Covid-19 Crisis*. <https://www.climate-transparency.org/>
- Cocca, T. (2016). Potential and limitations of virtual advice in wealth management. *Journal of Financial Transformation*, 44(1), 45–57.
- Codding, B. F., Brenner Coltrain, J., Louderback, L., Vernon, K. B., Magargal, K. E., Yaworsky, P. M., Robinson, E., Brewer, S. C., & Spangler, J. D. (2021). Socioecological dynamics structuring the spread of farming in the North American Basin-Plateau Region. *Environmental Archaeology*, 1–13. doi:10.1080/14614103.2021.1927480
- Cole, M. (2020). *Climate Change, The Fourth Industrial Revolution and Public Pedagogies: The Case for Ecosocialism*. Routledge. doi:10.4324/9781003051411
- Commissioner of Shenzhen Municipal Human Settlement and Environment. (2017). Shenzhen severely fined companies that violated environmental protection laws: Issued the first tens of millions of fines and revoked their pollution discharge permits. *China Environmental Supervision*, 11, 22.

- Compeau, D. R., & Meister, D. (2002). Infusion of innovation adoption: An individual perspective. *Proceedings of the ASAC*, 23-33.
- Coral, E. (2002). *Modelo de Planejamento Estratégico Para a Sustentabilidade Empresarial*. Florianópolis.
- Coronavirus, W. H. O. (COVID-19) Dashboard | WHO Coronavirus (COVID-19) Dashboard With Vaccination Data. (n.d.). Retrieved October 19, 2021, from <https://covid19.who.int/>
- Coronavirus: Oil price collapses to lowest level for 18 years - BBC News. (n.d.). Retrieved October 19, 2021, from <https://www.bbc.com/news/business-52089127>
- Corral-Verdugo, V., Mireles-Acosta, J., Tapia-Fonhiem, C., & Fraijo-Sing, B. (2011). Happiness as correlate of sustainable behavior: A study of pro-ecological, frugal, equitable and altruistic actions that promote subjective wellbeing. *Human Ecology Review*, 18(2), 95–104.
- Cosgrove, K., Vizcaino, M., & Wharton, C. (2021). COVID-19-Related Changes in Perceived Household Food Waste in the United States: A Cross-Sectional Descriptive Study. *International Journal of Environmental Research and Public Health*, 18(3), 1104. doi:10.3390/ijerph18031104 PMID:33513709
- Cowles, H. M. (2020). *The scientific method: An evolution of thinking from Darwin to Dewey*. Harvard University Press. doi:10.4159/9780674246843
- Crosbie, A. J. (1978). Brunei: The constraints on a small state. *Southeast Asian Affairs*, 67-79.
- Crosby, M., Nachiappan, Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). Blockchain Technology - Beyond Bitcoin. *Berkley Engineering*.
- Crutzen, P. J., & Stoermer, E. F. (2000). *The Anthropocene*. *IGBP Newsletter*, 41.
- Ćurčić, N., Mirković Svitlica, A., Brankov, J., Bjeljic, Ž., Pavlović, S., & Jandžiković, B. (2021). The Role of Rural Tourism in Strengthening the Sustainability of Rural Areas: The Case of Zlakusa Village. *Sustainability*, 13(12), 6747. doi:10.3390/s13126747
- da Silva, D. A., de Sousa Jr, R. T., de Oliveira Albuquerque, R., Orozco, A. L. S., & Villalba, L. J. G. (2021). IoT-based security service for the documentary chain of custody. *Sustainable Cities and Society*, 71, 102940. doi:10.1016/j.scs.2021.102940
- Dahman, Y. (2009). Nanostructured biomaterials and biocomposites from bacterial Cellulose nanofibers. *Journal of Nanoscience and Nanotechnology*, 9(9), 5105–5122. doi:10.1166/jnn.2009.1466 PMID:19928189
- Dapp, T., & Slomka, L., AG, D. B., & Hoffmann, R. (2014). Fintech–The digital (r) evolution in the financial sector. *Deutsche Bank Research*, 11, 1–39.
- Darley, W. K., & Lim, J.-S. (1999). Effects of store image and attitude toward secondhand stores on shopping frequency and distance traveled. *International Journal of Retail & Distribution Management*, 27(8), 311–318. doi:10.1108/09590559910288596
- Darma, W, & ... (2018). *Inovasi Diskruptif (Disruptive Innovation)*. Dalam Pendidikan.
- Dartnell, L. (2019). *Origins: How the Earth shaped human history* (1st ed.). Basic Books.
- Darwin, C. (1964). *On the origin of species: A facsimile of the* (1st ed.). Harvard University Press.

Compilation of References

- Das, G., Jain, S. P., Maheswaran, D., Slotegraaf, R. J., & Srinivasan, R. (2021). Pandemics and marketing: Insights, impacts, and research opportunities. *Journal of the Academy of Marketing Science*, 49(5), 1–20. doi:10.1007/11747-021-00786-y PMID:33994600
- Dastane, O. (2020). Impact of Digital Marketing on Online Purchase Intention: Mediation Effect of Customer Relationship Management. *Journal of Asian Business Strategy*, 10(1), 142–158. doi:10.18488/journal.1006.2020.101.142.158
- Dastane, O. (2020). Impact of Leadership Styles on Employee Performance: A Moderating Role of Gender. *Australian Journal of Business and Management Research*, 5(12), 27–52. doi:10.52283/NSWRCA.AJBMR.20200512A03
- Dastane, O., & Fazlin, I. (2017). Re-investigating key factors of customer satisfaction affecting customer retention for fast food industry. *International Journal of Management, Accounting and Economics*, 4(4), 379–400.
- Dastane, O., Goi, C. L., & Rabbane, F. (2020). A synthesis of constructs for modelling consumers' perception of value from mobile-commerce (M-VAL). *Journal of Retailing and Consumer Services*, 55, 102074. doi:10.1016/j.jretconser.2020.102074
- David-West, O., Iheanachor, N., & Umukoro, I. (2020). Sustainable business models for the creation of mobile financial services in Nigeria. *Journal of Innovation & Knowledge*, 5(2), 105–116. doi:10.1016/j.jik.2019.03.001
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Management Information Systems Quarterly*, 13(3), 319–340. doi:10.2307/249008
- Davis, F. D. (1993). User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies*, 38(3), 475–487. doi:10.1006/imms.1993.1022
- Dawar, S., & Chandra, M. (2010). *Masters of Rural Markets*. Academic Press.
- De Feo, G., & De Gisi, S. (2010). Public opinion and awareness towards MSW and separate collection programmes: A sociological procedure for selecting areas and citizens with a low level of knowledge. *Waste Management (New York, N.Y.)*, 30(6), 958–976. doi:10.1016/j.wasman.2010.02.019 PMID:20223647
- de Groot, J. I.-M., & Steg, L. (2008). Value orientations to explain beliefs related to environmental significant behavior: How to measure egoistic, altruistic, and biospheric value orientations. *Environment and Behavior*, 40(3), 330–354. doi:10.1177/0013916506297831
- De los Mozos, E. A., Badurdeen, F., & Dossou, P. E. (2020). Sustainable consumption by reducing food waste: A review of the current state and directions for future research. In *Procedia Manufacturing* (Vol. 51, pp. 1791–1798). Elsevier B.V.
- de Paula, G. T., Menezes, C., Pupo, M. T., & Rosa, C. A. (2020). Stingless bees and microbial interactions. *Current Opinion in Insect Science*. PMID:33271364
- de Sena Abrahão, R., Moriguchi, S. N., & Andrade, D. F. (2016). Intention of adoption of mobile payment: An analysis in the light of the Unified Theory of Acceptance and Use of Technology (UTAUT). *RAI Revista de Administração e Inovação*, 13(3), 221–230. doi:10.1016/j.ra.2016.06.003
- Del Giudice, M., Chierici, R., Mazzucchelli, A., & Fiano, F. (2020). Supply chain management in the era of circular economy: The moderating effect of big data. *International Journal of Logistics Management*.
- Delone, W. H., & McLean, E. R. (2003). The Delone and McLean Model of information systems success: A Ten-Year update. *Journal of Management Information Systems*, 19(4), 9–30. doi:10.1080/07421222.2003.11045748
- Demonja, D., & Ružić, P. (2011). *Rural tourism in Croatia with Croatian case studies of good practice and European experiences*. Meridians.

- Department of Agriculture, Water and the Environment. (2021). *Montreal Protocol on Substances that Deplete the Ozone Layer*. Retrieved 26 September 2021, from <https://www.environment.gov.au/protection/ozone/montreal-protocol>
- Department of Economic Planning and Statistics. (2019). *Report of the Labour Force Survey 2019*. http://www.deps.gov.bn/DEPD Documents Library/DOS/Labour force survey_KTK/2019 /KTK_2019.pdf
- Depoux, A., Martin, S., Karafillakis, E., Preet, R., Wilder-Smith, A., & Larson, H. (2020). *The pandemic of social media panic travels faster than the COVID-19 outbreak*. Oxford University Press.
- Despeisse, M., Kishita, Y., Nakano, M., & Barwood, M. (2015). Towards a circular economy for end-of-life vehicles: A comparative study UK – Japan. *Procedia CIRP*, 29, 668–673. doi:10.1016/j.procir.2015.02.122
- Dewan, S., & Kraemer, K. (2000). Information Technology and Productivity: Evidence from Country-Level Data. *Management Science*, 46(4), 548–562. doi:10.1287/mnsc.46.4.548.12057
- Dewi, A. K., Djajakirana, G., & Santosa, D. A. (2020). Potensi Limbah Tahu untuk Menghasilkan Listrik pada Tiga Model Sistem Microbial Fuel Cell (MFC). *Jurnal Ilmu Tanah Dan Lingkungan*, 22(1), 29–34. doi:10.29244/jitl.22.1.29-34
- Dhanwani, S. K. (2014). Recent Trends in Indian Banking Industry. *ABHINAV, National Monthly Refereed Journal of Research in Commerce & Management*, (3).
- Dhir, A., Talwar, S., Kaur, P., & Malibari, A. (2020). Food waste in hospitality and food services: A systematic literature review and framework development approach. *Journal of Cleaner Production*, 270, 122861.
- Diamond, C. W. (2021). *Animals, Oxygen, and the Mid-Proterozoic Earth System* (Doctoral dissertation). UC Riverside.
- Dianursanti, R., Rizkytata, B. T., Gumelar, M. T., & Abdullah, T. H. (2014). Industrial tofu wastewater as a cultivation medium of microalgae *Chlorella vulgaris*. *Energy Procedia*, 47, 56–61. doi:10.1016/j.egypro.2014.01.196
- Digital News Asia. (2019). *Get your business on cloud*. Available from: <https://www.digitalnewsasia.com/business/get-your-business-cloud>
- Dimsoka, T. (2008). *Sustainable Tourism Development as a Tool for Eliminating Poverty*. Facta University.
- Dinev, T., & Hu, Q. (2005). The centrality of awareness in the formation of user behavioral intention toward preventive technologies in the context of voluntary use. *SIGHCI 2005 Proceedings*, 10.
- Ding, J. Y. (2019). “Unicorn” CATL IPO case study (Master’s thesis). Anhui University of Finance and Economics. <https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD201902&filename=1019134973.nh>
- Dixon, R. (2012). The role of universities. *I Am a Linguist*, 6(1), 129-152.
- Djayanti, S. (2015). Kajian Penerapan Produksi Bersih di Industri Tahu di Desa Jimbaran, Bandungan, Jawa Tengah. *Jurnal Riset Teknologi Pencegahan Pencemaran Industri*, 6(2), 75–80. doi:10.21771/jrtppi.2015.v6.no2.p75-80
- Dogaru, L. (2020). The main goals of the fourth industrial revolution. renewable energy perspectives. *Procedia Manufacturing*, 46, 397–401. doi:10.1016/j.promfg.2020.03.058
- Dohale, V., Ambilkar, P., Gunasekaran, A., & Verma, P. (2021). Supply chain risk mitigation strategies during COVID-19: Exploratory cases of “make-to-order” handloom saree apparel industries. *International Journal of Physical Distribution & Logistics Management*.
- Doig, J. M. (2016). *Impact of online privacy concerns and brand reputation on consumer willingness to provide personal information* (Doctoral dissertation). Queensland University of Technology.

Compilation of References

- Dominici, G., & Palumbo, F. (2013). How to Build an E-Learning Product: Factors for Student/Customer Satisfaction. *Business Horizons*, 56(1), 87–96. doi:10.1016/j.bushor.2012.09.011
- Donald, S. S. (2009). Green management matters only if it yields more green: An economic/strategic perspective. *The Academy of Management Perspectives*, 23(3), 5–16. doi:10.5465/amp.2009.43479260
- Donni, R., Dastane, O., Haba, H. F., & Selvaraj, K. (2018). Consumer perception factors for fashion M-commerce and its impact on loyalty among working adults. *Business and Economic Review*, 8(2), 168–192. doi:10.5296/ber.v8i2.13044
- Donthu, N., & Gustafsson, A. (2020). Effects of COVID-19 on business and research. *Journal of Business Research*, 117(June), 284–289. doi:10.1016/j.jbusres.2020.06.008 PMID:32536736
- Dornhaus, A., & Chittka, L. (2005). Bumble bees (*Bombus terrestris*) store both food and information in honeypots. *Behavioral Ecology*, 16(3), 661–666. doi:10.1093/beheco/ari040
- DOSM. (2017). *Report of Household Income and Basic Amenities Survey 2016*. Department of Statistics Malaysia.
- Down, D. Down! Why Coronavirus Will Lockdown Indian Stock Market Indefinitely | Outlook India Magazine. (n.d.). Retrieved October 25, 2021, from <https://www.outlookindia.com/magazine/story/business-news-down-down-down-why-coronavirus-will-lockdown-indian-stock-market-indefinitely/302995>
- Doyumgaç, I., Tanhan, A., & Kiyamaz, M. S. (2021). Understanding the most important facilitators and barriers for on-line education during COVID-19 through online photovoice methodology. *International Journal of Higher Education*, 10(1), 166–190.
- Driediger, F., & Bhatiasevi, V. (2019). Online grocery shopping in Thailand: Consumer acceptance and usage behavior. *Journal of Retailing and Consumer Services*, 48(December), 224–237. doi:10.1016/j.jretconser.2019.02.005
- Driesen, D. (2006). Economic instruments for sustainable development. *Environmental Law for Sustainability*, 19, 277–308.
- Dube, K., Nhamo, G., & Chikodzi, D. (2021). COVID-19 pandemic and prospects for recovery of the global aviation industry. *Journal of Air Transport Management*, 92, 102022. <https://doi.org/10.1016/J.JAIRTRAMAN.2021.102022>
- Dubey, R., Gunasekaran, A., Childe, S. J., Papadopoulos, T., Luo, Z., Wamba, S. F., & Roubaud, D. (2019). Can big data and predictive analytics improve social and environmental sustainability? *Technological Forecasting and Social Change*, 144, 534–545. doi:10.1016/j.techfore.2017.06.020
- Duca, L. D., Rule, C., & Loebl, Z. (2012). Facilitating expansion of cross-border e-commerce-developing a global online dispute resolution system (Lessons derived from existing ODR systems-work of the United Nations Commission on International trade law). *Penn St. JL & Int'l Aff.*, 1, iv.
- Dulebenets, M. A. (2018). A diploid evolutionary algorithm for sustainable truck scheduling at a cross-docking facility. *Sustainability*, 10(5), 1333. doi:10.3390/s10051333
- Dumanska, I., Hrytsyna, L., Kharun, O., & Matviets, O. (2021). E-commerce and M-commerce as Global Trends of International Trade Caused by the Covid-19 Pandemic. *WSEAS Transactions on Environment and Development*, 17, 386–397. doi:10.37394/232015.2021.17.38
- Durodolu, O. (2016). *Technology Acceptance Model as a predictor of using information system to acquire information literacy skills*. Academic Press.
- Du, X., Jian, W., Zeng, Q., & Chang, Y. (2018). Do auditors applaud corporate environmental performance? Evidence from China. *Journal of Business Ethics*, 151(4), 1049–1080. doi:10.1007/10551-016-3223-6

- Dyllick, T., & Hockerts, K. (2002). Beyond the business case for corporate sustainability. *Business Strategy and the Environment*, 11(2), 130–141. doi:10.1002/bse.323
- Easterly, W., & Kraay, A. (2000). Small states, small problems? Income, growth, and volatility in small states. *World Development*, 28(11), 2013–2027. doi:10.1016/S0305-750X(00)00068-1
- Echtner, C. M., & Ritchie, J. R. (1993). The measurement of destination image: An empirical assesemnt. *Journal of Travel Research*, 31(4), 3–13. doi:10.1177/004728759303100402
- Edquist, C. (Ed.). (1997). *Systems of innovation: Technologies, Institutions and Organisations*. London: Printer.
- Edquist, C., & Hommen, L. (2008). *Small Economy Innovation Systems: Comparing Globalisation, Change, and Policy in Asia and Europe*. Edward Elgar. doi:10.4337/9781847209993
- Egawa, R., Sharma, S., Nadaoka, K., & MacKenzie, R. A. (2021). Burrow dynamics of crabs in subtropical estuarine mangrove forest. *Estuarine, Coastal and Shelf Science*, 252, 107244. doi:10.1016/j.ecss.2021.107244
- El-Ebiary, Y. A. B., ThaherAmayreh, K., Yusoff, M. H., Hatamleh, A., Karim, R., & Mohamed, R. R. (2021). Impacts of COVID-19 Pandemic in the Food and Beverage Industryand the Food Quality. *Annals of the Romanian Society for Cell Biology*, 7754–7760.
- Elheddad, M., Benjasak, C., Deljavan, R., Alharthi, M., & Almabrok, J. M. (2021). The effect of the Fourth Industrial Revolution on the environment: The relationship between electronic finance and pollution in OECD countries. *Technological Forecasting and Social Change*, 163, 120485. doi:10.1016/j.techfore.2020.120485
- Elkington, J. (2001). The triple bottom line for 21st century business. *The Earthscan Reader in Business and Sustainable Development*, 20-43.
- Elkington, J. (2004). Enter the triple bottom line. *The triple bottom line: Does it all add up*, 11(12), 1-16.
- Elkington, J. (1994). Towards the sustainable corporation: Win-win-win business strategies for sustainable development. *California Management Review*, 36(2), 90–100. doi:10.2307/41165746
- Elkington, J. (2013). Enter the triple bottom line. In *The triple bottom line* (pp. 23–38). Routledge.
- Ellerhoff, S. G. (2020). *Mole*. Reaktion Books.
- Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107–115. doi:10.1111/j.1365-2648.2007.04569.x PMID:18352969
- E-Marketer. (2020). *Retail Ecommerce Sales Worldwide, 2019-2024*. Retrieved online from <https://www.shopify.com/enterprise/global-ecommerce-statistics>
- Epstein, M. J., & Roy, M. J. (2001). Sustainability in action: Identifying and measuring the key performance drivers. *Long Range Planning*, 34(5), 585–604. doi:10.1016/S0024-6301(01)00084-X
- Epstein, M. J., & Roy, M. J. (2003). Making the business case for sustainability: Linking social and environmental actions to financial performance. *Journal of Corporate Citizenship*, 2003(9), 79–96. doi:10.9774/GLEAF.4700.2003.sp.00009
- Eroglu, S. A., Machleit, K. A., & Davis, L. M. (2003). Empirical testing of a model of online store atmospherics and shopper responses. *Psychology and Marketing*, 20(2), 139–150. doi:10.1002/mar.10064
- Eruera, A. (2008). *Rural Tourism and Development in the Eastern Hokianga Area*. Ministry of Tourism International Research.

Compilation of References

- Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From national systems and “Mode 2” to a triple helix of university-industry-government relations. *Research Policy*, 29(2), 109–123. doi:10.1016/S0048-7333(99)00055-4
- Etzkowitz, H., & Loet, L. (1995). The triple helix of university-industry-government relations: A laboratory for knowledge-based economic development. *EASST Review*, 14(1), 11–19.
- European Commission, Directorate-General for Energy, & Ethniko Metsovio Polytechnio (Greece). (2003). *European energy and transport: Trends to 2030*. European Communities.
- Evangelista, R., Guerrieri, P., & Meliciani, V. (2014). The Economic Impact of Digital Technologies in Europe. *Economics of Innovation and New Technology*, 23(8), 802–824. doi:10.1080/10438599.2014.918438
- Evans, D. (2011). Thrifty, green or frugal: Reflections on sustainable consumption in a changing economic climate. *Geoforum*, 42(5), 550–557. doi:10.1016/j.geoforum.2011.03.008
- Fagerberg, J., & Srholec, M. (2008). National innovation systems, capabilities and economic development. *Research Policy*, 37(9), 1417–1435. doi:10.1016/j.respol.2008.06.003
- Faisal, M., Gani, A., Mulana, F., & Daimon, H. (2016a). Treatment and utilization of industrial tofu waste in Indonesia. *Asian Journal of Chemistry*, 28(3), 501–507. Advance online publication. doi:10.14233/ajchem.2016.19372
- Faludi, J. (2020). How to Create Social Value Through Digital Social Innovation? Unlocking the Potential of the Social Value Creation of Digital Start-Ups. *Journal of Social Entrepreneurship*, 1–18. Advance online publication. doi:10.1080/19420676.2020.1823871
- Fan, V. Y., Jamison, D. T., & Summers, L. H. (2018). Pandemic risk: How large are the expected losses? *Bulletin of the World Health Organization*, 96(2), 129–134. doi:10.2471/BLT.17.199588 PMID:29403116
- Farhat, A., Normand, L., Chavez, E. R., & Touchburn, S. P. (1998). Nutrient digestibility in food waste ingredients for Pekin and Muscovy ducks. *Poultry Science*, 77(9), 1371–1376. doi:10.1093/ps/77.9.1371 PMID:9733125
- Fathima, Y. A., & Muthumani, S. (2015). User acceptance of banking technology with special reference to internet banking. *Journal of Theoretical and Applied Information Technology*, 73(1).
- Fawcett, S. E., Wallin, C., Allred, C., Fawcett, A. M., & Magnan, G. M. (2011). Information technology as an enabler of supply chain collaboration: A dynamic-capabilities perspective. *The Journal of Supply Chain Management*, 47(1), 38–59. doi:10.1111/j.1745-493X.2010.03213.x
- Fei, Y., Li, L., Chen, L., Zheng, Y., & Yu, B. (2018). *High-throughput sequencing and culture-based approaches to analyze microbial diversity associated with chemical changes in naturally fermented tofu whey, a traditional Chinese tofu-coagulant*. doi:10.1016/j.fm.2018.04.004
- Fernandes, N. (2020). Economic Effects of Coronavirus Outbreak (COVID-19) on the World Economy. *SSRN Electronic Journal*. doi:10.2139/SSRN.3557504
- FerreiraD. B. (2020). *Imunidade de grupo*. <https://www.hospitaldaluz.pt/pt/guia-de-saude/dicionario-de-saude/I/377/ imunidade-de-grupo>
- Fettweis, G., & Zimmermann, E. (2008). ICT Energy Consumption-Trends and Challenges. *Proceedings of the 11th international symposium on wireless personal multimedia communications*.
- Fierens, E., Brijs, K., & Delcour, J. A. (2016). Emulsifying and Foaming Properties of Okara Protein Hydrolysates. *Cereal Chemistry*, 93(1), 71–76. doi:10.1094/CCHEM-02-15-0031-R

- Fishbein, M., & Ajzen, I. (1977). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Academic Press.
- Fishbein, M. A. (1979). Theory of reasoned action: Some applications and implications. *Nebraska Symposium on Motivation*, 27, 65–116. PMID:7242751
- Fishbein, M., & Ajzen, I. (1975). *Belief Attitude, Intention and Behaviour: An Introduction to Theory and Research*. Addison-Wesley.
- Flick, U. (2018). *Doing Triangulation and Mixed Methods*. SAGE. doi:10.4135/9781529716634
- Folger, T. (2021). *This new technology could help cool people down—without electricity*. Environment. Retrieved 21 September 2021, from <https://www.nationalgeographic.com/environment/article/this-new-technology-could-help-cool-people-down-without-electricity>
- Fonseca, A. P., Seabra, C., & Silva, C. (2015). Dark tourism: Concepts, typologies and sites. *Journal of Tourism Research & Hospitality*.
- Foo, M. (2021). Green Purchasing: Capabilities, Practices and Effects on Firms' Triple Bottom Line Performance. *Estudios de Economía Aplicada*, 39(3), 6. doi:10.25115/eea.v39i3.4160
- Forcadell, F. J., Aracil, E., & Úbeda, F. (2019). The influence of innovation on corporate sustainability in the international banking industry. *Sustainability*, 11(11), 3210. doi:10.3390/u11113210
- Forcadell, F. J., Aracil, E., & Ubeda, F. (2020). Using reputation for corporate sustainability to tackle banks digitalization challenges. *Business Strategy and the Environment*, 29(6), 2181–2193. doi:10.1002/bse.2494
- Fornell, C., & Larcker, D. F. (1981b). *Structural equation models with unobservable variables and measurement error: Algebra and statistics*. Sage Publications.
- Fornell, C., Johnson, M. D., Anderson, E. W., Cha, J., & Bryant, B. E. (1996). The American customer satisfaction index: Nature, purpose, and findings. *Journal of Marketing*, 60(4), 7–18. doi:10.1177/002224299606000403
- Fornell, C., & Larcker, D. F. (1981a). *Structural equation models with unobservable variables and measurement error: Algebra and statistics*. Sage Publications Sage CA.
- Foroughi, B., Iranmanesh, M., & Hyun, S. S. (2019). Understanding the determinants of mobile banking continuance usage intention. *Journal of Enterprise Information Management*, 32(6), 1015–1033. doi:10.1108/JEIM-10-2018-0237
- Forsythe, S. M., & Shi, B. (2003). Consumer patronage and risk perceptions in Internet shopping. *Journal of Business Research*, 56(11), 867–875. doi:10.1016/S0148-2963(01)00273-9
- Fosso Wamba, S., Gunasekaran, A., Akter, S., Ren, S. J., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, 70, 356–365. doi:10.1016/j.jbusres.2016.08.009
- Freedman, M., & Jaggi, B. (1988, May). Impact of government regulations on pollution performance of pulp and paper firms. *Environmental Management*, 12(3), 391–396. doi:10.1007/BF01867528
- Freeman, R. E., Harrison, J. S., Wicks, A. C., Parmar, B. L., & De Colle, S. (2010). *Stakeholder theory: The state of the art*. Academic Press.
- Frikha, M., Serrano, M. P., Valencia, D. G., Rebollar, P. G., Fickler, J., & Mateos, G. G. (2012). Correlation between ileal digestibility of amino acids and chemical composition of soybean meals in broilers at 21 days of age. *Animal Feed Science and Technology*, 178(1–2), 103–114. doi:10.1016/j.anifeedsci.2012.09.002

Compilation of References

- Fu, R. R., Volk, M. W., Bilardello, D., Libourel, G., Lesur, G. R., & Ben Dor, O. (2021). The fine-scale magnetic history of the Allende meteorite: implications for the structure of the solar nebula. *AGU Advances*, 2(3), e2021AV000486.
- Further improve the “five pillars” of the green financial system. (2021, March 9). *Farmers daily*. http://www.farmer.com.cn/2021/03/09/wap_99866690.html
- G20 Research Group. (2016). *G20 Digital Economy Development and Cooperation Initiative*. G20 Research Group at the University of Toronto. Dipetik August 7, 2021, dari <http://www.g20.utoronto.ca/2016/160905-digital.html>
- Gabriel, J. M. O., Ogbuigwe, T. D., & Ahiauzu, L. U. (2016). Online shopping systems in Nigeria: Evolution, Trend and prospects. *Asian Research Journal of Arts & Social Sciences*, 1(4), 1-7. doi:10.9734/ARJASS/2016/29170
- Gannon, A. (1994). Rural tourism as a factor in rural community economic development for economies in transition. *Journal of Sustainable Tourism*, 2(1-2), 51–60. doi:10.1080/09669589409510683
- Gao, C. (2021). CATL released the first generation of sodium-ion batteries, the future can be expected. *Automobiles and Accessories*, 15, 55.
- Gao, D., Xu, Z., Ruan, Y. Z., & Lu, H. (2017). From a systematic literature review to integrated definition for sustainable supply chain innovation (SSCI). *Journal of Cleaner Production*, 142, 1518–1538. doi:10.1016/j.jclepro.2016.11.153
- Gao, L., & Bai, X. (2014). Online consumer behaviour and its relationship to website atmospheric induced flow: Insights into online travel agencies in China. *Journal of Retailing and Consumer Services*, 21(4), 653–665. doi:10.1016/j.jretconser.2014.01.001
- Garbowski, T., Pietryka, M., Pulikowski, K., & Richter, D. (2020). The use of a natural substrate for immobilization of microalgae cultivated in wastewater. *Scientific Reports*, 10(1), 1–9. doi:10.103841598-020-64656-3 PMID:32404871
- Gareth, L., Stephen, G., Hua, Z., & Juan, M. (2018). *Global tech spending forecast: Banking edition. Technical Report*. Celent.
- Garon, S. (2002). Saving for ‘My Own Good and the Good of the Nation’: Economic nationalism in modern Japan. In S. Wilson (Ed.), *Nation and Nationalism in Japan* (pp. 97–114). Routledge.
- Garson, G. D. (2012). *Testing statistical assumptions*. Statistical Associates Publishing.
- Gatersleben, B., Murtagh, N., Cherry, M., & Watkins, M. (2019). Moral, wasteful, frugal, or thrifty? Identifying consumer identities to understand and manage pro-environmental behavior. *Environment and Behavior*, 51(1), 24–49. doi:10.1177/0013916517733782
- Gates, W. H. (2000). *Remarks by Bill Gates at the Digital Dividends Conference*. Retrieved August 2021, from <https://www.gatesfoundation.org/ideas/speeches/2000/10/bill-gates-creating-digital>
- Gayahan, G., & Tschinkel, W. (2008). Fire Ants, Solenopsisinvicta, Dry and Store Insect Pieces for Later Use. *Journal of Insect Science*, 8(39), 1–8. doi:10.1673/031.008.3901
- Gellynck, X., & Verhelst, P. (2007). Assessing instruments for mixed household solid waste collection services in the Flemish region of Belgium. *Resources, Conservation and Recycling*, 49(4), 372–387. doi:10.1016/j.resconrec.2006.05.003
- Genovese, A., Acquaye, A. A., Figueroa, A., & Koh, S. L. (2017). Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications. *Omega*, 66, 344–357. doi:10.1016/j.omega.2015.05.015
- George, A. M. (2005). *India untouched*. Cranston, RI: The Writers’ Collective.

- George, R. P., Peterson, B. L., Yaros, O., Beam, D. L., Dibbell, J. M., & Moore, R. C. (2019). Blockchain for business. *Journal of Investment Compliance*, 20(1), 17–21. doi:10.1108/JOIC-01-2019-0001
- Ghalandari, K. (2012). The effect of performance expectancy, effort expectancy, social influence and facilitating conditions on acceptance of e-banking services in Iran: The moderating role of age and gender. *Middle East Journal of Scientific Research*, 12(6), 801–807.
- Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, 114, 11–32. doi:10.1016/j.jclepro.2015.09.007
- Giuffrida, M., Mangiaracina, R., Perego, A., & Tumino, A. (2017). Cross-border B2C e-commerce to Greater China and the role of logistics: A literature review. *International Journal of Physical Distribution & Logistics Management*, 47(9), 772–795. doi:10.1108/IJPDLM-08-2016-0241
- Given, L. M. (2008). *The SAGE encyclopedia of qualitative methods*. SAGE. doi:10.4135/9781412963909
- Glikson, A. (2013). Fire and human evolution: The deep-time blueprints of the Anthropocene. *Anthropocene*, 3, 89–92. doi:10.1016/j.ancene.2014.02.002
- Glikson, A. Y. (2021). Fire and Human Intelligence. In *The Event Horizon: Homo Prometheus and the Climate Catastrophe* (pp. 23–30). Springer. doi:10.1007/978-3-030-54734-9_4
- Glikson, A. Y. (2021). River Empires and Divine Rulers. In *The Fatal Species* (pp. 27–33). Springer. doi:10.1007/978-3-030-75468-6_5
- Global Carbon Atlas. (2019). <http://www.globalcarbonatlas.org/en/CO2-emissions>
- Goldsmith, R. E., Flynn, L. R., & Clark, R. A. (2014). The etiology of the frugal consumer. *Journal of Retailing and Consumer Services*, 21(2), 175–184. doi:10.1016/j.jretconser.2013.11.005
- Gonçalves, A. (2017). *Dark Tourism – O lado sombrio do Turismo: Aplicação à cidade do Porto* (Dissertation). Porto Accounting and Business School, Porto.
- Goodhue, D. L., Lewis, W., & Thompson, R. (2012). Does PLS have advantages for small sample size or non-normal data? *Management Information Systems Quarterly*, 36(3), 981–1001. doi:10.2307/41703490
- Google, Temasek, & Bain. (2020). *E-Conomy SEA 2020 – At Full Velocity: Resilient and Racing Ahead*. Author.
- Gössling, S. (2002). Global environmental consequences of tourism. *Global Environmental Change*, 12(4), 283–302. doi:10.1016/S0959-3780(02)00044-4
- Gössling, S., Scott, D., & Hall, M. (2020). Pandemics, tourism and global change: A rapid assessment of COVID-19. *Journal of Sustainable Tourism*, 29(1), 1–20. doi:10.1080/09669582.2020.1758708
- Government of the Republic of Indonesia (GoI). (2007). Law No. 17 Year 2007 on Long Term National Development Plan Year 2005-2025. Indonesia
- Government of the Republic of Indonesia (GoI). (2014). Law No. 3 of 2014 concerning on Industry. Indonesia.
- GPII. (2014). *Financial Inclusion Action Plan*. GPII.
- Grandhi, B., & Singh, J. A. (2016). What a Waste! A Study of Food Wastage Behavior in Singapore. *Journal of Food Products Marketing*, 22(4), 471–485. doi:10.1080/10454446.2014.885863
- Grandon, E., Alshare, O., & Kwan, O. (2005). Factors influencing student intention to adopt online classes: A cross-cultural study. *Journal of Computing Sciences in Colleges*, 20, 46–56.

Compilation of References

- Green Credit. (n.d.). In *Encyclopædia Baidu online*. <https://baike.baidu.com/item/%E7%BB%BF%E8%89%B2%E8%B4%B7%E6%AC%BE/5417936?fr=aladdin>
- Green Fund. (n.d.). In *Encyclopædia Baidu online*. <https://baike.baidu.com/item/%E7%BB%BF%E8%89%B2%E5%9F%BA%E9%87%91>
- Green Insurance. (n.d.). In *Encyclopædia Baidu online*. <https://baike.baidu.com/item/%E7%BB%BF%E8%89%B2%E8%B4%B7%E6%AC%BE>
- Green, A. S. (2020). Debt and inequality: Comparing the “means of specification” in the early cities of Mesopotamia and the Indus civilization. *Journal of Anthropological Archaeology*, 60, 101232. doi:10.1016/j.jaa.2020.101232
- Groschopf, W., Dobrovnik, M., & Herneth, C. (2021). Smart Contracts for Sustainable Supply Chain Management: Conceptual Frameworks for Supply Chain Maturity Evaluation and Smart Contract Sustainability Assessment. *Frontiers In Blockchain*, 4.
- Grossman, K., & Paulette, T. (2020). Wealth-on-the-hoof and the low-power state: Caprines as capital in early Mesopotamia. *Journal of Anthropological Archaeology*, 60, 101207. doi:10.1016/j.jaa.2020.101207
- Gruszczynski, L. (2020). The COVID-19 pandemic and international trade: Temporary turbulence or paradigm shift? *European Journal of Risk Regulation*, 11(2), 337–342. doi:10.1017/err.2020.29
- Guan, D., Wang, D., Hallegatte, S., Davis, S. J., Huo, J., Li, S., ... Coffman, D. M. (2020). Global supply-chain effects of COVID-19 control measures. *Nature Human Behaviour*, 4(6), 577–587. doi:10.103841562-020-0896-8 PMID:32493967
- Gu, D. Z. (2020). Dedication to Clean Power and Promotion of the Energy Revolution. *Engineering*, 6(12), 1331–1332. doi:10.1016/j.eng.2020.10.005
- Guellec, D., & Paunov, C. (2017). *Digital Innovation and the Distribution of Income*. Available at SSRN: <https://ssrn.com/abstract=3065799>
- Gunadi, D., Sanjaya, R., & Harnadi, B. (2019). Examining the Acceptance of Virtual Assistant - Vanika for University Students. *ICICOS 2019 - 3rd International Conference on Informatics and Computational Sciences: Accelerating Informatics and Computational Research for Smarter Society in The Era of Industry 4.0, Proceedings*, 1–4.
- Gunessee, S., & Subramanian, N. (2020). Ambiguity and its coping mechanisms in supply chains lessons from the Covid-19 pandemic and natural disasters. *International Journal of Operations & Production Management*, 40(7/8), 1201–1223. doi:10.1108/IJOPM-07-2019-0530
- Guo, J. J. (2021, June 10). *36Kr First Release | Combining a one-stop carbon neutral SaaS with green finance, “Carbonbase” completes a million-dollar angel round of financing*. <https://36kr.com/p/1254216551313160>
- Guo, X., Liu, Y., & Liu, Z. (2021). Study on Value Portfolio from the Perspective of COVID-19: A Case Study of Aviation, E-commerce and Retail Industry. *2021 International Conference on Financial Management and Economic Transition (FMET 2021)*, 255–259.
- Gupta, S., & Pokharel, S. (2019). *New Delhi is choking on smog and there’s no end in sight*. CNN. Retrieved 16 September 2021, from <https://edition.cnn.com/2019/11/04/india/delhi-india-smog-pollution-intl-hnk/index.html>
- Gupta, S., Chen, H., Hazen, B. T., Kaur, S., & Santibañez Gonzalez, E. D. R. (2019). Circular economy and big data analytics: A stakeholder perspective. *Technological Forecasting and Social Change*, 144, 466–474. doi:10.1016/j.techfore.2018.06.030

- Gurumurthy, K., Priya, A. J., & Don, K. R. (2021). Effect of Lockdown on Indian Economy. *Annals of the Romanian Society for Cell Biology*, 5880–5890.
- Guthrie, C., Fosso-Wamba, S., & Arnaud, J. B. (2021). Online consumer resilience during a pandemic: An exploratory study of e-commerce behavior before, during and after a COVID-19 lockdown. *Journal of Retailing and Consumer Services*, 61, 102570. doi:10.1016/j.jretconser.2021.102570
- Guu, Y., Chiu, C., & Young, J. (1997). Processing of Soybean Soaking Water with a NF - RO Membrane System and Lactic Acid Fermentation of Retained Solutes. *Figure*, 1(10), 4096–4100. doi:10.1021/jf970155z
- Guych, N., Anastasia, S., Simon, Y., & Jennet, A. (2018). Factors influencing the intention to use cryptocurrency payments: An examination of blockchain economy. *Munich Personal RePEc Archive*, 1-11.
- Hadinnata, S. (2019). *Anaerobic Digestion of Slaughterhouse Wastewater : CO 2 Capture of Biogas Using Chlorella vulgaris*. doi:10.22146/ijc.25129
- Hafeez, M., Yuan, C., Shah, W. U. H., Mahmood, M. T., Li, X., & Iqbal, K. (2020). Evaluating the relationship among agriculture, energy demand, finance, and environmental degradation in one belt and one road economies. *Carbon Management*, 11(2), 139–154. doi:10.1080/17583004.2020.1721974
- Hage, O., & Söderholm, P. (2008). An econometric analysis of regional differences in household waste collection: The case of plastic packaging waste in Sweden. *Waste Management*, 28(10), 1720-1731.
- Haini, H. (2021). Examining the Impact of ICT, Human Capital and Carbon Emissions: Evidence from the ASEAN Economies. *Inter Economics*, 166, 116–125. doi:10.1016/j.inteco.2021.03.003
- Hair, J.F., Anderson, R.E., Babin, B.J., & Black, W.C. (2010). *Multivariate data analysis: A global perspective* (Vol. 7). Academic Press.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Thiele, K. O. (2017). Mirror, mirror on the wall: A comparative evaluation of composite-based structural equation modeling methods. *Journal of the Academy of Marketing Science*, 45(5), 616–632. doi:10.1007/11747-017-0517-x
- Hair, J. F. Jr, Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: Updated guidelines on which method to use. *International Journal of Multivariate Data Analysis*, 1(2), 107–123. doi:10.1504/IJMDA.2017.10008574
- Hair, J. F. Jr, Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results and higher acceptance. *Long Range Planning*, 46(1-2), 1–12. doi:10.1016/j.lrp.2013.01.001
- Hair, J. F. Jr, Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM). *European Business Review*, 26(2), 106–121. doi:10.1108/EBR-10-2013-0128
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, 19(2), 139–152. doi:10.2753/MTP1069-6679190202
- Hajian, M., & Kashani, S. J. (2021). Evolution of the concept of sustainability. From Brundtland Report to sustainable development goals. In *Sustainable Resource Management* (pp. 1–24). Elsevier. doi:10.1016/B978-0-12-824342-8.00018-3
- Hakiki, G. (2020). *Consumption of Calorie and Protein of Indonesia and Province - Based on the September 2019 Susenas* (N. Sahrizal & I. Sahara, Eds.). Badan Pusat Statistik.
- Haleem, A., Javaid, M., & Vaishya, R. (2020). Effects of COVID-19 pandemic in daily life. *Current Medicine Research and Practice*, 10(2), 78. doi:10.1016/J.CMRP.2020.03.011

Compilation of References

- Halkin, S. L., & Bray, A. M. (2021). Are smart foraging squirrels shoppers? choices and may How ants meet current and future needs. *Exploring Animal Behavior in Laboratory and Field*, 192.
- Hall, D. R., Kirkpatrick, I., & Mitchell, M. (Eds.). (2005). Rural tourism and sustainable business (Vol. 26). Channel View Publications.
- Hanaysha, J. R. (2020). Marketing mix elements and corporate social responsibility: Do they really matter to store image? *Jindal Journal of Business Research*, 9(1), 56–71. doi:10.1177/2278682120908563
- Hand, C., Riley, F. D. O., Harris, P., Singh, J., & Rettie, R. (2009). Online grocery shopping: The influence of situational factors. *European Journal of Marketing*, 43(9), 1205–1219. doi:10.1108/03090560910976447
- Handfield, R. B., & Bechtel, C. (2002). The role of trust and relationship structure in improving supply chain responsiveness. *Industrial Marketing Management*, 31(4), 367–382. doi:10.1016/S0019-8501(01)00169-9
- Hang, X., Cao, W., Luo, J., Chen, X., Yin, J., Wang, Q., Luo, W., & Wan, Y. (2015). *Resource Recovery from Soybean Soaking Water by Ultrafiltration and Reverse Osmosis*. doi:10.1007/s11947-015-1531-y
- Haque, A., Islam, N., Samrat, N. H., Dey, S., & Ray, B. (2021). Smart Farming through Responsible Leadership in Bangladesh: Possibilities, Opportunities, and Beyond. *Sustainability*, 13(8), 4511. doi:10.3390/s13084511
- Harari, Y. (2015). *Sapiens: A Brief History of Humankind* (1st ed.). Penguin Random House.
- Harari, Y. (2018). *Homo Deus: A Brief History of Tomorrow*. Harper Perennial.
- Harrison, D. (1992). *Tourism and the less developed countries*. Belhaven.
- Hart, M., & Henriques, V. (2006). On the influence of facilitating conditions on DSS usage. *Preface of the Editors*, 135.
- Harvey, D. (2012). *Rebel Cities: From the Right to the City to the Urban Revolution*. Verso.
- Hasanat, M. W., Ashikul Hoque, F. A. S., & Mashrekha Anwar, P., Hamid, A. B. A., & Tat, H. H. (2020). The impact of coronavirus on business continuity planning. *Asian Journal of Multidisciplinary Studies*, 3(1), 85–90.
- Hayes, I. (2004). *Optimizing the e-supply chain: The final frontier*. Academic Press.
- Hazen, B. T., Skipper, J. B., Ezell, J. D., & Boone, C. A. (2016). Big data and predictive analytics for supply chain sustainability: A theory-driven research agenda. *Computers & Industrial Engineering*, 101, 592–598. doi:10.1016/j.cie.2016.06.030
- He, W., Zhang, Z., & Li, W. (2021). Information technology solutions, challenges, and suggestions for tackling the COVID-19 pandemic. *International Journal of Information Management*, 57, 102287. doi:10.1016/J.IJINFORMGT.2020.102287
- Heeks, R. (1998). *Small enterprise development and the 'dutch disease' in a small economy: The case of Brunei*. Institute for Development Policy and Management University of Manchester Manchester.
- He, L., Liu, R., Zhong, Z., Wang, D., & Xia, Y. (2019). Can green financial development promote renewable energy investment efficiency? A consideration of bank. *Renewable Energy*, 143, 974–984.
- He, L., Zhang, L., Zhong, Z., Wang, D., & Wang, F. (2019). Green credit, renewable energy investment and green economy development: Empirical analysis based on 150 listed companies of China. *Journal of Cleaner Production*, 208, 363–372. doi:10.1016/j.jclepro.2018.10.119
- Hemachandra, S., & Sharkasi, N. (2021). Digital Transformation Induced by the Covid-19 Pandemic. In F. J. Martínez-López & D. López López (Eds.), *Advances in Digital Marketing and eCommerce. DMEC 2021. Springer Proceedings in Business and Economics*. Springer. doi:10.1007/978-3-030-76520-0_6

- Henderson, J. C. (2000). War as a Tourist Attraction: the Case of Vietnam. *International Journal of Tourism Research*, 2(4), 269-280. doi:10.1002/1522-1970(200007/08)2:43.0.CO;2-A
- Herberz, T., Barlow, C. Y., & Finkbeiner, M. (2020). Sustainability assessment of a single-use plastics ban. *Sustainability*, 12(9), 3746. doi:10.3390/u12093746
- Hidayat, N., Anggarini, S., & Sunyoto, N. M. S. (2016). Evaluation of two-stage biological treatment with attached filter media on treatment of tofu-processing wastewater. *International Journal of Applied Environmental Sciences*, 11(4), 1067–1076. <http://www.ripublication.com>
- Hill, P. S., Tripathi, A. K., & Schauble, E. A. (2014). ScienceDirect Theoretical constraints on the effects of pH, salinity, and temperature on clumped isotope signatures of dissolved inorganic carbon species and precipitating carbonate minerals. *Geochimica et Cosmochimica Acta*, 125, 610–652. doi:10.1016/j.gca.2013.06.018
- Hiyanti, H., Nugroho, L., Sukmadilaga, C., & Fitrijanti, T. (2020). Peluang dan Tantangan Fintech (Financial Technology) Syariah di Indonesia. *Jurnal Ilmiah Ekonomi Islam*, 5(3), 326–333. doi:10.29040/jiei.v5i3.578
- Hobsbawm, E., & Wrigley, C. (1999). *Industry and empire*. New Press.
- Hoffmann, M. P., Koplinka-Loehr, C., & Eiseman, D. L. (2021). Our Changing Climate. In *Our Changing Menu* (pp. 14–24). Cornell University Press. doi:10.1515/9781501754647-005
- Hofmann, D., Butler, J., & Tans, P. (2009). A new look at atmospheric carbon dioxide. *Atmospheric Environment*, 43(12), 2084–2086. doi:10.1016/j.atmosenv.2008.12.028
- Hofstede, G., Hofstede, G. J., & Monkov, M. (2010). *Cultures and Organizations - Software of the Mind. Intercultural Cooperation and Its Importance for Survival*. McGraw Hill.
- Holmberg, T., & Ideland, M. (2021). The circular economy of food waste: Transforming waste to energy through ‘make-up’ work. *Journal of Material Culture*, 26(3), 344–361. Advance online publication. doi:10.1177/13591835211002555
- Holt, D., & Ghobadian, A. (2003). Greening the Supply Chain-Critical Factors Driving Operational Activity. *Innovating for Sustainability*, (October), 12–15.
- Hong, L. M., Nawi, N. B.-C., Hamsani, N. H., & Zulkiffli, W.-F. W. (2020). Online store image effect on perceived risks towards online purchasing behaviour. *International Journal of Business Information Systems*, 35(1), 27–44. doi:10.1504/IJBIS.2020.109530
- Hootsuite/We Are Social. (2021). *Digital 2021: Global Overview Report*. Hootsuite/We Are Social. Retrieved from <https://wearesocial.com/digital-2021>
- Hopewell, K. (2020). Power, Multilateralism, and Neoliberalism at the WTO. In *Breaking the WTO* (pp. 42–76). Stanford University Press. doi:10.1515/9781503600027-005
- Ho, S. S., & Ng, V. T. (1994). Customers' risk perceptions of electronic payment systems. *International Journal of Bank Marketing*, 12(8), 26–38. doi:10.1108/02652329410069029
- Hossain, K., Rahman, M., & Roy, S. (2019). Iot data compression and optimization techniques in cloud storage: Current prospects and future directions. *International Journal of Cloud Applications and Computing*, 9(2), 43–59. doi:10.4018/IJCAC.2019040103
- Hossain, T. (2015). *Digital literacy skills of university students of Bangladesh: A comparative study between a public and a private university*. University of Dhaka.

Compilation of References

- House, C. (2015). Penciling in details of the Hadean. *Proceedings of the National Academy of Sciences of the United States of America*, 112(47), 14410–14411. doi:10.1073/pnas.1519765112 PMID:26564166
- Hughes, H., & Allen, D. (2005). Cultural tourism in Central and Eastern Europe: The views of 'induced image formation agents'. *Tourism Management*, 26(2), 173–183. doi:10.1016/j.tourman.2003.08.021
- Hui, S. C. S., Dastane, O., Johari, Z., & Roslee, M. (2021). Enhancing Online Repurchase Intention via Application of Big Data Analytics in E-Commerce. In *Handbook of Research on Innovation and Development of E-Commerce and E-Business in ASEAN* (pp. 395–434). IGI Global.
- Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal*, 20(2), 195–204.
- Humphreys, P. K., Wong, Y. K., & Chan, F. T. S. (2003). Integrating environmental criteria into the supplier selection process. *Journal of Materials Processing Technology*, 138(1-3), 349–356. doi:10.1016/S0924-0136(03)00097-9
- Hung, Y. T., & Toney, A. M. (2020). Greenhouse Gases. In *Handbook of Environment and Waste Management* (pp. 531–554). Acid Rain and Greenhouse Gas Pollution Control. doi:10.1142/9789811207136_0014
- Hurun, A. M., & Setiyanto, A. (1999). Peluang dan Kendala Pengembangan Teknologi Madya Bagi Agroindustri. Pusat Penelitian dan Pengembangan Sosial Ekonomi Pertanian.
- Husin, M. M., Haron, R., & Aziz, S. (2019). The role of perceived benefits in formation of intention to use islamic crowdfunding platform among small and medium enterprises in Malaysia. *International Journal of Entrepreneurship*, 2(7), 39–47. doi:10.35631/ijemp.27005
- Hussain, M., & Malik, M. (2020). Organizational enablers for circular economy in the context of sustainable supply chain management. *Journal of Cleaner Production*, 256, 120375. doi:10.1016/j.jclepro.2020.120375
- Hu, Y., & Sundar, S. S. (2010). Effects of online health sources on credibility and behavioral intentions. *Communication Research*, 37(1), 105–132. doi:10.1177/0093650209351512
- Hvass, K. K. (2015). Business model innovation through second hand retailing: A fashion industry case. *Journal of Corporate Citizenship*, 57(57), 11–32. doi:10.9774/GLEAF.4700.2015.ma.00004
- Hye, A. K. M., Miraz, M. H., & Habib, M. M. (2020a). Factors Affecting Change Management through Technology Adoption in Public Organizations in Bangladesh. *Int. J. Sup. Chain. Mgt*, 9(4), 122–131.
- Hye, A. K. M., Miraz, M. H., & Habib, M. M. (2020b). Wave Retail Banking Effect on Customer Satisfaction in Retail Supply Chain in Bangladesh. *Int. J. Sup. Chain. Mgt*, 9(3), 232–238.
- Hyndman, H. M. (2020). *The Approaching Catastrophe in India* (London: Twentieth Century Press, 1897). In *Contemporary Thought on Nineteenth Century Socialism* (pp. 389-405). Routledge.
- Ialenti, V. (2020). *Deep time reckoning: How future thinking can help Earth now*. MIT Press. doi:10.7551/mitpress/12372.001.0001
- Ibrahim, F., Gulihana, N. A., & Susanto, H. (2022). An Explanatory Study of User Satisfaction: Evidence From Brunei Health Information and Management System (Bru-HIMS). In P. Ordóñez de Pablos (Ed.), *Handbook of Research on Developing Circular, Digital, and Green Economies in Asia* (pp. 346–369). IGI Global. doi:10.4018/978-1-7998-8678-5.ch017
- Igwe, I. O. (2021). WTO, A Multilateral Trade Institution or a Parallel Organisation: Reform Initiatives Addressing the WTO Agricultural Trade Distortions to Developing Countries. *Athens JL*, 7(1), 65–90. doi:10.30958/ajl.7-1-4

- Ikezoe, K., Kiriya, E., & Fujimura, S. (2020). Car-sharing intention analysis in Japan by comparing the utility of car ownership for car-owners and non-car owners. *Transport Policy*, 96, 1–14. doi:10.1016/j.tranpol.2020.05.018
- Iliev, D. (2020). Consumption, motivation and experience in dark tourism: A conceptual and critical analysis. *Tourism Geographies*, 1-22.
- IMD. (2017). *The 2017 IMD World Digital Competitiveness Ranking - Top performers*. IMD World Competitiveness Center. www.imd.org/wcc
- Indonesia FinTech Association (AFTECH). (n.d.). *Cash and E Wallet Transaction Proportion*. https://www.fintech.id/id
- Indonesia, S. (2016-2020). *Gini Coefficient in Indonesia*. https://www.bps.go.id/pressrelease.html?katsubjek=23&Brs%5Btgl_rilis_ind%5D=&Brs%5Btahun%5D=&yt0=Cari
- Indonesia.go.id. (2019). *Jasa Peer to Peer Lending Semakin Seksi*. Retrieved June 27, 2019, from https://www.indonesia.go.id/narasi/indonesia-dalam-angka/ekonomi/jasa-peer-to-peer-lending-semakin-seksi
- Indriyati & Diyono. (2012). Reaktor tipe fixed bed dan penerapannya pada industri tahu. *Jurnal Teknik Lingkungan*, 89–94.
- Ingale, S. T., Naik, V. G., & Talathi, J. M. (2007). Entrepreneur e-Agribusiness. *Sciences et Techniques (Paris)*, (February).
- Internet World Stats. (2021). *Internet Usage Statistics, The Internet Big Picture, World Internet Users and 2021 Population Stats*. Retrieved from https://www.internetworldstats.com/stats.htm
- Ioannides, D., & Gyimóthy, S. (2020). The COVID-19 crisis as an opportunity for escaping the unsustainable global tourism path. *Tourism Geographies*, 22(3), 6. doi:10.1080/14616688.2020.1763445
- Ishida, H. (2014). The effect of ICT development on economic growth and energy consumption in Japan. *Telematics and Informatics*, 32(1), 79–88. Advance online publication. doi:10.1016/j.tele.2014.04.003
- Islam, M., Turki, A., Murad, M., & Karim, A. (2017). Do sustainable procurement practices improve organizational performance? *Sustainability*, 9(12), 2281. doi:10.3390/s9122281
- Ivanov, D., & Dolgui, A. (2020). Viability of intertwined supply networks: Extending the supply chain resilience angles towards survivability. A position paper motivated by COVID-19 outbreak. *International Journal of Production Research*, 58(10), 2904–2915. doi:10.1080/00207543.2020.1750727
- Ivanov, D., & Dolgui, A. (2021). OR-methods for coping with the ripple effect in supply chains during COVID-19 pandemic: Managerial insights and research implications. *International Journal of Production Economics*, 232, 107921. doi:10.1016/j.ijpe.2020.107921 PMID:32952301
- Izogo, E. E., & Jayawardhena, C. (2018). Online shopping experience in an emerging e-retailing market: Towards a conceptual model. *Journal of Consumer Behaviour*, 17(4), 379–392. doi:10.1002/cb.1715
- Jabbour, C. J. C., Jabbour, A. B., L.de, S., Sarkis, J., & Filho, M. G. (2019a). Unlocking the circular economy through new business models based on large-scale data: An integrative framework and research agenda. *Technological Forecasting and Social Change*, 144, 546–552. doi:10.1016/j.techfore.2017.09.010
- Jabnoun, N., & Al-Tamimi, H. A. H. (2003). Measuring perceived service quality at UAE commercial banks. *International Journal of Quality & Reliability Management*, 20(4), 458–472. doi:10.1108/02656710310468614
- Jacoby, J. (2002). Stimulus-Organism-Response Reconsidered: An Evolutionary Step in Modeling (Consumer) Behavior. *Journal of Consumer Psychology*, 12(1), 51–57. doi:10.1207/S15327663JCP1201_05

Compilation of References

- Jagannathan, V., Balasubramanian, S., & Natarajan, T. (2018). An extension to the Delone and Mclean information systems success model and validation in the internet banking context. In *Encyclopedia of Information Science and Technology* (4th ed., pp. 49–60). IGI Global.
- Jäger, A. K., & Weber, A. (2020). Can you believe it? The effects of benefit type versus construal level on advertisement credibility and purchase intention for organic food. *Journal of Cleaner Production*, 257, 120543. Advance online publication. doi:10.1016/j.jclepro.2020.120543
- Jamil, N. A. (2012). *The Integration of Theory of Planned Behaviour (TPB) and Technology Acceptance Model (TAM) in Determining Online Purchasing Behaviour in Malaysia* [Unpublished doctoral dissertation]. Universiti Utara, Malaysia.
- Janaina, N., Silveira, C., & Paulo, S. (2021). *Determinants of Absorptive Capacity : a systematic literature review Determinants of Absorptive Capacity : A systematic literature review*. Academic Press.
- Javaid, M., & Khan, I. H. (2021). Internet of Things (IoT) enabled healthcare helps to take the challenges of COVID-19 Pandemic. *Journal of Oral Biology and Craniofacial Research*, 11(2), 209–214. doi:10.1016/j.jobcr.2021.01.015 PMID:33665069
- Jaya, J. D., Ariyani, L., & Hadijah, H. (2019). Designing clean production of tofu processing industry in {UD}. Sumber Urip Pelaihari. *Jurnal Agroindustri*, 8(2), 105–112. doi:10.31186/j.agroind.8.2.105-112
- Jaya, J. D., & Lestari, E. (2019). Designing Clean Production in UD. Usaha Berkah Pelaihari Using 5R Approach. *Jurnal Ilmiah Inovasi*, 19(2). Advance online publication. doi:10.25047/jii.v19i2.1139
- Jayawardhena, C., & Foley, P. (2000). Changes in the banking sector—the case of Internet banking in the UK. *Internet Research*, 10(1), 19–31. doi:10.1108/10662240010312048
- Jiang, C., Wu, Z., Li, R., & Liu, Q. (2011). Technology of protein separation from whey wastewater by two-stage foam separation. *Biochemical Engineering Journal*, 55(1), 43–48. doi:10.1016/j.bej.2011.03.005
- Jiang, L. L., Lin, C., & Lin, P. (2014). The determinants of pollution levels: Firm-level evidence from Chinese manufacturing. *Journal of Comparative Economics*, 42(1), 118–142. doi:10.1016/j.jce.2013.07.007
- Jiang, Y., Zhao, P.-F., Lin, S.-M., Tang, R.-J., Chen, Y.-J., & Luo, L. (2018). Partial substitution of soybean meal with fermented soybean residue in diets for juvenile largemouth bass. *Aquaculture Nutrition*, 24(4), 1213–1222. doi:10.1111/anu.12659
- Jiao, J. L., Zhang, X. L., & Tang, Y. S. (2020). What factors determine the survival of green innovative enterprises in China?—A method based on fsQCA. *Technology in Society*, 62, 101314. doi:10.1016/j.techsoc.2020.101314 PMID:32834233
- Jin, J., & Wang, Q. (2019). Evaluation of informative bands used in different PLS regressions for estimating leaf biochemical contents from hyperspectral reflectance. *Remote Sensing*, 11(2), 197. doi:10.3390/rs11020197
- Johnson, V. L., Kiser, A., Washington, R., & Torres, R. (2018). Limitations to the rapid adoption of M-payment services: Understanding the impact of privacy risk on M-Payment services. *Computers in Human Behavior*, 79, 111–122. doi:10.1016/j.chb.2017.10.035
- Jonas, R., & Farah, L. F. (1998). Production and application of microbial cellulose. *Polymer Degradation & Stability*, 59(1–3), 101–106. doi:10.1016/S0141-3910(97)00197-3
- Jones, E., Miraz, M., Hye, A., Mahbub, A., Wahab, K., & Habib, M. (2021). Blockchain Securities to Construct Inclusive, Digital Economy Globally. *International Supply Chain Technology Journal*, 7(1).

- Jones, R., Baker, T., Huet, K., Murphy, L., & Lewis, N. (2020). Treating ecological deficit with debt: The practical and political concerns with green bonds. *Geoforum. Journal of Physical, Human, and Regional Geosciences*, 114, 49–58. doi:10.1016/j.geoforum.2020.05.014 PMID:32536703
- Jorgenson, D. W. (2007). Information Technology and the G7 Economies. In U. Apte & U. Karmarkar (Eds.), *Managing in the Information Economy. Annals of Information Systems* (Vol. 1). Springer. doi:10.1007/978-0-387-36892-4_2
- Jorgenson, D. W., & Vu, K. (2007). Information technology and the world growth resurgence. *German Economic Review*, 8(2), 125–145. doi:10.1111/j.1468-0475.2007.00401.x
- Joseph, R., & Duvall, D. (2021). Fungi on Mars and Extraterrestrial Civilizations. Genetics, Evolution, Alien Megastructures and Ancient Stars. *Journal of Cosmology*, 103.
- Jovanović, M. (2010). Is Globalisation Taking us for a Ride? *Journal of Economic Integration*, 25(3), 501–549. doi:10.11130/jei.2010.25.3.501
- Jr, H., Celsi, M., Money, A., Samouel, P., & Page, M. (2015). *The essentials of business research methods* (3rd ed.). doi:10.4324/9781315716862
- Juma, C. (2016). *Innovation and its Enemies: Why people resist new technologies*. Oxford University Press. doi:10.1093/acprof:oso/9780190467036.001.0001
- Jung, D., Glaser, F., & Köpplin, W. (2019). Robo-advisory: opportunities and risks for the future of financial advisory. In *Advances in consulting research* (pp. 405–427). Springer. doi:10.1007/978-3-319-95999-3_20
- Jünger, M., & Mietzner, M. (2020). Banking goes digital: The adoption of FinTech services by German households. *Finance Research Letters*, 34, 101260. doi:10.1016/j.frl.2019.08.008
- Kabir, M. A., Saidin, S. Z., & Ahmi, A. (2015, August). Adoption of e-payment systems: a review of literature. In *Proceedings of the International Conference on E-commerce* (Vol. 2012, pp. 112-120). Academic Press.
- Kahigi, E., Ekenberg, L., Hansson, H., Tusubira, F., & Danielson, M. (2008). Exploring the e-Learning State of art. *The Electronic Journal of e-Learning*, 6.
- Kallbekken, S., & Sælen, H. (2013). “Nudging” hotel guests to reduce food waste as a win-win environmental measure. *Economics Letters*, 119(3), 325–327. doi:10.1016/j.econlet.2013.03.019
- Kang, S. (2021). Microbes’ Many Roles in Climate Change: Contribution, Consequence, Mitigation, and Model System. *Microbes: The Foundation Stone of the Biosphere*, 187-194.
- Kantar. (2020). *Global study of 25,000 consumers gives brands clearest direction on how to stay connected in a pandemic world*. Academic Press.
- Kao, F.-J., Su, N.-W., & Lee, M.-H. (2003). Effect of Calcium Sulfate Concentration in Soymilk on the Microstructure of Firm Tofu and the Protein Constitutions in Tofu Whey. *Journal of Agricultural and Food Chemistry*, 51(21), 6211–6216. doi:10.1021/jf0342021 PMID:14518946
- Kaplan, S., & Sawhney, M. (2000). E-Hubs: New B2B market. *Harvard Business Review*, 78(3), 102–103.
- Karo, R. K., & Luna, L. (2019). Pengawasan Teknologi Finansial Melalui Regulatory Sandbox Oleh Bank Indonesia Atau Otoritas Jasa Keuangan Berdasarkan Perspektif Keadilan Bermartabat. Transparansi. *Jurnal Ilmiah Ilmu Administrasi*, 2(2), 116–125. doi:10.31334/transparansi.v2i2.547
- Kaswan, M. S., & Rathi, R. (2020). Green Lean Six Sigma for sustainable development: Integration and framework. *Environmental Impact Assessment Review*, 83, 106396. doi:10.1016/j.eiar.2020.106396

Compilation of References

- Kattel, R., Kalvet, T., & Randma-Liiv, T. (2013). Small states and innovation. *Small States in Europe: Challenges and Opportunities*, 65-86.
- Kaur, J. (n.d.). Innovation in Indian Banking Sector. *Parichay: Maharaja Surajmal Institute Journal of Applied Research*, 1.
- Kaur, N., Kaur, M., Padhi, S. S., & Singh, K. K. (2021). Geospatial analysis of the distribution of urban green spaces: a study of four Indian cities. *Cities & Health*, 1–17.
- Kaushal, G. (1979). *Economic history of India, 1757-1966*. Kalyani Publishers.
- Kazancoglu, Y., Kazancoglu, I., & Sagnak, M. (2018). A new holistic conceptual framework for green supply chain management performance assessment based on the circular economy. *Journal of Cleaner Production*, 195, 1282–1299. doi:10.1016/j.jclepro.2018.06.015
- Keating, B. A., Herrero, M., Carberry, P. S., Gardner, J., & Cole, M. B. (2014). Food wedges: Framing the global food demand and supply challenge towards 2050. *Global Food Security*, 3(3–4), 125–132. doi:10.1016/j.gfs.2014.08.004
- Kenny, C. (2003). The Internet and economic growth in less-developed countries: A case of managing expectations? *Oxford Development Studies*, 31(1), 99–113. doi:10.1080/1360081032000047212
- Keršulienė, V., Zavadskas, E. K., & Turskis, Z. (2010). Selection Of Rational Dispute Resolution Method by Applying New Step-Wise Weight Assessment Ratio Analysis (Swara). *Journal of Business Economics and Management*, 11(2), 243–258. doi:10.3846/jbem.2010.12
- Khaddam, A., Irtaimeh, H., & Bader, B. (2020). The effect of supply chain management on competitive advantage: The mediating role of information technology. *Uncertain Supply Chain Management*, 547–562. doi:10.5267/j.uscm.2020.3.001
- Khalife, A., & Peeters, C. (2020). Food storage and morphological divergence between worker and soldier castes in a subterranean myrmicine ant, *Carebara perpusilla*. *Journal of Natural History*, 54(47-48), 3131–3148. doi:10.1080/00222933.2021.1890851
- Khan, H. U., & Uwemi, S. (2018). What are e-commerce possible challenges in developing countries : A case study of Nigeria. *Int. J. Business and Systems Research*, 12(4), 454–486. doi:10.1504/IJBSR.2018.095077
- Khan, I. S., Ahmad, M. O., & Majava, J. (2021). Industry 4.0 and sustainable development: A systematic mapping of triple bottom line, Circular Economy and Sustainable Business Models perspectives. *Journal of Cleaner Production*, 297, 126655. doi:10.1016/j.jclepro.2021.126655
- Khanna, A. (2020). Impact of migration of labour force due to global COVID-19 pandemic with reference to India. *Journal of Health Management*, 22(2), 181–191.
- Khanpae, M., Karami, E., Maleksaeidi, H., & Keshavarz, M. (2020). Farmers' attitude towards using treated wastewater for irrigation : The question of sustainability. *Journal of Cleaner Production*, 243, 118541. doi:10.1016/j.jclepro.2019.118541
- Khan, S. A., Ahmad, S., & Jamshed, M. (2021). IoT-enabled services in online food retailing. *Journal of Public Affairs*, 21(1), e2150. doi:10.1002/pa.2150
- Khan, S., & Tariq, M. U. (2021). Harnessing IoT advantages in the disruptive era: UAE retail industry. *Academy of Entrepreneurship Journal*, 27, 1–13.
- Kharlamova, G., Stavitsky, A., & Zarotiadis, G. (2018). The impact of technological changes on income inequality: The EU states case study. *Journal of International Studies*, 11(2), 76–94. doi:10.14254/2071-8330.2018/11-2/6
- Khatun, F., Palas, M. J. U., & Ray, P. K. (2017). Using the unified theory of acceptance and use of technology model to analyze cloud-based mHealth service for primary care. *Digital Medicine*, 3(2), 69. doi:10.4103/digm.digm_21_17

- Khidzir, N. Z., Ghani, W. S. D. W. A., & Guan, T. T. (2017, March). Cloud-Based Mobile-Retail Application for Textile Cyberpreneurs: Task-Technology Fit Perspective Analysis. In *Proceedings of the International Conference on High Performance Compilation, Computing and Communications* (pp. 65–70). 10.1145/3069593.3069609
- Khordagui, N., & Saleh, G. (2016). Absorptive capacity factors that mediate foreign direct investment spillovers: A sector-level analysis from emerging economies. *International Journal of Business and Globalisation*, 16(2), 188–201. doi:10.1504/IJBG.2016.074486
- Kieselbach, S. R., & Long, P. T. (1990). Tourism and the rural revitalization movement. *Parks & Recreation (Arlington)*, 25(3), 62–66.
- Kim, J. S. (2016). An extended technology acceptance model in behavioral intention toward hotel tablet apps with moderating effects of gender and age. *International Journal of Contemporary Hospitality Management*, 28(8), 1535–1553. Advance online publication. doi:10.1108/IJCHM-06-2015-0289
- Kimmerl, J. (2020). *Understanding Users' Perception on the Adoption of Stablecoins-The Libra Case*. Paper presented at the PACIS.
- Kim, T. W. (2010). Food storage and carrion feeding in the fiddler crab *Uca lactea*. *Aquatic Biology*, 10(1), 33–39. doi:10.3354/ab00264
- Kimura, M. (2020). Tracing the Course of Evolution. In *My Thoughts on Biological Evolution* (pp. 35–48). Springer. doi:10.1007/978-981-15-6165-8_3
- Kinnaman, T. C., Shinkuma, T., & Yamamoto, M. (2014). The socially optimal recycling rate: Evidence from Japan. *Journal of Environmental Economics and Management*, 68(1), 54–70. doi:10.1016/j.jeem.2014.01.004
- Kirch, P. V. (2021). The impact of the prehistoric Polynesians on the Hawaiian ecosystem. In *A Natural History of the Hawaiian Islands* (pp. 425–438). University of Hawaii Press.
- Klahr, H., & Schreiber, A. (2015). Linking the Origin of Asteroids to Planetary Formation in the Solar Nebula. *Proceedings of the International Astronomical Union. International Astronomical Union*, 10(S318), 1–8. doi:10.1017/S1743921315010406
- Klemm, D., Heublein, B., Fink, H. P., & Bohn, A. (2005). Cellulose: Fascinating biopolymer and sustainable raw material. *Angewandte Chemie International Edition*, 44(22), 3358–3393. doi:10.1002/anie.200460587 PMID:15861454
- Koçak, O., Koçak, Ö. E., & Younis, M. Z. (2021). The Psychological Consequences of COVID-19 Fear and the Moderator Effects of Individuals' Underlying Illness and Witnessing Infected Friends and Family. *International Journal of Environmental Research and Public Health* 2021, 18(4), 1836. doi:10.3390/IJERPH18041836
- Kock, N. (2016). Non-normality propagation among latent variables and indicators in PLS-SEM simulations. *Journal of Modern Applied Statistical Methods*, 15(1), 16. doi:10.22237/jmasm/1462076100
- Kolodinsky, J. M., Hogarth, J. M., & Hilgert, M. A. (2004). The adoption of electronic banking technologies by US consumers. *International Journal of Bank Marketing*, 22(4), 238–259. doi:10.1108/02652320410542536
- Kolodiziev, O., Krupka, M., Shulga, N., Kulchitsky, M., & Lozynska, O. (2021). *The level of digital transformation affecting the competitiveness of banks*. Academic Press.
- Koonin, L. M. (2020). Novel coronavirus disease (COVID-19) outbreak: Now is the time to refresh pandemic plans. *Journal of Business Continuity & Emergency Planning*, 13(4), 298–312. PMID:32438951

Compilation of References

- Korstanje, M. (2012). The darker side of travel: The theory and Practice of Dark Tourism. *International Journal of Contemporary Hospitality Management*, 24(1), 160–162. doi:10.1108/09596111211197854
- Kotler, P., & Pfoertsch, W. (2007). Being known or being one of many: The need for brand management for business-to-business (B2B) companies. *Journal of Business and Industrial Marketing*, 22(6), 357–362. doi:10.1108/08858620710780118
- Kozinets, R. V. (2010). *Netnography: Doing ethnographic research online*. SAGE.
- Kreutz, C., Carvalho, K. Q. De, Passig, F. H., Belini, A. D., Cordovil, C. S. D. C. M. S., & Gomes, S. D. (2018). *Impact of the hydraulic loading rate on the hydrodynamic characteristics of an anaerobic fixed bed reactor treating cattle slaughterhouse wastewater*. The hydrodynamic behavior of an anaerobic fixed bed reactor (AFBR) was evaluated in the treatment of cat. 4430.
- Krisjanous, J. (2016). An exploratory multimodal discourse analysis of dark tourism websites: Communicating issues around contested sites. *Journal of Destination Marketing & Management*, 5(4), 341–350. doi:10.1016/j.jdmm.2016.07.005
- Kristiansen, I., Halvorsen, P., & Hansen, D. (2007). Influenza pandemic: Perception of risk and individual precautions in a general population. Cross sectional study. *BMC Public Health*, 7(48), 1–7. doi:10.1186/1471-2458-7-48 PMID:17407563
- Ksepka, D. T. (2018). Mystery of the Lost Reptiles: A diverse group of Mesozoic aquatic reptiles survived the Cretaceous extinction but then dwindled during the Age of Mammals. *American Scientist*, 106(4), 222. <https://link.gale.com/apps/doc/A546025755/AONE?u=anon~8b108479&sid=googleScholar&xid=032bd71c>
- Kucukusta, D., Law, R., Besbes, A., & Legohérel, P. (2015). Re-examining perceived usefulness and ease of use in online booking. *International Journal of Contemporary Hospitality Management*, 27(2), 185–198. doi:10.1108/IJCHM-09-2013-0413
- Kumar, S. (2019). *Dharavi slum beats Taj Mahal as India's top tourist destination*. Academic Press.
- Kumar, A. (2020). Anthropocene: The recent age of man. *Earth Science India*, 13(4).
- Kumar, V., Rani, A., & Husain, L. (2016). Investigations of {Amino} {Acids} {Profile}, {Fatty} {Acids} {Composition}, {Isoflavones} {Content} and {Antioxidative} {Properties} in {Soy} {Okara}. *Asian Journal of Chemistry*, 28(4), 903–906. doi:10.14233/ajchem.2016.19548
- Kuo, Y. L., & Perrings, C. (2010). Wasting time? Recycling incentives in urban Taiwan and Japan. *Environmental and Resource Economics*, 47(3), 423–437. doi:10.1007/10640-010-9386-1
- Kurniawati, S. D., Supartono, W., & Suyantohadi, A. (2019). Life cycle assessment on a small scale tofu industry in Baturetno village – Bantu District - Yogyakarta. *IOP Conference Series. Earth and Environmental Science*, 365(1), 12066. doi:10.1088/1755-1315/365/1/012066
- Kwok, S. (2021). Evolution of the Earth Through the Ages. In *Our Place in the Universe-II* (pp. 223–234). Springer. doi:10.1007/978-3-030-80260-8_21
- Laato, S., Islam, A. K. M. N., Farooq, A., & Dhir, A. (2020). Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach. *Journal of Retailing and Consumer Services*, 57, 102224. Advance online publication. doi:10.1016/j.jretconser.2020.102224
- Labonté, R., Mohindra, K., & Schrecker, T. (2011). The growing impact of globalization for health and public health practice. *Annual Review of Public Health*, 32(1), 83–263. doi:10.1146/annurev-publhealth-031210-101225 PMID:21219153
- Lacy, P., Long, J., & Spindler, W. (2020). E-Commerce Meets the Circular Economy. In *The Circular Economy Handbook* (pp. 197–201). Palgrave Macmillan. doi:10.1057/978-1-349-95968-6_15

- Ladner, J. T., Wiley, M. R., Mate, S., Dudas, G., Prieto, K., & Lovett, S. ... Palacios, G. (2015). Evolution and Spread of Ebola Virus in Liberia, 2014–2015. *Cell Host & Microbe*, 18(6), 659–669. doi:10.1016/J.CHOM.2015.11.008
- Lai, P. C. (2017). The literature review of technology adoption models and theories for the novelty technology. *JISTEM- Journal of Information Systems and Technology Management*, 14(1), 21–38. doi:10.4301/S1807-17752017000100002
- Lalon, R. M. (2020). COVID-19 vs Bangladesh: Is it Possible to Recover the Impending Economic Distress Amid this Pandemic? *Journal of Economics and Business*, 3(2). Advance online publication. doi:10.31014/aior.1992.03.02.240
- Lammens, T. M., Gangarapu, S., Franssen, M. C. R., Scott, E. L., & Sanders, J. P. M. (2012). *Techno-economic assessment of the production of bio-based chemicals from glutamic acid*. doi:10.1002/bbb
- Lampropoulos, G., Siakas, K., & Anastasiadis, T. (2019). Internet of Things in the Context of Industry 4.0: An Overview. *International Journal of Entrepreneurial Knowledge*, 7(1). Doi:10.2478/ijek-2019-0001
- Lapointe, L., & Rivard, S. (2005). A Multilevel Model of Resistance to Information Technology Implementation. *Management Information Systems Quarterly*, 29(3), 461–491. doi:10.2307/25148692
- LD FEB UI. (2018). Hasil Riset LD FEB UI Tahun 2018. In *Triliun ke Perekonomian Indonesia*. Jakarta: Universitas Indonesia.
- Lee, J. & Lee, K. (2021). Catching-up national innovations systems (NIS) in China and post-catching-up NIS in Korea and Taiwan: Verifying the detour hypothesis and policy implications. *Innovation and Development*, 1-25.
- Lee, J., Burnett, G., Vandegrift, M., Baeg, J. H., & Morris, R. (2015). Availability and accessibility in an open access institutional repository: A case study. *Information Research*, 20(1), paper 661. Retrieved from <http://InformationR.net/ir/20-1/paper661.html>
- Lee, J.-W., & Wie, D. (2013). *Technological Change, Skill Demand, and Wage Inequality in Indonesia*. Asian Development Bank Economics Working Paper Series No. 340. Available at SSRN: <https://ssrn.com/abstract=2245380>
- Lee, K., & Lee, J. (2021). *Alternative pathways to growth beyond the middle-income stage and national innovation systems (NIS): Balanced, Imbalanced, Catching-up, and Trapped NIS*. Academic Press.
- Lee, J. W., & Brahmastre, T. (2014). ICT, CO2 Emissions and economic growth: Evidence from a panel of ASEAN. *Global Economic Review*, 43(2), 93–109. doi:10.1080/1226508X.2014.917803
- Lee, K. C., & Chung, N. (2009). Understanding factors affecting trust in and satisfaction with mobile banking in Korea: A modified DeLone and McLean’s model perspective. *Interacting with Computers*, 21(5-6), 385–392. doi:10.1016/j.intcom.2009.06.004
- Lee, S. H. (2016). When are frugal consumers not frugal? The influence of personal networks. *Journal of Retailing and Consumer Services*, 30, 1–7. doi:10.1016/j.jretconser.2015.12.005
- Lee, S. Y. T., Gholami, R., & Tong, T. Y. (2005). Time series analysis in the assessment of ICT impact at the aggregate level – Lessons and implications for the new economy. *Information & Management*, 42(7), 1009–1022. doi:10.1016/j.im.2004.11.005
- Lee, T. (2002). Feeding and hoarding behaviour of the Eurasian red squirrel *Sciurus vulgaris* during autumn in Hokkaido, Japan. *Acta Theriologica*, 47(4), 459–470. doi:10.1007/BF03192470
- Legrís, P., Ingham, J., & Collette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, 40(3), 191–204. doi:10.1016/S0378-7206(01)00143-4

Compilation of References

- Lehmberg, D., Dhanaraj, C., & Funai, A. (2013). What do we make of Japan? Myths and realities. *Business Horizons*, 56(2), 219–229. doi:10.1016/j.bushor.2012.11.006
- Leong, K., & Sung, A. (2018). FinTech (Financial Technology): What is it and how to use technologies to create business value in fintech way? *International Journal of Innovation, Management and Technology*, 9(2), 74–78. doi:10.18178/ijimt.2018.9.2.791
- Leroux, M., Wortman, M., & Mathias, E. (2001). The dominant factor influencing the development of business-to-business (B2B) e-commerce in agriculture. *The International Food and Agribusiness Management Review*, 4, 206–211.
- Leydesdorff, L. (2012). The triple helix, quadruple helix, and an N-tuple of helices: Explanatory models for analysing the knowledge-based economy? *Journal of the Knowledge Economy*, 3(1), 25–35. doi:10.1007/13132-011-0049-4
- Li, J. L., Chen, X. T., Chen, X., Jin, M. X., Ma, Z. Y., Zhao, Z., J., Yang, F., & Sun, R. H. (2021). Method for Assessing Ecosystem Service Values of Clean Electricity Generation. *Journal of Global Energy Interconnection*.
- Liberato, D., Liberato, P., Alén, E., & Lopes, M. C. (2018). *Dark Tourism: proposta de roteirização*. Academic Press.
- Libutti, A., Gatta, G., Gagliardi, A., Vergine, P., Pollice, A., Beneduce, L., Disciglio, G., & Tarantino, E. (2018). Agro-industrial wastewater reuse for irrigation of a vegetable crop succession under Mediterranean conditions. *Agricultural Water Management*, 196, 1–14. doi:10.1016/j.agwat.2017.10.015
- Li, C. Z., Chen, Z., Xue, F., Kong, X. T., Xiao, B., Lai, X., & Zhao, Y. (2021). A blockchain-and IoT-based smart product-service system for the sustainability of prefabricated housing construction. *Journal of Cleaner Production*, 286, 125391. doi:10.1016/j.jclepro.2020.125391
- Light, D. (2017). Progress in dark tourism and thanatourism research: An uneasy relationship with heritage tourism. *Tourism Management*, 61, 275–301. doi:10.1016/j.tourman.2017.01.011
- Lin, C. H., Morais, D. B., Kerstetter, D. L., & Hou, J. S. (2007). Examining the role of cognitive and affective image in predicting choice across natural, developed, and theme-park destinations. *Journal of Travel Research*, 46(2), 183–194. doi:10.1177/0047287507304049
- Lin, D., Liu, Z., Shen, R., Chen, S., & Yang, X. (2020). Bacterial cellulose in food industry: Current research and future prospects. *International Journal of Biological Macromolecules*, 158, 1007–1019. doi:10.1016/j.ijbiomac.2020.04.230 PMID:32387361
- Lin, J., Shen, Z., Zhang, A., & Chai, Y. (2018). Blockchain and IoT based food traceability for smart agriculture. *Proceedings of the 3rd International Conference on Crowd Science and Engineering*. 10.1145/3265689.3265692
- Lin, X., Wu, R., Lim, Y. T., Han, J., & Chen, S. C. (2019). Understanding the sustainable usage intention of mobile payment technology in Korea: Cross-countries comparison of Chinese and Korean users. *Sustainability*, 11(19), 5532. doi:10.3390/s11195532
- Liu, A., Kim, Y. R., & O'Connell, J. F. (2021). COVID-19 and the aviation industry: The interrelationship between the spread of the COVID-19 pandemic and the frequency of flights on the EU market. *Annals of Tourism Research*, 91, 103298. <https://doi.org/10.1016/J.ANNALS.2021.103298>
- Liu, C., Hotta, Y., Santo, A., Hengesbaugh, M., Watabe, A., Totoki, Y., Allen, D., & Bengtsson, M. (2016). Food waste in Japan: Trends, current practices and key challenges. *Journal of Cleaner Production*, 133, 557–564. doi:10.1016/j.jclepro.2016.06.026
- Liu, G., Eng, T.-Y., & Takeda, S. (2015). An investigation of marketing capabilities and social enterprise performance in the UK and Japan. *Entrepreneurship Theory and Practice*, 39(2), 267–298. doi:10.1111/etap.12041

- Liu, J. G., & Shen, Z. Q. (2011). Low Carbon Finance: Present Situation and Future Development in China. *Energy Procedia*, 214-218, 4–5.
- Liu, W., Wu, Z., Wang, Y., Li, R., & Huang, D. (2015). Isolation of soy whey proteins from isoflavones in the concentrated solution using foam fractionation. *Separation and Purification Technology*, 149, 31–37. doi:10.1016/j.seppur.2015.05.010
- Liu, X. H., Wang, E. X., & Cai, D. T. (2019). Green credit policy, property rights and debt financing: Quasi-natural experimental evidence from China. *Finance Research Letters*, 29, 129–135. doi:10.1016/j.frl.2019.03.014
- Liu, Y., & Wang, H. (2009). A comparative study on e-learning technologies and products: From the East to the West. *Systems Research and Behavioral Science*, 26(2), 191–209. doi:10.1002/res.959
- Li, W., Xiao, J. X., & Huang, J. (2021, July). Advertising and Lifestyle: A Brief History of Contemporary Chinese Advertising and Lifestyle Transition. In *International Conference on Applied Human Factors and Ergonomics* (pp. 506-513). Springer. 10.1007/978-3-030-80094-9_60
- Li, Y. R., Wang, Z. W., Yu, Z. R., & Corlett, R. T. (2021). Species diversity, morphometrics, and nesting biology of Chinese stingless bees (Hymenoptera, Apidae, Meliponini). *Apidologie*, 1–17. doi:10.1007/13592-021-00899-x
- Lockdown proved inflection point for e-commerce in India - The Economic Times. (n.d.). Retrieved October 25, 2021, from <https://economictimes.indiatimes.com/industry/services/retail/lockdown-proved-inflection-point-for-e-commerce-in-india/articleshow/81665377.cms?from=mdr>
- Long, H., & Zhao, J. (2021). The Impact of SARS Epidemic and Financial Crisis on China's Economy Structure Referenced to the Potential Impact of COVID-19. *SSRN 3810413*.
- Longe, E. O., & Ukpebor, E. F. (2009). Survey of household waste generation and composition in Ojo local government area, Lagos state, Nigeria. *Int. J. of Geotech. & Env*, 1(1), 41–54.
- López, J. J. (2006). Dynamic growth in the Rio Grande valley. *Southwest Economy*, 2, 11–14.
- Love, N., & Fry, N. (2006). Accounting Students' Perceptions of a Virtual Learning Environment: Springboard or Safety Net? *Accounting Education*, 15(2), 151–166. doi:10.1080/06939280600609201
- LPEM FEB UI. (2019). *Dampak Tokopedia terhadap Perekonomian Indonesia*. Universitas Indonesia.
- Lubis, D. M., Hamidah, U., Dwiartama, A., & Sintawardani, N. (2021). *Water footprint of tofu production: a case study in Giriharja, West Java, Indonesia*. Unpublished manuscript.
- Lubis, M., & Maulana, F. A. (2010). Information and electronic transaction law effectiveness (UU-ITE) in Indonesia. *Proceeding of the 3rd International Conference on Information and Communication Technology for the Moslem World (ICT4M) 2010*.
- Lubowiecki-Vikuk, A., Djercan, B., & Sousa, B. (2021). Sustainable development and leisure services: Changes and trends. In *A Handbook of Sustainable Development and Leisure Services, World Sustainability Series*. Academic Press.
- Lule, I., Omwansa, T. K., & Waema, T. M. (2012). Application of technology acceptance model (TAM) in m-banking adoption in Kenya. *International Journal of Computing & ICT Research*, 6(1).
- Lundvall, B. Å., Joseph, K. J., & Chaminade, C. (2009). *Handbook of Innovation Systems and Developing Countries: Building Domestic Capabilities in a Global Setting*. Academic Press.

Compilation of References

- Lundvall, B. Å., Joseph, K. J., & Chaminade, C. (2009). Handbook of innovation systems and developing countries: Building domestic capabilities in a global setting. In *Handbook of Innovation Systems and Developing Countries: Building Domestic Capabilities in a Global Setting*. https://play.google.com/books/reader?id=AaRyLGPjke0C&pg=GBS.PA4.w.1.2.0_190
- Lundvall, B.-Å. (Ed.). (1992). *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. London. Pinter Publisher.
- Luthfihadi, M., & Dhewanto, W. (2013). Technology Acceptance of E-commerce in Indonesia. *International Journal of Engineering Innovation and Management*, 3(1), 9–18.
- Lwoga, E. T., & Lwoga, N. B. (2017). User Acceptance of Mobile Payment: The Effects of User-Centric Security, System Characteristics and Gender. *The Electronic Journal on Information Systems in Developing Countries*, 81(1), 1–24. doi:10.1002/j.1681-4835.2017.tb00595.x
- Ma, C.-Y., Liu, W.-S., Kwok, K. C., & Kwok, F. (1996). Isolation and characterization of proteins from soymilk residue (okara). *Food Research International*, 29(8), 799–805. doi:10.1016/0963-9969(95)00061-5
- Macchiavello, E., & Siri, M. (2020). *Sustainable Finance and Fintech: Can Technology Contribute to Achieving Environmental Goals? A Preliminary Assessment of 'Green FinTech'*. Academic Press.
- Machado, A., Nogueira, S., & Sousa, B. (2020). Semiótica e e-branding em comunicação de turismo: Estudo das capas de revistas digitais no período pandémico Covid-19. *Revista Ibérica de Sistemas e Tecnologias de Informação*, E34, 293–308.
- Machado, M. A.-D., de Almeida, S. O., Bollick, L. C., & Bragagnolo, G. (2019). Second-hand fashion market: Consumer role in circular economy. *Journal of Fashion Marketing and Management*, 23(3), 382–395. doi:10.1108/JFMM-07-2018-0099
- Magee, A. F., & Höhna, S. (2021). Impact of K-Pg Mass Extinction Event on Crocodylomorpha Inferred from Phylogeny of Extinct and Extant Taxa. bioRxiv. doi:10.1101/2021.01.14.426715
- Mahadi, H. M., Ferdoush, S., & Rahman, M. (2016). *Supply Chain Management in Service Quality*. Paper presented at the International Conference on Industrial Engineering and Operations Management.
- Mahmud, M. S., Talukder, M. U., & Rahman, S. M. (2021). Does 'Fear of COVID-19' trigger future career anxiety? An empirical investigation considering depression from COVID-19 as a mediator. *The International Journal of Social Psychiatry*, 67(1), 35. <https://doi.org/10.1177/0020764020935488>
- Mahon, P. Y. (2013). Internet research and ethics: Transformative issues in nursing education research. *Journal of Professional Nursing*, 30(2), 124–129. doi:10.1016/j.profnurs.2013.06.007 PMID:24720940
- Mair, S. (2020). How will coronavirus change the world? *BBC Future*, 31.
- Mallat, N. (2007). Exploring consumer adoption of mobile payments—A qualitative study. *The Journal of Strategic Information Systems*, 16(4), 413–432. doi:10.1016/j.jsis.2007.08.001
- Malmodin, J., & Lundén, D. (2018). The Energy and Carbon Footprint of the Global ICT and E&M Sectors 2010–2015. *Sustainability*, 10(9), 3027. doi:10.3390/su10093027
- Malmodin, J., Moberg, A., Lunden, D., Finnveden, G., & Lovehagen, N. (2010). Greenhouse Gas Emissions and Operational Electricity Use in the ICT and Entertainment & Media Sectors. *Special Issue: Environmental Applications of Information & Communication Technology*, 14(5), 770–790. doi:10.1111/j.1530-9290.2010.00278.x

- Manguvo, A., & Mafuvadze, B. (2015). The impact of traditional and religious practices on the spread of Ebola in West Africa: Time for a strategic shift. *The Pan African Medical Journal*, 22(Suppl 1), 9. <https://doi.org/10.11694/PAMJ.SUPP.2015.22.1.6190>
- Manpower Industry Steering Committee for Info Communications. (2020). *Presentation Manpower Survey Results Sides Pack*. AITI.
- Manser Payne, E., Peltier, J. W., & Barger, V. A. (2018). Mobile banking and AI-enabled mobile banking: The differential effects of technological and non-technological factors on digital natives' perceptions and behaviour. *Journal of Research in Interactive Marketing*, 12(3), 328–346. doi:10.1108/JRIM-07-2018-0087
- Mao, C., Feng, Y., Wang, X., & Ren, G. (2015). Review on research achievements of biogas from anaerobic digestion. *Renewable & Sustainable Energy Reviews*, 45, 540–555. doi:10.1016/j.rser.2015.02.032
- Marchese, D., Reynolds, E., Bates, M. E., Morgan, H., Clark, S. S., & Linkov, I. (2018). Resilience and sustainability: Similarities and differences in environmental management applications. *The Science of the Total Environment*, 613, 1275–1283. doi:10.1016/j.scitotenv.2017.09.086 PMID:28962075
- Marchiori, B. E., Carraher, C. E., & Stiles, K. (2014). Understanding and overcoming business etiquette differences in Japan, Turkey, and the United States of America. *Journal of Technology Management in China*, 9(3), 274–288. doi:10.1108/JTMC-08-2014-0045
- Marlowe, F. (2005). Hunter-gatherers and human evolution. *Evolutionary Anthropology*, 14(2), 54–67. doi:10.1002/evan.20046
- Martinsen, D. L. (1969). Energetics and activity patterns of short tailed shrews (*Blarina*) on restricted diets. *Ecology*, 50(3), 505–510. doi:10.2307/1933910
- Maruping, L. M., Bala, H., Venkatesh, V., & Brown, S. A. (2017). Going beyond intention: Integrating behavioral expectation into the unified theory of acceptance and use of technology. *Journal of the Association for Information Science and Technology*, 68(3), 623–637. doi:10.1002/asi.23699
- Masoero, G. (2020). *Food hoarding of an avian predator under food limitation and climate change* (Doctoral dissertation). Universidad de Turku, Turku, Finland.
- Mason, W. A., Conrey, F. R., & Smith, E. R. (2007). Situating social influence processes: Dynamic, multidirectional flows of influence within social networks. *Personality and Social Psychology Review*, 11(3), 279–300. doi:10.1177/1088868307301032 PMID:18453465
- Masoud, E. Y. (2013). The effect of perceived risk on online shopping in Jordan. *European Journal of Business and Management*, 5(6), 76–87. https://www.researchgate.net/profile/Emad-Masoud/publication/340438323_The_Effect_of_Perceived_Risk_on_Online_Shopping_in_Jordan/links/5eb44e2c92851cd50da11774/The-Effect-of-Perceived-Risk-on-Online-Shopping-in-Jordan.pdf
- Mathew, V. (2009). Sustainable tourism: A case of destination competitiveness in South Asia. *South Asian Journal of Tourism and Heritage*, 2(1), 83–89.
- Mathimani, T., & Pugazhendhi, A. (2019). Biocatalysis and Agricultural Biotechnology Utilization of algae for biofuel, bio-products and bio-remediation. *Biocatalysis and Agricultural Biotechnology*, 17(December), 326–330. doi:10.1016/j.bcab.2018.12.007
- Matsuo, S. (1978). The oxidation state of the primordial atmosphere. *Origin of Life*, 21-27.
- Mavroidis, P. C. (2021). Trade integration in turbulent times. *The Kansas Journal of Law & Public Policy*, 30(3).

Compilation of References

- Mbaiwa, J. E. (2003). The socio-economic and environmental impacts of tourism development on the Okavango Delta, north-western Botswana. *Journal of Arid Environments*, 54(2), 447–467. doi:10.1006/jare.2002.1101
- McAfee, A., Brynjolfsson, E., Davenport, T. H., Patil, D. J., & Barton, D. (2012). Big data: The management revolution. *Harvard Business Review*, 90(10), 60–68. PMID:23074865
- McKerlie, K., Knight, N., & Thorpe, B. (2006). Advancing extended producer responsibility in Canada. *Journal of Cleaner Production*, 14(6-7), 616–628. doi:10.1016/j.jclepro.2005.08.001
- McKinsey & Company. (2016). *Unlocking Indonesia Digital Opportunity*. McKinsey Indonesia Office.
- McKinsey & Company. (2018). *The digital archipelago: How online commerce is driving Indonesia's economic development*. <https://www.mckinsey.com/~/media/McKinsey/Featured%20Insights/Asia%20Pacific/The%20digital%20archipelago%20How%20online%20commerce%20is%20driving%20Indonesias%20economic%20development/The-digital-archipelago-Executive-summary.ashx>
- McMenamin, M. A. (2020). Bradoriids (Arthropoda) and the Cambrian diversification. *Geosciences*, 10(4), 119. doi:10.3390/geosciences10040119
- McNamara, K. S. (2003). *Information and communication technologies, poverty and development: Learning from experience*. The World Bank.
- Mead, G. H. (1962). *The Self as Social Structure. Inside Social Life*. Roxbury Publishing.
- Medina, M. (2000). Scavenger cooperatives in Asia and Latin America. *Resources, Conservation and Recycling*, 31(1), 51–69. doi:10.1016/S0921-3449(00)00071-9
- Meehan, J., & Bryde, D. (2011). Sustainable procurement practice. *Business Strategy and the Environment*, 20(2), 94–106. doi:10.1002/bse.678
- Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology*. The MIT Press.
- Mehta, K., & Jha, S. S. (2020). COVID-19: A Nightmare for the Indian Economy. *SSRN Electronic Journal*. doi:10.2139/SSRN.3612676
- Mei, Y. C., & Aun, N. B. (2019). Factors influencing consumers' perceived usefulness of m-wallet in Klang Valley, Malaysia. Academic Press.
- Meijer, D., & Ubacht, J. (2018, May). The governance of blockchain systems from an institutional perspective, a matter of trust or control? In *Proceedings of the 19th Annual International Conference on Digital Government Research: Governance in the Data Age* (pp. 1-9). 10.1145/3209281.3209321
- Mejia-Escobar, J. C., González-Ruiz, J. D., & Duque-Grisales, E. (2020). Sustainable Financial Products in the Latin America Banking Industry: Current Status and Insights. *Sustainability*, 12(14), 5648. doi:10.3390/s12145648
- Mendes, F. A., & Neves, S. (2021). *Covid-19. Com vacinação, Portugal poderá atingir imunidade de grupo no início de Agosto*. Academic Press.
- Mendoza-Tello, J. C., Mora, H., Pujol-López, F. A., & Lytras, M. D. (2018). Social commerce as a driver to enhance trust and intention to use cryptocurrencies for electronic payments. *IEEE Access: Practical Innovations, Open Solutions*, 6, 50737–50751. doi:10.1109/ACCESS.2018.2869359
- Meylinah, S., Wright, T., & Meylinah, S. (2020). *Indonesia {Grain} and {Feed} {Annual} {Report} 2020*. <https://www.fas.usda.gov/data/indonesia-grain-and-feed-annual-4>

- Miafodzzyeva, S., Brandt, N., & Andersson, M. (2013). Recycling behaviour of householders living in multicultural urban area: A case study of Järva, Stockholm, Sweden. *Waste Management & Research*, 31(5), 447–457. doi:10.1177/0734242X13476746 PMID:23435616
- Michael, I., Ramsay, T., Stephens, M., & Kotsi, F. (2019). A study of unconscious emotional and cognitive responses to tourism images using a neuroscience method. *Journal of Islamic Marketing*, 10(2), 543–564. doi:10.1108/JIMA-09-2017-0098
- Mieth, A., & Bork, H. R. (2003). Diminution and degradation of environmental resources by prehistoric land use on Poike Peninsula, Easter Island (Rapa Nui). *Rapa Nui Journal: Journal of the Easter Island Foundation*, 17(1), 34–41.
- Migliorelli, M. (2021). What Do We Mean by Sustainable Finance? Assessing Existing Frameworks and Policy Risks. *Sustainability*, 13(2), 975. doi:10.3390/s13020975
- Milles, M. B., & Huberman, A. M. (2005). *Qualitative data analysis (translation)*. UI Press.
- Ministry of Finance. (2020). *Towards A Dynamic And Sustainable Economy Economic Blueprint For Brunei Darussalam*. Author.
- Miraz, M. H., Kabir, A., Habib, M. M., & Ahmed, M. S. (2019). *Securities on Blockchain in Order to Engage with Blockchain Technologies to Build a Comprehensive, Apparent and Liable Digital Economy World Wide*. Paper presented at the 2nd International Conference on Business and Management (ICBM).
- Miraz, M. H., Kabir, A., Habib, M. M., & Alam, M. M. (2019). *Blockchain Technology in Transport Industries in Malaysia*. Paper presented at the 2nd International Conference on Business and Management.
- Miraz, M. H., Saleheen, F., & Habib, M. M. (2017). *Assessing SCM: A Procedure Based on a Theoretical Model*. Paper presented at the 1st International Conference on Business & Management.
- Miraz, M. H. (2020a). Factors Affecting e-logistics in Malaysia: The Mediating Role of Trust. *Journal of Advanced Research in Dynamical and Control Systems*, 12(3), 111–120. doi:10.5373/JARDCS/V12SP3/20201244
- Miraz, M. H. (2020b). Trust Impact on Blockchain & Bitcoin Monetary Transaction. *Journal of Advanced Research in Dynamical and Control Systems*, 12(3), 155–162. doi:10.5373/JARDCS/V12SP3/20201249
- Miraz, M. H., & Habib, M. M. (2016). ICT Adoption in Small and Medium Enterprises: An Empirical Evidence of Service Sectors in Bangladesh *Journal of Economics, Business and Management*, 4(8), 481–487. doi:10.18178/joebm.2016.4.8.439
- Miraz, M. H., Hasan, M. G., & Sharif, K. I. (2018). Supply Chain Management for Garments Industries Using Blockchain in Bangladesh. *Journal of Business Management and Economic Research*, 2(8), 13–20. doi:10.29226/TR1001.2018.54
- Miraz, M. H., Hasan, M. G., & Sharif, K. I. (2019a). Blockchain Technology Implementation in Malaysian Retail Market. *Jour of Adv Research in Dynamical & Control Systems*, 11(5), 991–994.
- Miraz, M. H., Hasan, M. G., & Sharif, K. I. (2019b). The Numerous Tactical Plans Affect Customer and Postal Service Relationship: The Mediating Role of Blockchain, An Empirical Study in Bangladesh. *Jour of Adv Research in Dynamical & Control Systems*, 11(5), 985–990.
- Miraz, M. H., Hasan, M. T., Masum, M. H., Alam, M. M., & Sarkar, S. (2020). Factors Affecting Consumers Intention to Use Blockchain-Based Services (BBS) in the Hotel Industry. *International Journal of Mechanical and Production Engineering Research and Development*, 10(3), 8891–8902. doi:10.24247/ijmperdjun2020846

Compilation of References

- Miraz, M. H., Hasan, M. T., Sumi, F. R., Sarkar, S., & Majumder, M. I. (2020). Understanding, Supervision, Strategy and Acceptance Effect into the Blockchain Employment in Malaysia. *International Journal of Mechanical and Production Engineering Research and Development*, 10(3), 8339–8360. doi:10.24247/ijmperdjun2020793
- Miraz, M. H., Hye, A. K. M., Alkurtehe, K. A. M., Habib, M. M., Ahmed, M. S., Molla, M. S., & Hasan, M. T. (2020). The Effect of Blockchain in Transportation Malaysia. *International Supply Chain Technology Journal*, 6(1), 1–10. doi:10.20545/isc tj.v06.i01.02
- Miraz, M. H., Hye, A. K. M., Wahab, M. K., Alkurtehe, K. A. M., Majumder, M. I., Habib, M. M., & Alsabahi, M. A. (2020a). Blockchain Securities to Construct Inclusive, Digital Economy Globally. *International Supply Chain Technology Journal*, 6(1), 1–11. doi:10.20545/isc tj.v06.i01.03
- Miraz, M. H., Hye, A. K. M., Wahab, M. K., Alkurtehe, K. A. M., Majumder, M. I., Habib, M. M., & Alsabahi, M. A. (2020b). Electronics Product Promotion and SCM. *Contemporary Research on Bangladesh*, 6(1), 1–9. doi:10.20545/isc tj.v06.i01.01
- Miraz, M. H., Majumder, M. I., Chowdhury, A. H. M. Y., & Habib, M. M. (2018). A Study on Sustainable Supply Chain Governance for Successful Investment. *International Supply Chain Technology Journal*, 4(6), 2–10. doi:10.20545/isc tj.v4i06.167
- Mishra, R. K. (2001). *Insolvency Procedure and Corporate Restructuring: The Case of State Public Undertakings in Orissa*. Academic Press.
- Mishra, R. K., & Kiranmai, J. (2009). E-banking: A case of India. *ICFAI Journal of Public Administration*, 5(1).
- Mitchell, V. (1999). Consumer perceived risk: Conceptualisations and models. *European Journal of Marketing*, 33(1/2), 166–195. doi:10.1108/03090569910249229
- Mofijul Hoq Masum, M. H. M. (2020). Factors Affecting the Sustainability Reporting, Evidence from Bangladesh. *International Journal of Mechanical and Production Engineering Research and Development*, 10(3), 8323–8338. doi:10.24247/ijmperdjun2020792
- Mohajan, H. (2015). *Present and Future of Nestlé Bangladesh Limited*. Academic Press.
- Mohammadi, H. (2014). Investigating users' perspectives on e-learning: An integration of TAM and IS success model. *Computers in Human Behavior*, 45, 359–374. Advance online publication. doi:10.1016/j.chb.2014.07.044
- Mohanty, T. R. (2021). Man-Forest Interaction in a Metropolis: Perspectives from Hermeneutics. *Environment, Development and Sustainability in India: Perspectives, Issues and Alternatives*, 89.
- Mohiddin, F., & Susanto, H. (2021). Three Parties Engagement of Learning Management System: Students-Lecturer Technology Evidence From Brunei. In *Handbook of Research on Analyzing IT Opportunities for Inclusive Digital Learning* (pp. 130-153). IGI Global.
- Mohiddin, F., Susanto, H., & Ibrahim, F. (2021). Implications of Knowledge Management Adoption Within Higher Education Institutions: Business Process Reengineering Approach. In *Handbook of Research on Analyzing IT Opportunities for Inclusive Digital Learning* (pp. 307–351). IGI Global. doi:10.4018/978-1-7998-7184-2.ch016
- Mohite, B. V., & Patil, S. V. (2014). A novel biomaterial: Bacterial cellulose and its new era applications. *Biotechnology and Applied Biochemistry*, 61(2), 101–110. doi:10.1002/bab.1148 PMID:24033726
- Molina-Azorín, J. F., Claver-Cortés, E., López-Gamero, M. D., & Tarí, J. J. (2009). Green management and financial performance: A literature review. *Management Decision*, 47(7), 1080–1100. doi:10.1108/00251740910978313

- Moolla, A., & Bisschoff, C. (2012). Validating a Model to Measure the Brand Loyalty of Fast Moving Consumer Goods. *J. Soc Sci*, 31(2), 101–115. doi:10.1080/09718923.2012.11893019
- Morishita, S. (2016). Managing omotenashi in onsen ryokans - A case study of Kurokawa Onsen in Kyushu, Japan. *Journal of Global Tourism Research*, 1(2), 157–160. doi:10.37020/jgtr.1.2_157
- Morrison, S. M., & Hazen, R. M. (2020). An evolutionary system of mineralogy. Part II: Interstellar and solar nebula primary condensation mineralogy (> 4.565 Ga). *American Mineralogist: Journal of Earth and Planetary Materials*, 105(10), 1508–1535. PMID:33958805
- Moscardo, G., & Ballantyne, R. (2008). Interpretation and attractions. *Managing visitor attractions: New directions*, 237-252.
- Moslehpour, M., Pham, V. K., Wong, W. K., & Bilgiçli, İ. (2018). E-purchase intention of Taiwanese consumers: Sustainable mediation of perceived usefulness and perceived ease of use. *Sustainability*, 10(1), 234. doi:10.3390u10010234
- Mourad, M. (2016). Recycling, recovering and preventing “food waste”: Competing solutions for food systems sustainability in the United States and France. *Journal of Cleaner Production*, 126, 461–477.
- Müller, J., Kiel, D., & Voigt, K.-I. (2018). What Drives the Implementation of Industry 4.0? The Role of Opportunities and Challenges in the Context of Sustainability. *Sustainability*, 10(1), 10. doi:10.3390u10010247
- Mulyaningsih, T., Miranti, R., Daly, A., & Manning, C. (2019). Regional Skill Differentials: A Study of the Indonesian Labor Market. *The Singapore Economic Review*, 1–22. doi:10.1142/S0217590819500371
- Murata, K. (2014). An empirical cross-cultural study of humour in business meetings in New Zealand and Japan. *Journal of Pragmatics*, 60, 251–265. doi:10.1016/j.pragma.2013.09.002
- Mutaqin, M. I., Widyarani, Hamidah, U., Janetasari, S. A., Muchlis, & Sintawardarni, N. (2019). Biogas Consumption Pattern in Indonesia : (A Case Study of Sumedang Community Biogas Plant, Indonesia). *Proceeding - 2019 International Conference on Sustainable Energy Engineering and Application: Innovative Technology Toward Energy Resilience, ICSEEA 2019*, 113–118. 10.1109/ICSEEA47812.2019.8938624
- Muthuraman, S., Haziazi, M., Veerasamy, R., & Yahyaei, N.. (2020). SME for sustainable development in Sultanate of Oman. *October*, 43–48.
- Nagai, K. (2020). Kangaroo Notebook: Abe’s Metatherian Journey. In *Imperial Beast Fables* (pp. 121-153). Palgrave Macmillan.
- Nandi, S., Hervani, A. A., & Helms, M. M. (2020). Circular economy business models—Supply chain perspectives. *IEEE Engineering Management Review*, 48(2), 193–201. doi:10.1109/EMR.2020.2991388
- Nasri, W., & Charfeddine, L. (2012). Factors affecting the adoption of Internet banking in Tunisia: An integration theory of acceptance model and theory of planned behaviour. *The Journal of High Technology Management Research*, 23(1), 1–14. doi:10.1016/j.hitech.2012.03.001
- Nayak, G., & Dhaigude, A. S. (2019). A conceptual model of sustainable supply chain management in small and medium enterprises using blockchain technology. *Cogent Economics & Finance*, 7(1), 1667184. doi:10.1080/23322039.2019.1667184
- Nazamudeen, S., Susanto, H., & Mohiddin, F. (2021). Augmented Reality Towards an Informative Educational Environment: Digitalizing Interactive Learning. In *Handbook of Research on Analyzing IT Opportunities for Inclusive Digital Learning* (pp. 103–129). IGI Global. doi:10.4018/978-1-7998-7184-2.ch007

Compilation of References

- Neal, D., & Ross, M. (2018). Mobile framing: Vertical videos from user-generated content to corporate marketing. In M. Schleser & M. Berry (Eds.), *Mobile Story Making in an Age of Smartphones* (pp. 151–160). Palgrave Pivot. doi:10.1007/978-3-319-76795-6_15
- Nedomová, L., Maryska, M., & Doucek, P. (2017). Unequal Wage of Men and Women in ICT in the Czech Republic? *Gender, Technology and Development*, 21(1-2), 116–134. doi:10.1080/09718524.2017.1385317
- Nesset, E., Nervik, B., & Helgesen, Ø. (2011). Satisfaction and image as mediators of store loyalty drivers in grocery retailing. *International Review of Retail, Distribution and Consumer Research*, 21(3), 267–292. doi:10.1080/09593969.2011.588716
- Netchitailo, V. S. (2021). From the Beginning of the World to the Beginning of Life on Earth. *Journal of High Energy Physics, Gravitation, and Cosmology*, 7(4), 1503–1523. doi:10.4236/jhepgc.2021.74092
- Neubauer, D. (2008). The historical transformation of public good. *Journal of Asian Public Policy*, 1(2), 127–138. doi:10.1080/17516230802094528
- Nghiêm-Phú, B. (2017). Sensory marketing in an outdoor out-store shopping environment – an exploratory study in Japan. *Asia Pacific Journal of Marketing and Logistics*, 29(5), 994–1016. doi:10.1108/APJML-09-2016-0178
- Nguyen, Q. K. (2016, November). Blockchain-a financial technology for future sustainable development. In *2016 3rd International conference on green technology and sustainable development (GTSD)* (pp. 51-54). IEEE. 10.1109/GTSD.2016.22
- Nguyen, H. V., & Lobo, A. (2017). Encouraging Vietnamese household recycling behavior: Insights and implications. *Sustainability*, 9(2), 179. doi:10.3390/s9020179
- Nieto-Veloza, A., Zhong, Q., Kim, W.-S., D'Souza, D., Krishnan, H. B., & Dia, V. P. (2021). Utilization of tofu processing wastewater as a source of the bioactive peptide lunasin. *Food Chemistry*, 362, 130220. doi:10.1016/j.foodchem.2021.130220 PMID:34098437
- Nilawati, D., Matsuura, N., Honda, R., Hara, H., & Neni, Y. (2021). Methane recovery from acidic tofu wastewater using an anaerobic fixed - bed reactor with bamboo as the biofilm carrier. *Journal of Material Cycles and Waste Management*, 23(2), 537–547. doi:10.1007/10163-020-01145-9
- Niringiye, A. (2010). Determinants of willingness to pay for solid waste management in Kampala City. *Current Research Journal of Economic Theory*, 2(3), 119–122.
- Niringiye, A., & Omotor, D. G. (2010). Determinants of willingness to pay for solid waste management in Kampala city. *Current Research Journal of Economic Theory*, 2(3), 119–122.
- Norman, W., & MacDonald, C. (2004). Getting to the bottom of “triple bottom line”. *Business Ethics Quarterly*, 14(2), 243–262. doi:10.5840/beq200414211
- Norton, M. G. (2021). Flint—The Material of Evolution. In *Ten Materials That Shaped Our World* (pp. 7–23). Springer. doi:10.1007/978-3-030-75213-2_2
- Nugroho, G., Sulistyaningrum, R., Melania, R., & Handayani, W. (2019). Environmental analysis of tofu production in the context of cleaner production: Case study of tofu household industries in {Salatiga}, {Indonesia}. *Journal of Environmental Science and Sustainable Development*, 2(2), 127–138. doi:10.7454/jessd.v2i2.1021
- Nurangraeni, I. (2020). Inovasi Financial Technology (Fintech) pada Asuransi Syariah (Studi kasus: PT Duta Danadyakasa Teknologi). *JESI*, 9(2), 94–103. doi:10.21927/jesi.2019.9(2).94-103

- Nzama, A. T. (2008). Socio-Cultural Impacts of Tourism on the Rural Areas Within the World Heritage Sites–The case of KwaZulu-Natal, South Africa. *South Asian Journal of Tourism and Heritage*, 1(1), 1–8.
- O’Keefe, N., Zhang, Z., Augustin, M., & Payne, J. (2011, December). Body size evolution in the Phylum Brachiopoda throughout the Phanerozoic Eon. In *AGU Fall Meeting Abstracts* (Vol. 2011, pp. ED41A-0494). Academic Press.
- OECD. (2014). *Measuring the Digital Economy: A New Perspective*. OECD Publishing., doi:10.1787/9789264221796-
- Ogedengbe, F. A., & Abdul-Talib, Y. Y. (2020). Factors influencing electronic banking continuance usage intention in developing economies: A study of Nigeria. *International Journal of Business Information Systems*, 35(1), 63–87. doi:10.1504/IJBIS.2020.109541
- Ohe, Y. (2008). Impact of rural tourism operated by retiree farmers on multifunctionality: Evidence from Chiba, Japan. *Asia Pacific Journal of Tourism Research*, 13(4), 343–356. doi:10.1080/10941660802420945
- Ohe, Y. (2020). *Community-based rural tourism and entrepreneurship*. Springer. doi:10.1007/978-981-15-0383-2
- Oh, S. S., Kim, K.-A., Kim, M., Oh, J., Chu, S. H., & Choi, J. (2021). Measurement of Digital Literacy Among Older Adults: Systematic Review. *Journal of Medical Internet Research*, 23(2), e26145. doi:10.2196/26145 PMID:33533727
- Okulicz-Kozaryn, A., Nash, T., & Tursi, N. O. (2015). Luxury car owners are not happier than frugal car owners. *International Review of Economics*, 62(2), 121–141. doi:10.1007/12232-015-0223-2
- Oliveira, T., Thomas, M., Baptista, G., & Campos, F. (2016). Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology. *Computers in Human Behavior*, 61, 404–414. doi:10.1016/j.chb.2016.03.030
- Omar, I. A., Jayaraman, R., Debe, M. S., Salah, K., Yaqoob, I., & Omar, M. (2021). Automating procurement contracts in the healthcare supply chain using blockchain smart contracts. *IEEE Access: Practical Innovations, Open Solutions*, 9, 37397–37409. doi:10.1109/ACCESS.2021.3062471
- Onaolapo, S. and Oyewole, O. (2018). Performance Expectancy, Effort Expectancy, and Facilitating Conditions as Factors Influencing Smart Phones Use for Mobile Learning by Postgraduate Students of the University of Ibadan, Nigeria. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 14(1), 95-115.
- Onaolapo, S., & Oyewole, O. (2018). Performance expectancy, effort expectancy, and facilitating conditions as factors influencing smart phones use for mobile learning by postgraduate students of the University of Ibadan, Nigeria. *Interdisciplinary Journal of e-Skills and Lifelong Learning*, 14(1), 95-115.
- Oppewal, H., & Timmermans, H. (1997). Retailer self-perceived store image and competitive position. *International Review of Retail, Distribution and Consumer Research*, 7(1), 41–59. doi:10.1080/095939697343120
- Organization for Economic Co-operation and Development. (2007). *Public-Private Dialogue in Developing Countries: Opportunities, Risks, and Pre-Conditions*. <https://www.oecd.org/dev/39517753.pdf>
- Organization for Economic Co-operation and Development. (2015). *Addressing the Tax Challenges of the Digital Economy*. OECD/G20 Base Erosion and Profit Shifting Project. <https://www.oecd-library.org/docserver/9789264241046-en.pdf?expires=1594712019&id=id&accname=guest&checksum=6444D20F31B1777C9815383E985F8D82>
- Organization for Economic Co-operation and Development. (2019). *Regulatory effectiveness in the era of digitalization*. <https://www.oecd.org/gov/regulatory-policy/Regulatory-effectiveness-in-the-era-of-digitalisation.pdf>
- Organization, World Health. (2020). *Coronavirus disease (COVID-19): Vaccines*. Author.

Compilation of References

- Otoritas Jasa Keuangan. (2020a). *Grup Inovasi Keuangan Digital Otoritas Jasa Keuangan: Daftar Penyelenggara Inovasi Keuangan Digital Per Juni 2020*. <https://www.ojk.go.id/id/berita-dan-kegiatan/publikasi/Pages/-Penyelenggara-IKD-dengan-Status-Tercatat-di-OJK-per-Juni-2020.aspx>
- Otoritas Jasa Keuangan. (2020b). *Perkembangan Fintech Lending (Pendanaan Gotong Royong Online)*. <https://www.ojk.go.id/id/kanal/iknb/data-dan-statistik/fintech/default.aspx>
- Ou, Q., Vannier, J., Yang, X., Chen, A., Mai, H., Shu, D., Han, J., Fu, D., Wang, R., & Mayer, G. (2020). Evolutionary trade-off in reproduction of Cambrian arthropods. *Science Advances*, 6(18), eaaz3376. doi:10.1126ciadv.aaz3376 PMID:32426476
- Our World in Data. (2021). *CO2 and Greenhouse Gas Emissions Country Profiles*. <https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>
- Oyedemi, T. D., & Choung, M. (2020). Digital Inequality and Youth Unemployment. *South African Journal for Communication Theory and Research*, 46(3). Advance online publication. doi:10.1080/02500167.2020.1821738
- Pádua, S. I. D., & Jabbour, C. J. C. (2015). Promotion and evolution of sustainability performance measurement systems from a perspective of business process management: From a literature review to a pentagonal proposal. *Business Process Management Journal*, 21, 403–418.
- Pagoropoulos, A., Pigosso, D. C. A., & McAlloone, T. C. (2017). The emergent role of digital technologies in the circular economy: A review. *Procedia CIRP*, 64, 19–24. doi:10.1016/j.procir.2017.02.047
- Paiola, M., Schiavone, F., Grandinetti, R., & Chen, J. (2021). Digital servitization and sustainability through networking: Some evidences from IoT-based business models. *Journal of Business Research*, 132, 507–516. doi:10.1016/j.jbusres.2021.04.047
- Palmieri, N., Forleo, M. B., & Salimei, E. (2017). Environmental impacts of a dairy cheese chain including whey feeding: {An} {Italian} case study. *Journal of Cleaner Production*, 140, 881–889. doi:10.1016/j.jclepro.2016.06.185
- Panigrahi, S., Bahinipati, B., & Jain, V. (2019). Sustainable supply chain management. *Management of Environmental Quality*, 30(5), 1001–1049. doi:10.1108/MEQ-01-2018-0003
- Panizzut, N., Rafi-ul-Shan, P. M., Amar, H., Sher, F., Mazhar, M. U., & Klemeš, J. J. (2021). Exploring relationship between environmentalism and consumerism in a market economy society: A structured systematic literature review. *Cleaner Engineering and Technology*, 100047.
- Pan, S., Alex, M., Huang, I., Liu, I., Chang, E., & Chiang, P. (2015). Strategies on implementation of waste-to-energy (WTE) supply chain for circular economy system : A review. *Journal of Cleaner Production*, 108, 1–13. doi:10.1016/j.jclepro.2015.06.124
- Pappalardo, G., Cerroni, S., Nayga, R. M., & Yang, W. (2020). Impact of Covid-19 on Household Food Waste: The Case of Italy. *Frontiers in Nutrition*, 7. doi:10.3389/fnut.2020.585090
- Pardo, J., Shukla, A. M., Chamarthi, G., & Gupte, A. (2020). The journey of remdesivir: From Ebola to COVID-19. *Drugs in Context*, 9.
- Parizeau, K., von Massow, M., & Martin, R. (2015). Household-level dynamics of food waste production and related beliefs, attitudes, and behaviours in Guelph, Ontario. *Waste Management (New York, N.Y.)*, 35, 207–217. doi:10.1016/j.wasman.2014.09.019 PMID:25445261
- Park, H., Kwon, T. A., Zaman, M. M., & Song, S. Y. (2020). Thrift shopping for clothes: To treat self or others? *Journal of Global Fashion Marketing*, 11(1), 56–70. doi:10.1080/20932685.2019.1684831

- Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Journal of Educational Technology & Society*, 12(3), 150–162. http://www.ifets.info/journals/12_3/14.pdf
- Park, Y., Meng, F., & Baloch, M. A. (2018). The Effect of ICT, Financial Development, Growth, and Trade Openness on CO2 Emissions: An Empirical Analysis. *Environmental Science and Pollution Research International*, 25(30), 30708–30719. Advance online publication. doi:10.1007/11356-018-3108-6 PMID:30178410
- Parlakkiliç, A., Üzmez, M., & Mertoğlu, S. (2020). How Does Covid-19 Pandemic Effect Online Shopping in E-Commerce? *Journal of Business in The Digital Age*, 3(2), 117–122. doi:10.46238/jobda.823955
- Parsons, E. (2005). Dealing in secondhand goods: Creating meaning and value. In K. M. Ekstrom & H. Brembeck (Eds.), *European Advances in Consumer Research* (Vol. 7, pp. 189–194). Association for Consumer Research.
- Parvez, N., Chowdhury, T. H., Urmi, S. S., & Taher, K. A. (2021). *Prospects of Internet of Things for Bangladesh*. Paper presented at the 2021 International Conference on Information and Communication Technology for Sustainable Development (ICICT4SD). 10.1109/ICICT4SD50815.2021.9396818
- Patro, C. S. (2019). Influence of Perceived Benefits and Risks on Consumers' Perceived Value in Online Shopping. *International Journal of Applied Behavioral Economics*, 8(3), 12–36. doi:10.4018/IJABE.2019070102
- Paudel, P. (2021). Online Education: Benefits, Challenges and Strategies During and After COVID-19 in Higher Education. *International Journal on Studies in Education*, 3(2), 70–85. <https://doi.org/10.46328/IJONSE.32>
- Peeri, N. C., Shrestha, N., Rahman, M. S., Zaki, R., Tan, Z., & Bibi, S. ... Haque, U. (2020). The SARS, MERS and novel coronavirus (COVID-19) epidemics, the newest and biggest global health threats: what lessons have we learned? *International Journal of Epidemiology*, 49(3), 717–726. doi:10.1093/IJE/DYAA033
- Pei, T. J., & Dastane, O. (2021). Digital Technology in Retail: Impact on Shopper Satisfaction. In *Handbook of Research on Disruptive Innovation and Digital Transformation in Asia* (pp. 187-213). IGI Global.
- Peng, H. T., & Liu, Y. (2018). How government subsidies promote the growth of entrepreneurial companies in clean energy industry: An empirical study in China. *Journal of Cleaner Production*, 188, 508–520. doi:10.1016/j.jclepro.2018.03.126
- Peng, X., Li, X., & Yang, X. (2021). Analysis of circular economy of E-commerce market based on grey model under the background of big data. *Journal of Enterprise Information Management*. Advance online publication. doi:10.1108/JEIM-01-2021-0015
- People's Bank of China, Development and Reform Commission, and China Securities Regulatory Commission. (2020). *Catalogue of Green Bond Supported Projects (2021)*. People's Bank of China.
- People's Bank of China. (2016). *Guiding Opinions on Building a Green Financial System* (Vol. 000014672). Ministry of Ecology and Environment of the People's Republic of China.
- Pereira, T. (2020). Motivações para a prática do dark tourism. *ACENO-Revista de Antropologia do Centro-Oeste*, 7(14), 215–230.
- Perez-garcia, O., Escalante, F. M. E., Luz, E., & Bashan, Y. (2010). Heterotrophic cultures of microalgae : Metabolism and potential products. *Water Research*, 45(1), 11–36. doi:10.1016/j.watres.2010.08.037 PMID:20970155
- Peterkova, J. (2020). Innovation and Industry 4.0 as a part of small state diplomacy. *SHS Web of Conferences*, 74.
- Petit, V. (2021). *The Age of Fire Is Over: A New Approach to the Energy Transition*. Academic Press.

Compilation of References

- Petrosillo, N., Viceconte, G., Ergonul, O., Ippolito, G., & Petersen, E. (2020, June). COVID-19, SARS and MERS: Are they closely related? *Clinical Microbiology and Infection*, 26, 729–734. <https://doi.org/10.1016/j.cmi.2020.03.026>
- Pharino, C., Pearce, P., & Pryce, J. (2018). Paranormal tourism: Assessing tourists' onsite experiences. *Tourism Management Perspectives*, 28, 20–28. doi:10.1016/j.tmp.2018.06.003
- Piccinini, E., Gregory, R. W., & Kolbe, L. M. (2015). Changes in the producer-consumer relationship-towards digital transformation. *Changes (Hove, England)*, 3(4), 1634–1648.
- Pieroni, M. P., McAloone, T. C., & Pigosso, D. C. (2019). Business model innovation for circular economy and sustainability: A review of approaches. *Journal of Cleaner Production*, 215, 198–216. doi:10.1016/j.jclepro.2019.01.036
- Pikiran-rakyat.com. (2019). *Fintech: Diantara Peluang dan Tantangan*. Retrieved September 4, 2020, from <https://www.pikiran-rakyat.com/ekonomi/pr-01320871/fintech-diantara-peluang-dan-tantangan>
- Pilik, M., Juříčková, E., & Kwarteng, M. A. (2017). On-line shopping behaviour in the Czech Republic under the digital transformation of economy. *Economic Annals-XXI*, 165(5–6), 119–123. doi:10.21003/ea.V165-24
- Poddar, M. K., & Dikshit, P. K. (2021). Recent development in bacterial cellulose production and synthesis of cellulose based conductive polymer nanocomposites. *Nano Select*, 2(January), 1–24. doi:10.1002/nano.202100044
- Podder, A. K., Al Bukhari, A., Islam, S., Mia, S., Mohammed, M. A., Kumar, N. M., ... Abdulkareem, K. H. (2021). IoT based smart agrotech system for verification of Urban farming parameters. *Microprocessors and Microsystems*, 82, 104025. doi:10.1016/j.micpro.2021.104025
- Podkalicka, A., & Potts, J. (2014). Towards a general theory of thrift. *International Journal of Cultural Studies*, 17(3), 227–241. doi:10.1177/1367877913496198
- Podoshen, J. (2013). Dark tourism motivations: Simulation, emotional contagion and topographic comparison. *Tourism Management*, 35, 263–271. doi:10.1016/j.tourman.2012.08.002
- Pongsiri, M. J., Roman, J., Ezenwa, V. O., Goldberg, T. L., Koren, H. S., Newbold, S. C., Ostfeld, R. S., Pattanayak, S. K., & Salkeld, D. J. (2009). Biodiversity loss affects global disease ecology. *Bioscience*, 59(11), 945–954. doi:10.1525/bio.2009.59.11.6
- Pontas, K., & Muslim, A. (2015). Oxidation Process of H₂O₂/UV for COD Reduction of Wastewater from Soybean Tofu Production. *Makara Journal of Technology*, 19(3), 120–126. doi:10.7454/mst.v19i3.3043
- Porter, M. E. (1985). *The Competitive Advantage: Creating and Sustaining Superior Performance*. Free Press., doi:10.1590/S0034-75901985000200009
- Powel, F. A. (1965). Source credibility and behavioral compliance as determinants of attitude change. *Journal of Personality and Social Psychology*, 2(5), 669–676. doi:10.1037/h0022724 PMID:5838765
- Pranto, T. H., Noman, A. A., Mahmud, A., & Haque, A. B. (2021). Blockchain and smart contract for IoT enabled smart agriculture. *PeerJ. Computer Science*, 7, e407. doi:10.7717/peerj-cs.407 PMID:33834098
- Praskievicz, S. (2021). How the environment became global. *Anthropocene*, 35, 100305. doi:10.1016/j.ancene.2021.100305
- Pratisha Akar, D. N. M. (2021). Influence of E-Commerce Growth on Retail Market along with Covid Impact. *International Journal of Modern Agriculture*, 10(2), 4311–4318. <http://www.modern-journals.com/index.php/ijma/article/view/1335>
- Prause, G. (2019). Smart Contracts for Smart Supply Chains. *IFAC-PapersOnLine*, 52(13), 2501–2506. doi:10.1016/j.ifacol.2019.11.582

- Proenca, S., & Soukiazis, E. (2005). Tourism as an alternative source of regional growth in Portugal. *Centro de Estudos da Uniao Europeia Faculdade de Economia da Universidade de Coimbra, Discussion paper*, (34).
- Prothero, D. (2018). The Iridium Layer. The Death of the Dinosaurs. In *The Story of the Earth in 25 Rocks: Tales of Important Geological Puzzles and the People Who Solved Them* (pp. 216–228). Columbia University Press. doi:10.7312/prot18260-022
- Purwaningrum, F. (2017). Knowledge flow in the ICT sector: Case study of Anggerek Desa Technology Park in negara Brunei Darussalam. *South East Asia Research*, 25(2), 157–174. doi:10.1177/0967828X17706568
- Pusarla, H. R., & Mamillapalli, R. S. (2020). Impact of COVID-19 on Real Estate Sector in India. *J-GIBS*, 12(1).
- Puschmann, T. (2017). Fintech. *Business & Information Systems Engineering*, 59(1), 69–76. doi:10.1007/12599-017-0464-6
- Putritama, A. (2019). The mobile payment fintech continuance usage intention in Indonesia. *Journal of Economics*, 15(2), 243–258.
- Qiao, Z., Chen, X. D., Cheng, Y., & Liu, H. (n.d.). Microbiological and Chemical Changes During the Production of Acidic Whey, A Traditional Chinese Tofu-Coagulant. *International Journal of Food Properties*, 37–41. doi:10.1080/10942910802180190
- Quested, T., Marsh, E., Stunell, D., & Parry, A. (2013). Spaghetti soup: The complex world of food waste behaviours. *Resources, Conservation and Recycling*, 79, 43–51. doi:10.1016/j.resconrec.2013.04.011
- Qureshi, A. I. (2017). Zika virus disease: From origin to outbreak. Academic Press.
- Rafalak, M., Abramczuk, K., & Wierzbicki, A. (2014). Incredible: Is (almost) all web content trustworthy? Analysis of psychological factors related to website credibility evaluation. In *Proceedings of the 23rd International Conference on World Wide Web* (pp. 1117–1122). International World-Wide-Web Conference Committee (IW3C2). 10.1145/2567948.2578997
- Raffoni, A., Visani, F., Bartolini, M., & Silvi, R. (2018). Business performance analytics: Exploring the potential for performance management systems. *Production Planning and Control*, 29(1), 51–67. doi:10.1080/09537287.2017.1381887
- Rafiq, M., & Ahmed, P. K. (1995). Using the 7Ps as a generic marketing mix: An exploratory survey of UK and European marketing academics. *Marketing Intelligence & Planning*, 13(9), 4–15. doi:10.1108/02634509510097793
- Rahadiyan, I., & Sari, A. R. (2019). Peluang dan tantangan implementasi fintech peer to peer lending sebagai salah satu upaya peningkatan kesejahteraan masyarakat Indonesia. *Defendonesia*, 4(1), 18–28. doi:10.54755/defendonesia.v4i1.79
- Raheem, I. D., Tiwari, A. K., & Balsalobre-Lorente, D. (2020). The Role of ICT and Financial Development in CO2 Emissions and Economic Growth. *Environmental Science and Pollution Research International*, 27(2), 1912–1922. Advance online publication. doi:10.1007/11356-019-06590-0 PMID:31760620
- Rahji, M. A. Y., & Oloruntopa, E. O. (2009). Determinants of households' willingness-to-pay for private solid waste management services in Ibadan, Nigeria. *Waste Management & Research*, 27(10), 961–965. doi:10.1177/0734242X09103824 PMID:19470546
- Rahman & Jalil. (2014). Factors Influencing Malaysia Consumers' Intention Towards E-Shopping. *Journal of Applied Sciences*, 14(18), 2119–2128.
- Rahman, M. N., Mona, S. S., Al Noman, S. A., & Avi, A. D. (2020). COVID-19, Consumer Behavior and Inventory Management: A Study on the Retail Pharmaceutical Industry of Bangladesh. *Supply Chain Insider*, 4(1), 8-25.

Compilation of References

- Rajalakshmi, S. S. A. M., Jenny, M. N. S., & Dhandapani, A. R. (2020). Lab - scale degradation of leather industry effluent and its reduction by *Chlorella* sp. SRD3 and *Oscillatoria* sp. SRD2 : A bioremediation approach. *Applied Water Science*, 10(5), 1–11. doi:10.1007/13201-020-01197-0
- Rajeev, A., Pati, R. K., Padhi, S. S., & Govindan, K. (2017). Evolution of sustainability in supply chain management: A literature review. *Journal of Cleaner Production*, 162, 299–314. doi:10.1016/j.jclepro.2017.05.026
- Rajwade, J. M., Paknikar, K. M., & Kumbhar, J. V. (2015). Applications of bacterial cellulose and its composites in biomedicine. *Applied Microbiology and Biotechnology*, 99(6), 2491–2511. doi:10.1007/00253-015-6426-3 PMID:25666681
- Ramaiah, M., & Avtar, R. (2019). Urban green spaces and their need in cities of rapidly urbanizing India: A review. *Urban Science*, 3(3), 94. doi:10.3390/urbansci3030094
- Ramaraj, R., & Dussadee, N. (2015). Biological purification processes for biogas using algae cultures. *RE:view*, 4, 20–32. doi:10.11648/j.ijrse.s.2015040101.14
- Ramayah, T., Cheah, J., Chuah, F., Ting, H., & Memon, M. (2018). Partial least squares structural equation modeling (PLS-SEM) using smartPLS 3.0. In *An Updated Guide and Practical Guide to Statistical Analysis*. Pearson.
- Ramayah, T., Yeap, J. A., Ahmad, N. H., Halim, H. A., & Rahman, S. A. (2017). Testing a confirmatory model of facebook usage in smartPLS using consistent PLS. *International Journal of Business and Innovation*, 3(2), 1–14.
- Ramesh, G., & ... , G. (. (2018). Efficient Information Management In Technical Education System Supply Chain Using Data Integration System (DIS). *International Journal Of Mechanical And Production Engineering Research And Development*, 8(3), 125–132. doi:10.24247/ijmperdjun201814
- Ram, S., & Sheth, J. N. (1989). Consumer resistance to innovations: The marketing problem and its solutions. *Journal of Consumer Marketing*, 6(2), 5–14. doi:10.1108/EUM0000000002542
- Rao, P., & Holt, D. (2005). Do green supply chains lead to competitiveness and economic performance? *International Journal of Operations & Production Management*, 25(9), 898–916. doi:10.1108/01443570510613956
- Rashid, A. T. (2016). *Digital Inclusion and Social Inequality: Gender Differences in ICT Access and Use in Five Developing Countries*. Asian Institute of Technology. doi:10.1177/0971852416660651
- Raviadaran, N. S. H., Dastane, O., & Ma'arif, M. Y., & Satar, M. (2019). Impact of Service Quality Dimensions on Internet Banking Adoption, Satisfaction and Patronage. *International Journal of Management, Accounting and Economics*, 6(10), 709–730.
- Razak, A. A., & White, G. R. T. (2015). The triple helix model for innovation: A holistic exploration of barriers and enablers. *International Journal of Business Performance and Supply Chain Modelling*, 7(3), 278–291. doi:10.1504/IJBPSM.2015.071600
- Raza, S. A., Qazi, W., Khan, K. A., & Salam, J. (2021). Social Isolation and Acceptance of the Learning Management System (LMS) in the time of COVID-19 Pandemic: An Expansion of the UTAUT Model. *Journal of Educational Computing Research*, 59(2), 183–208. doi:10.1177/0735633120960421
- Reddy, P., Sharma, B., & Chaudhary, K. (2021). Digital literacy: A review in the South Pacific. *Journal of Computing in Higher Education*, 1–26. doi:10.1007/12528-021-09280-4
- Rekha, C. R., & Vijayalakshmi, G. (2013). Influence of processing parameters on the quality of soycurd (tofu). *Journal of Food Science and Technology*, 50(1), 176–180. doi:10.1007/13197-011-0245-z PMID:24425905

- Rengamani, J., & Venkatraman, V. (2015). Study on the impact of reverse logistics in the transportation sector. *International Journal of Design and Manufacturing Technology*, 6(2).
- Report, D. (2020). On Int'l day of awareness of food loss and waste, experts want end to wastage. *The Daily Star*.
- Research Center for Green Finance Development. (2021). *Green Finance in China: Overview, Experience and Outlook*. Author.
- Revin, V., Liyaskina, E., Nazarkina, M., Bogatyreva, A., & Shchankin, M. (2018). Cost-effective production of bacterial cellulose using acidic food industry by-products. *Brazilian Journal of Microbiology*, 49, 151–159. doi:10.1016/j.bjm.2017.12.012 PMID:29703527
- Reyna, A., Martín, C., Chen, J., Soler, E., & Díaz, M. (2018). On blockchain and its integration with IoT. Challenges and opportunities. *Future Generation Computer Systems*, 88, 173–190. doi:10.1016/j.future.2018.05.046
- Reynolds, C., Soma, T., Spring, C., & Lazell, J. (2020). *Routledge Handbook of Food Waste* (1st ed., Vol. 1). Routledge.
- Richards, J., & Van Buren, M. (2000). *Order, legitimacy, and wealth in ancient states*. Cambridge University Press.
- Richmond, K., & Triplett, R. E. (2018). ICT and Income Inequality: A Cross-national Perspective. *International Review of Applied Economics*, 32(2), 195–214. Advance online publication. doi:10.1080/02692171.2017.1338677
- Richter, B., & Bokelmann, W. (2017). Explorative study about the analysis of storing, purchasing and wasting food by using household diaries. *Resources, Conservation and Recycling*, 125, 181–187. doi:10.1016/j.resconrec.2017.06.006
- Riedel, J. (1992). Economic Development in East Asia: Doing What Is Commonly Happening. In H. Hughes (Ed.), *The Success of Industrialization in East Asia. PT*. Gramedia Pustaka Utama.
- Riza, A. F., & Hafizi, M. R. (2020). Customers attitude toward Islamic mobile banking in Indonesia: Implementation of TAM. *Asian Journal of Islamic Management*, 1(2), 75–84.
- Rogers, E. M. (2003). *Diffusion of Innovations* (5th ed.). Free Press.
- Roggeveen, A. L., & Sethuraman, R. (2020). How the COVID-19 Pandemic May Change the World of Retailing. *Journal of Retailing*, 96(2), 169–171. Advance online publication. doi:10.1016/j.jretai.2020.04.002
- Romagnoli, V., Aigner, J. F., Berlinghof, T., Bey, N., Rödger, J. M., Pätz, C., & Saveyn, H. (2020). *Identification and assessment of opportunities and threats for the Circular Economy arising from E-commerce*. Publications Office of the European Union.
- Romli, M., & Suprihatin, S. (2009). Beban Pencemaran Limbah Cair Industri Tahu dan Analisis Alternatif Strategi Pengelolaannya. *Jurnal Purifikasi*, 10(2), 141–154. doi:10.12962/j25983806.v10.i2.174
- Roolaht, T. (2012). The Characteristics of Small Country National Innovation Systems BT - Innovation Systems in Small Catching-Up Economies: New Perspectives on Practice and Policy. Springer. doi:10.1007/978-1-4614-1548-0_2
- Roscoe, S., Cousins, P. D., & Lamming, R. C. (2016). Developing eco-innovations: A three-stage typology of supply networks. *Journal of Cleaner Production*, 112, 1948–1959. doi:10.1016/j.jclepro.2015.06.125
- Rosenberg, N., & Richard, R. N. (1994). American Universities and Technical Advance in Industry. *Research Policy*, 23(3), 23. doi:10.1016/0048-7333(94)90042-6
- Rothe, F. (2020). Rethinking Positive and Negative Impacts of 'ICT for Development' Through the Holistic Lens of the Sustainable Development Goals. *Information Technology for Development*, 26(4), 653–669. Advance online publication. doi:10.1080/02681102.2020.1756728

Compilation of References

- Rougier, G. W., Martinelli, A. G., & Forasiepi, A. M. (2021). The Fossil Record of South American Mesozoic Mammals and Their Close Relatives. In *Mesozoic Mammals from South America and Their Forerunners* (pp. 25–126). Springer. doi:10.1007/978-3-030-63862-7_2
- Roussou, I., & Stiakakis, E. (2016). *Adoption of Digital Currencies by Companies in the European Union: A Research Model combining DOI and TAM*. Paper presented at the 4 th International Conference on Contemporary Marketing Issues ICCMI, Heraklion, Greece.
- Roy, S., & Sinha, I. (2014). Determinants of customers' acceptance of electronic payment system in Indian banking sector—A study. *International Journal of Scientific and Engineering Research*, 5(1), 177–187.
- Roy, T. (2020). *The Economic History of India, 1857–2010*. Oxford University Press. doi:10.1093/oso/9780190128296.001.0001
- Ruf, B. M., Muralidhar, K., Brown, R. M., Janney, J. J., & Paul, K. (2001). An empirical investigation of the relationship between change in corporate social performance and financial performance: A stakeholder theory perspective. *Journal of Business Ethics*, 32(2), 143–156. doi:10.1023/A:1010786912118
- Rumata, V. M., & Sastrosubroto, A. S. (2020). The Paradox of Indonesian Digital Economy Development. In *E-Business*. IntechOpen.
- Rupke, N. A. (2009). *Richard Owen: Biology without Darwin*. University of Chicago Press. doi:10.7208/chicago/9780226731780.001.0001
- Russell, J. A., & Pratt, G. (1980). A description of the affective quality attributed to environments. *Journal of Personality and Social Psychology*, 38(2), 311–322. doi:10.1037/0022-3514.38.2.311
- Russell, S. V., Young, C. W., Unsworth, K. L., & Robinson, C. (2017). Bringing habits and emotions into food waste behaviour. *Resources, Conservation and Recycling*, 125, 107–114. doi:10.1016/j.resconrec.2017.06.007
- Rusu, R. C. V., Neculiță, M., Cristea, D., Mogodan, A., Petrea, Ș., & Simionov, I. (2020). Sustainable development of rural areas of South-East Region of Romania. *Sustainable Development*, 20(2).
- Rychlik, L., & Jancewicz, E. (2002). Prey size, prey nutrition, and food handling by shrews of different body sizes. *Behavioral Ecology*, 13(2), 216–223. doi:10.1093/beheco/13.2.216
- Ryglóva, K. (2007). Limiting factors in the field of business activities in rural tourism. *Zemědělská Ekonomika-Praha*, 53(9), 421.
- Saade, R. G., Tan, W., & Kira, D. (2008). Is Usage Predictable Using Belief-Attitude? Intention Paradigm? *Issues in Informing Science and Information Technology*, 5, 591–599. doi:10.28945/1030
- Sachs. (1994). Estratégias de transição para o século XXI—Desenvolvimento e Meio Ambiente. *Rev. Adm. Empres.*, 1, 29–56.
- Saha, S. K., Babai, T. C., & Saha, S. (2018). Adventure Tourism in Meghalaya. *J Tourism Hospit*, 7(350), 269–2167.
- Sahu, G. P., & Singh, N. K. (2017, November). Paradigm shift of Indian cash-based economy to cashless economy: a study on Allahabad City. In *Conference on e-Business, e-Services and e-Society* (pp. 453-461). Springer.
- Sair, S. A., & Danish, R. Q. (2018). Effect of performance expectancy and effort expectancy on the mobile commerce adoption intention through personal innovativeness among Pakistani consumers. *Pakistan Journal of Commerce and Social Sciences*, 12(2), 501–520.

- Sakinah, N. E., Rahmatullah, L. T., Kuncoro, E. P., & Oktavetri, N. I. (2019). Performance of sequencing batch reactor (SBR) of treated tofu wastewater: Variation of contact time and activated sludge sources. *IOP Conference Series. Earth and Environmental Science*, 259(1), 012017. Advance online publication. doi:10.1088/1755-1315/259/1/012017
- Sakpal, S., & Soni, R. (n.d.). *A Study of Opportunities and Challenges Faced Towards Sustainability of Digital Payment Banks in India*. Academic Press.
- Samara, E., Georgiadis, P., & Bakouros, I. (2012). The impact of innovation policies on the performance of national innovation systems: A system dynamics analysis. *Technovation*, 32(11), 624–638. doi:10.1016/j.technovation.2012.06.002
- Samuel, P. (1994). *Chitosan as a Coagulant for Recovery of Proteinaceous Solids from*. Academic Press.
- Sánchez-Baracaldo, P., Bianchini, G., Wilson, J. D., & Knoll, A. H. (2021). Cyanobacteria and biogeochemical cycles through Earth history. *Trends in Microbiology*. Advance online publication. doi:10.1016/j.tim.2021.05.008 PMID:34229911
- Sánchez-Baracaldo, P., & Cardona, T. (2019). On the origin of oxygenic photosynthesis and Cyanobacteria. *The New Phytologist*, 225(4), 1440–1446. doi:10.1111/nph.16249 PMID:31598981
- Sánchez, M. B., & Sousa, B. B. (2020). O dark tourism e a perspectiva cultural no marketing dos tempos modernos. In C. Neves (Ed.), *Turismo, Sociedade e Ambiente* (pp. 158–171). Atena Editora. doi:10.22533/at.ed.55320041214
- Santos, V., Ramos, P., Sousa, B., & Valeri, M. (2021). Towards a Framework for the Global Wine Tourism System. *Journal of Organizational Change Management*. Advance online publication. doi:10.1108/JOCM-11-2020-0362
- Saragih, B., & Krisnamurthi, B. (1992). *Agroindustry as a Leading Sector in PJP-II (Agroindustry as a leading sector). Supporting paper in a panel discussion on Education and Research Towards Agro-Industry Development in Long-term Development - Phase II*. Institut Pertanian Bogor.
- Sarfraz, Z., Sarfraz, A., Iftikar, H. M., & Akhund, R. (2021). Is covid-19 pushing us to the fifth industrial revolution (Society 5.0)? *Pakistan Journal of Medical Sciences*, 37(2), 591. doi:10.12669/pjms.37.2.3387 PMID:33679956
- Sari, Y. W., & Division, B. (2021). *The protein challenge : Matching future demand and supply in Indonesia*. doi:10.1002/bbb.2176
- Sarkar, S. (2009). *Rural Tourism Prospects in West Bengal Province*. Berjaya University College of Hospitality.
- Saunders, M., Lewis, P. & Thornhill, A. (2015). *Research Methods for Business Students*. Academic Press.
- Saxena, T., Anuragi, P., Arvind, S., Dorshetwar, K., & Singh, A. (2021). Coronavirus and Its Impact on Indian Sectors. *SSRN Electronic Journal*. doi:10.2139/SSRN.3936285
- Scarre, C., Fagan, B. M., & Golden, C. (2021). *Ancient civilizations*. Routledge. doi:10.4324/9780429401008
- Schiederig, T., Tietze, F., & Herstatt, C. (2012). Green innovation in technology and innovation management - an exploratory literature review. *R & D Management*, 42(2), 180–192.
- Schmidly, D. J., & Bradley, R. D. (2021). Order Soricomorpha—Shrews and Moles. In *The Mammals of Texas* (pp. 93–109). University of Texas Press.
- Schoeman, F. D. (Ed.). (1984). *Philosophical dimensions of privacy: An anthology*. Cambridge University Press. doi:10.1017/CBO9780511625138
- Schot, J., Brand, E., & Fischer, K. (1997). The greening of industry for a sustainable future: Building an international research agenda. *Business Strategy and the Environment*, 6(3), 153–162. doi:10.1002/(SICI)1099-0836(199707)6:3<153::AID-BSE109>3.0.CO;2-Y

Compilation of References

- Schübeler, P., Christen, J., & Wehrle, K. (1996). Conceptual framework for municipal solid waste management in low-income countries (Vol. 9). St. Gallen: SKAT (Swiss Center for Development Cooperation).
- Schulz, K., & Feist, M. (2021). Leveraging blockchain technology for innovative climate finance under the Green Climate Fund. *Earth System Governance*, 7, 100084.
- Science, E., Fernandes, T. V., Shrestha, R., International, W., Sui, Y., & De Sousa, G. P. G. (2015). *Closing Domestic Nutrient Cycles Using Microalgae*. Advance online publication. doi:10.1021/acs.est.5b02858
- Scuotto, V., Garcia-Perez, A., Cillo, V., & Elisa, G. (2019). Do stakeholder capabilities promote sustainable business innovation in small and medium-sized enterprises? Evidence from Italy. *Journal of Business Research*, 119.
- Second Covid wave impacts bank deposits, currency holding with public: RBI article - Times of India. (n.d.). Retrieved October 25, 2021, from <https://timesofindia.indiatimes.com/business/india-business/second-covid-wave-impacts-bank-deposits-currency-holding-with-public-rbi-article/articleshow/83582606.cms>
- Sekaran, U., & Bougie, R. (2016). *Research methods for business: A skill building approach*. John Wiley & Sons.
- Selvaganapathi, R., & Raja, V. P. (2012). Technophobia of Higher Secondary School Teachers. *International Journal of Teacher Educational Research*, 1(3).
- Sen, S., Antara, N., Sen, S., & Chowdhury, S. (2020). The Unprecedented Pandemic 'COVID-19' Effect on the Bangladesh Apparel Workers by Shivering the Apparel Supply Chain. *Journal of Textile and Apparel, Technology and Management*, 11(3), 1–20.
- Septifani, R., Suhartini, S., & Perdana, I. J. (2021). Cleaner production analysis of tofu small scale enterprise. *IOP Conference Series. Earth and Environmental Science*, 733(1), 12055. doi:10.1088/1755-1315/733/1/012055
- Seroja, R., Effendi, H., & Hariyadi, S. (2018). Tofu wastewater treatment using vetiver grass (*Vetiveria zizanioides*) and zeliac. *Applied Water Science*, 8(1), 1–6. doi:10.1007/13201-018-0640-y
- Setiawan, A., Jati, D. R., & Saziati, O. (2021). Penerapan produksi bersih industri kecil tahu di Jalan Parit Pangeran Siantan Pontianak. *Jurnal Rekayasa Lingkungan Tropis*, 5(1). <https://jurnal.untan.ac.id/index.php/jurlis/article/view/44564>
- Setiawan, A.B. (2018). Business Revolution Based On Platform As a Digital Economic Activator In Indonesia. *Journal of Telematics and Information Society*, 9(1), 61-76.
- Shabur, A., Hridoy, M. W., & Rahman, K. A. (2021). The investigation of challenges of implementing Industry 4.0 in Bangladesh. *Academia Letters*, 2.
- Shadat, M. W. B., Islam, M. S., Zahan, I., & Matin, M. (2020). *Digital Literacy of Rural Households in Bangladesh*. Academic Press.
- Shammi, M., Bodrud-Doza, M., Islam, A. R. M. T., & Rahman, M. M. (2021). Strategic assessment of COVID-19 pandemic in Bangladesh: Comparative lockdown scenario analysis, public perception, and management for sustainability. *Environment, Development and Sustainability*, 23(4), 6148–6191. doi:10.1007/10668-020-00867-y PMID:32837281
- Shankar, A., & Rishi, B. (2020). Convenience matter in mobile banking adoption intention? *Australasian Marketing Journal*, 28(4), 273–285. doi:10.1016/j.ausmj.2020.06.008
- Shariatmadari, F., & Forbes, J. M. (2005). Performance of broiler chickens given whey in the food and/or drinking water. *British Poultry Science*, 46(4), 498–505. doi:10.1080/00071660500190900 PMID:16268109
- Sharma, J. (2006). *Tourism Planning and Development. A New Perspective*. Kanishka Publishers.

Sharpley, R. (2001). Tourism in Cyprus: Challenges and opportunities. *Tourism Geographies*, 3(1), 64–86. doi:10.1080/14616680010008711

Shehzad, K., Zaman, U., Ahmad, M., & Liu, X. (2021). Asymmetric Impact of Information and Communication Technologies on Environmental Quality: Analyzing the Role of Financial Development and Energy Consumption. *Environment, Development and Sustainability*. Advance online publication. doi:10.1007/10668-021-01506-w

Shell Source. (2021). *Shell Accelerates Drive for Net for Zero Emission with Customer First Strategy*. <https://www.shell.com/media/news-and-media-releases/2021/shell-accelerates-drive-for-net-zero-emissions-with-customer-first-strategy.html>

Shen, J. (2021). What Roles Do Population and Migration Flows Play in the Spatial Diffusion of COVID-19 from Wuhan City to Provincial Regions in China? *China Review*, 21(3), 189–220.

Shenzhen WONDERLAND-TIME Green Building Technology Co. Ltd. (n.d.). In *Encyclopædia Baidu online*. <https://baike.baidu.com/item/%E6%B7%B1%E5%9C%B3%E4%B8%87%E9%83%BD%E6%97%B6%E4%BB%A3%E7%BB%BF%E8%89%B2%E5%BB%BA%E7%AD%91%E6%8A%80%E6%9C%AF%E6%9C%89%E9%99%90%E5%85%AC%E5%8F%B8/22448288?fr=aladdin>

Shenzhen Yonglixin Hardware Products Co. Ltd. (n.d.). In *Encyclopædia Baidu online*. <https://baike.baidu.com/item/%E6%B7%B1%E5%9C%B3%E5%B8%82%E6%B0%B8%E5%88%A9%E9%91%AB%E4%BA%94%E9%87%91%E5%88%B6%E5%93%81%E6%9C%89%E9%99%90%E5%85%AC%E5%8F%B8/21181903?fr=aladdin>

Sheth, J. (2020). Impact of Covid-19 on consumer behavior: Will the old habits return or die? *Journal of Business Research*, 117, 280–283. Advance online publication. doi:10.1016/j.jbusres.2020.05.059 PMID:32536735

Shiau, W. L., & Chau, P. Y. (2016). Understanding behavioural intention to use a cloud computing classroom: A multiple model comparison approach. *Information & Management*, 53(3), 355–365. doi:10.1016/j.im.2015.10.004

Shilton, A. N., Powell, N., & Guieysse, B. (2012). Plant based phosphorus recovery from wastewater via algae and macrophytes. *Current Opinion in Biotechnology*, 23(6), 884–889. doi:10.1016/j.copbio.2012.07.002 PMID:22889679

Shishlov, I., Morel, R., & Cochran, I. (2016). Beyond Transparency: Unlocking the Full Potential of Green Bonds. *Institute for Climate Economics*, 2016, 1–28.

Shi, X. R., Zheng, Y. X., Lei, Y., Xue, W. B., Yan, G., Liu, X., Cai, B. F., Tong, D., & Wang, J. N. (2021, November). Air quality benefits of achieving carbon neutrality in China. *The Science of the Total Environment*, 795, 148784. doi:10.1016/j.scitotenv.2021.148784 PMID:34246132

Shurtleff, W., & Aoyagi, A. (2013). *History of tofu and tofu products (965 CE to 2013) : Extensively annotated bibliography and sourcebook*. Academic Press.

Siddiqui, K. (2020). The Study of Economic History and the Importance of Understanding the Past. *WORLD (Oakland, Calif.)*.

Siegel, D. M. (2008). *Accepting technology and overcoming resistance to change using the motivation and acceptance model*. Retrieved from http://etd.fcla.edu/CF/CFE0002154/Siegel_Daniel_M_200805_PhD.pdf

Simatupang, P., & Purwoto, A. (1990). *Pengembangan Agroindustri Sebagai Penggerak Pembangunan Desa*. Prosiding Agroindustri Faktor Penunjang Pembangunan Pertanian di Indonesia. Pusat Penelitian Sosial Ekonomi Pertanian.

Sim, K., Chua, H. C., Vieta, E., & Fernandez, G. (2020). The anatomy of panic buying related to the current COVID-19 pandemic. *Psychiatry Research*, 288, 113015. <https://doi.org/10.1016/J.PSYCHRES.2020.113015>

Singh, S. K. (2020). *E-Payment—A Study of Banking System in India*. Academic Press.

Compilation of References

- Singh, B., & Malhotra, P. (2004). Adoption of Internet banking: An empirical investigation of Indian banking Sector. *Journal of Internet Banking and Commerce*, 9(2), 9909–05.
- Singh, S., & Srivastava, R. K. (2020). Understanding the intention to use mobile banking by existing online banking customers: An empirical study. *Journal of Financial Services Marketing*, 25(3), 86–96. doi:10.105741264-020-00074-w
- Singh, S., & Srivastava, S. (2019). Engaging consumers in multichannel online retail environment: A moderation study of platform type on interaction of e-commerce and m-commerce. *Journal of Modelling in Management*, 14(1), 49–76. doi:10.1108/JM2-09-2017-0098
- Sintawardani, N., Thye, Y. P., & Hamidah, U. 2013. Environmental Awareness of Local Government and Community to Support Applied Technological Solutions. In *Proc. The 12th Science Council Asia (SCA) Conference & International Symposium*. LIPI Press.
- Skaf, L., Franzese, P. P., Capone, R., & Buonocore, E. (2021). Unfolding hidden environmental impacts of food waste: An assessment for fifteen countries of the world. *Journal of Cleaner Production*, 310, 127523. doi:10.1016/j.jclepro.2021.127523
- Slack, R. J., Gronow, J. R., & Voulvoulis, N. (2009). The management of household hazardous waste in the United Kingdom. *Journal of Environmental Management*, 90(1), 36–42. doi:10.1016/j.jenvman.2008.03.007 PMID:18423843
- Slaper, T. F., & Hall, T. J. (2011). The triple bottom line: What is it and how does it work. *Indiana Business Review*, 86(1), 4-8.
- SmithA.NobaneeH. (2020). Artificial Intelligence: In Banking a Mini-Review. Available at SSRN 3539171.
- Smith, W. W. (2007, October). New Horizons in Tourism: Strange Experiences and Stranger Practices. *Annals of Tourism Research*, 34(4), 1093–1095. doi:10.1016/j.annals.2007.04.006
- Soekartawi. (2005). *Agro-Industry in the Socio-Economic Perspective*. PT Raja Grafindo Persada.
- Soekartawi. (2005a). *Agribisnis: Teori dan Aplikasinya [Agribusiness: Theory and Practice]* (8th ed.). RajaGrafindo Persada.
- Sohn, S., & Groß, M. (2020). Understanding the inhibitors to consumer mobile purchasing intentions. *Journal of Retailing and Consumer Services*, 55(April), 102–129. doi:10.1016/j.jretconser.2020.102129
- Solomon, M. R. (2010). *Consumer behaviour: A European perspective*. Prentice Hall/Financial Times.
- Song, M., Cen, L., Zheng, Z., Fisher, R., Liang, X., Wang, Y., & Huisingh, D. (2017). How would big data support societal development and environmental sustainability? Insights and practices. *Journal of Cleaner Production*, 142, 489–500. doi:10.1016/j.jclepro.2016.10.091
- Soni, G., Mangla, S. K., Singh, P., Dey, B. L., & Dora, M. (2021). Technological interventions in social business: Mapping current research and establishing future research agenda. *Technological Forecasting and Social Change*, 169, 120818. doi:10.1016/j.techfore.2021.120818
- Soni, P., & Krishnan, R. T. (2014). Frugal innovation: Aligning theory, practice, and public policy. *Journal of Indian Business Research*, 6(1), 29–47. doi:10.1108/JIBR-03-2013-0025
- Soorani, F., & Ahmadvand, M. (2019). Determinants of consumers' food management behavior: Applying and extending the theory of planned behavior. *Waste Management (New York, N.Y.)*, 98, 151–159. doi:10.1016/j.wasman.2019.08.025 PMID:31446255

- Soppe, A. (2004). Sustainable corporate finance. *Journal of Business Ethics*, 53(1), 213–224. doi:10.1023/B:BUSI.0000039410.18373.12
- Soumik, R. (2019). *Fintech companies prove Gates' point: Banking is necessary, banks are not*. Retrieved September 4, 2020, from <https://techwireasia.com/2019/11/fintech-companies-prove-gates-point-banking-is-necessary-banks-are-not/>
- Sousa, B. B., Castro, C., Luís, M. E., & Lopes, P. (2021). Religious and Spiritual Tourism: From Its Origins to Alentejo (Portugal). In *Global Development of Religious Tourism* (pp. 44-64). IGI Global.
- Sousa, B. B., Machado, A. F., Igreja, C. M., & Campos, J. G. (2020). As redes sociais como veículo para combater os efeitos nefastos do covid-19: Um estudo exploratório no contexto turístico português, *Cambiassu. Estudos em Comunicação*, 15(25), 21–35.
- Sousa, B. B., & Magalhães, F. C. (2019). An Approach on Attachment in Public Marketing and Higher Education Management Contexts. In C. Machado & J. Davim (Eds.), *Higher Education and the Evolution of Management, Applied Sciences, and Engineering Curricula* (pp. 151–171). IGI Global. doi:10.4018/978-1-5225-7259-6.ch006
- Sousa, B., & Rocha, A. T. (2019). The role of attachment in public management and place marketing contexts: A case study applied to Vila de Montalegre (Portugal). *International Journal of Public Sector Performance Management*, 5(2), 189–205. doi:10.1504/IJPSPM.2019.099094
- Soylu, D. & Andekina, R. (2021). Evolution and development of the triple helix model in Turkey. *InterConf*, 89-94.
- Spena, T. R., Caridà, A., Colurcio, M., & Melia, M. (2012). Store experience and co-creation: The case of temporary shop. *International Journal of Retail & Distribution Management*, 40(1), 21–40. doi:10.1108/09590551211193586
- Spenceley, A., & Seif, J. (2003). *Strategies, impacts and costs of pro-poor tourism approaches in South Africa*. Overseas Development Institute.
- Spencer, J. (2021). The Sustainable Development Goals. In *Design for Global Challenges and Goals* (pp. 12–25). Routledge. doi:10.4324/9781003099680-3
- Sremac, S., Stević, Ž., Pamučar, D., Arsić, M., & Matic, B. (2018). Evaluation of a third-party logistics (3PL) provider using a rough SWARA–WASPAS model based on a new rough dombi aggregator. *Symmetry*, 10(8), 305. doi:10.3390ym10080305
- Srinivasan, R. (2019). Supply chain and shipping management: A key factor for logistic innovation. *International Journal of Engineering and Advanced Technology*, 414–417.
- Sriwuryandari, L., Widyarani, Priantoro, E. A., Muchlis, Hamidah, U., Sembiring, T., & Sintawardani, N. (2019). Performance of the three-stages anaerobic tofu wastewater treatment during the second start-up process. *IOP Conference Series: Earth and Environmental Science*, 277(1), 6–13. 10.1088/1755-1315/277/1/012010
- Stafford, S. L. (2002). The effect of punishment on firm compliance with hazardous waste regulations. *Journal of Environmental Economics and Management*, 44(2), 290–308. doi:10.1006/jjem.2001.1204
- Starnawska, S. E. (2021). Sustainability in the Banking Industry Through Technological Transformation. In *The Palgrave Handbook of Corporate Sustainability in the Digital Era* (pp. 429–453). Palgrave Macmillan. doi:10.1007/978-3-030-42412-1_22
- Statistics, I. (2018). *Village Potential Statistics of Indonesia*. Jakarta: Indonesia Statistics. Retrieved from <https://www.bps.go.id/publication/download.html?nrbvfeve=MTk2ZWwNDk4NmE0NTQwMjYxYmE5OTRk&xzmn=aHR0cHM6Ly93d3cuYnBzLmdvLmlkL3B1YmxpY2F0aW9uLzlwMTgvMTIvMTcvMTk2ZWwNDk4NmE0NTQwMjYxYmE5OTRkL3BvdGVuc2ktZGVzYS0yMDE4Lmh0bWw%3D&twoadfnarfeauf=MjAyMS0wOC0xMSAwO>

Compilation of References

- Stephan, R. M., Mohtar, R. H., Daher, B., Embid Irujo, A., Hillers, A., Ganter, J. C., Karlberg, L., Martin, L., Nairizi, S., Rodriguez, D. J., & Sarni, W. (2018). Water–energy–food nexus: A platform for implementing the Sustainable Development Goals. *Water International*, 43(3), 472–479. doi:10.1080/02508060.2018.1446581
- Steward, S. (2020). What does that shirt mean to you? Thrift-store consumption as cultural capital. *Journal of Consumer Culture*, 20(4), 457–477. doi:10.1177/1469540517745707
- Stock, T., & Seliger, G. (2016). Opportunities of sustainable manufacturing in industry 4.0. *Procedia CIRP*, 40, 536–541. doi:10.1016/j.procir.2016.01.129
- Stone, P. (2006). A Dark Tourism Spectrum: Towards a typology of death and macabre related tourist sites, attractions and exhibitions. *Tourism: An Interdisciplinary International Journal*, 54(2), 145–160.
- Stone, P. (2012). Dark tourism and significant other death: Towards a model of mortality mediation. *Annals of Tourism Research*, 39(3), 1565–1587. doi:10.1016/j.annals.2012.04.007
- Stone, P., & Sharpley, R. (2008). Consuming Dark Tourism: A Thanatological Perspective. *Annals of Tourism Research*, 35(2), 574–595. doi:10.1016/j.annals.2008.02.003
- Strauss, J., & Frost, R. (2014). *E-marketing*. Pearson Education.
- Streiner, D. L. (2003). Being inconsistent about consistency: When coefficient alpha does and doesn't matter. *Journal of Personality Assessment*, 80(3), 217–222. doi:10.1207/S15327752JPA8003_01 PMID:12763696
- Suchiang, B. R., Nonghuloo, I. M., Kharbhih, S., Singh, P. P., Tiwary, R., Adhikari, D., Upadhaya, K., Ramanujam, P., & Barik, S. K. (2020). Tree diversity and community composition in sacred forests are superior than the other community forests in a human-dominated landscape of Meghalaya. *Tropical Ecology*, 61(1), 84–105. doi:10.100742965-020-00066-w
- Suh, B., & Han, I. (2002). Effect of trust on customer acceptance of Internet banking. *Electronic Commerce Research and Applications*, 1(3-4), 247–263. doi:10.1016/S1567-4223(02)00017-0
- Sumardiono, S., Budiyo, B., Syaichurrozi, I., & Budi Sasongko, S. (2014). Utilization of Biogas as Carbon Dioxide Provider for *Spirulina platensis* Culture. *Current Research Journal of Biological Sciences*, 6(1), 53–59. doi:10.19026/crjbs.6.5498
- Sun, C., & Zhai, Z. (2020). The efficacy of social distance and ventilation effectiveness in preventing COVID-19 transmission. *Sustainable Cities and Society*, 62, 102390. <https://doi.org/10.1016/J.SCS.2020.102390>
- Sun, D. X., Zeng, S. X., Lin, H., Meng, X. H., & Byungjun, Y. (2019). Can transportation infrastructure pave a green way? A city-level examination in China. *Journal of Cleaner Production*, 226, 669–678. doi:10.1016/j.jclepro.2019.04.124
- Sun, J., & Lv, X. (2021). Feeling dark, seeing dark: Mind–body in dark tourism. *Annals of Tourism Research*, 86, 103087. doi:10.1016/j.annals.2020.103087
- Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D. (2008). What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education*, 50(4), 1183–1202. doi:10.1016/j.compedu.2006.11.007
- Suoranta, M., & Mattila, M. (2004). Mobile banking and consumer behaviour: New insights into the diffusion pattern. *Journal of Financial Services Marketing*, 8(4), 354–366. doi:10.1057/palgrave.fsm.4770132
- Supriyati, A. S., Suryani, E., & Tarigan, H. (2006). Analisis Peningkatan Nilai Tambah melalui Pengembangan Agro-industri di Pedesaan. Laporan Penelitian. Pusat Analisis Sosial Ekonomi dan Kebijakan Pertanian.

- Supriyati, A., & Suryani, E. (2006). Peranan, peluang dan kendala pengembangan agroindustri di Indonesia. *Forum Penelitian Agro Ekonomi*, 24(2), 92 – 106.
- Susam, S. O., & Ucer, B. H. (2019). Modeling the Dependence Structure of CO2 Emissions and Energy Consumption Based on the Archimedean Copula Approach: The Case of the United States. *Energy Sources. Part B, Economics, Planning, and Policy*, 14(6), 274–289. doi:10.1080/15567249.2019.1671550
- Susanto, H. (2019). Toward Big Data's Impact on the Learning Process: Generation Y and Z Perspectives. In *The Emerging Technology of Big Data* (pp. 65-92). Apple Academic Press.
- Susanto, A., Chang, Y., & Ha, Y. (2016). Determinants of continuance intention to use the smartphone banking services: An extension to the expectation-confirmation model. *Industrial Management & Data Systems*, 116(3), 508–525. doi:10.1108/IMDS-05-2015-0195
- Susanto, H. (2017). Electronic Health System: Sensors Emerging and Intelligent Technology Approach. In *Smart Sensors Networks* (pp. 189–203). Elsevier. doi:10.1016/B978-0-12-809859-2.00012-7
- Susanto, H. (2018). Smart mobile device emerging Technologies: An enabler to Health Monitoring system. In *High-Performance Materials and Engineered Chemistry* (pp. 241–264). Apple Academic Press. doi:10.1201/9781315187860-8
- Susanto, H., & Almunawar, M. N. (2015). Managing Compliance with an Information Security Management Standard. In *Encyclopedia of Information Science and Technology* (3rd ed., pp. 1452–1463). IGI Global. doi:10.4018/978-1-4666-5888-2.ch138
- Susanto, H., & Almunawar, M. N. (2018). *Information Security Management Systems: A Novel Framework and Software as a Tool for Compliance with Information Security Standard*. CRC Press. doi:10.1201/9781315232355
- Susanto, H., Almunawar, M. N., Leu, F. Y., & Chen, C. K. (2016). Android vs iOS or Others? SMD-OS Security Issues: Generation Y Perception. *International Journal of Technology Diffusion*, 7(2), 1–18. doi:10.4018/IJTD.2016040101
- Susanto, H., & Chen, C. K. (2017). Information and Communication Emerging Technology: Making Sense of Healthcare Innovation. In *Internet of Things and Big Data Technologies for Next Generation Healthcare* (pp. 229–250). Springer. doi:10.1007/978-3-319-49736-5_10
- Susanto, H., & Chen, C. K. (2019). The Evolution of Learning Analytics Through Big Data's Emerging Technology. In *The Emerging Technology of Big Data* (pp. 153–171). Apple Academic Press. doi:10.1201/9781351241250-7
- Susanto, H., Chen, C. K., & Almunawar, M. N. (2018). Revealing Big Data Emerging Technology as Enabler of LMS Technologies Transferability. In *Internet of Things and Big Data Analytics Toward Next-Generation Intelligence* (pp. 123–145). Springer. doi:10.1007/978-3-319-60435-0_5
- Susanto, H., Hamid, H., Mohiddin, F., & Setiana, D. (2021). Role of Learning Technology Strategies Among People With Disabilities: A Job Opportunities Barrier. In *Handbook of Research on Analyzing IT Opportunities for Inclusive Digital Learning* (pp. 215–248). IGI Global. doi:10.4018/978-1-7998-7184-2.ch012
- Susanto, H., Ibrahim, F., Nazmudeen, S. H., Mohiddin, F., & Setiana, D. (2021). Human-Centered Design to Enhance the Usability, Human Factors, and User Experience Within Digital Destructive Ecosystems. In *Global Challenges and Strategic Disruptors in Asian Businesses and Economies* (pp. 76–94). IGI Global. doi:10.4018/978-1-7998-4787-8.ch005
- Susanto, H., Leu, F.-Y., Caesarendra, W., Ibrahim, F., Haghi, P. K., Khusni, U., & Glowacz, A. (2020). Managing Cloud Intelligent Systems over Digital Ecosystems: Revealing Emerging App Technology in the Time of the COVID19 Pandemic. *Appl. Syst. Innov.*, 3(3), 37. doi:10.3390/asi3030037

Compilation of References

- Svatošová, V. (2015). The use of marketing management tools in e-commerce. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 63(1), 303–312. doi:10.11118/actaun201563010303
- Swain, M. R., Estrela, R., Roudier, G. M., Sotin, C., Rimmer, P. B., Valio, A., West, R., Pearson, K., Huber-Feely, N., & Zellem, R. T. (2021). Detection of an Atmosphere on a Rocky Exoplanet. *The Astronomical Journal*, 161(5), 213. doi:10.3847/1538-3881/abe879
- Tabak, F., & Nguyen, N.T. (2013). *Technology Acceptance and Performance in Online Learning Environments: Impact of Self-Regulation*. Academic Press.
- Takieddine, S., & Sun, J. (2015). Internet banking diffusion: A country-level analysis. *Electronic Commerce Research and Applications*, 14(5), 361–371. doi:10.1016/j.elerap.2015.06.001
- Tambunan, M., & Priyanto, S. H. (2005). Changes in Economic Structure and the Role of Agro-Industry in the Process of Agricultural Industrialization in Indonesia. In *Economic Thoughts and Problems in Indonesia in the Last Half Century*. Canisius Collaboration and Indonesian Economic Bachelor Association.
- Tambunan, T. (2019). Recent evidence of the development of micro, small and medium enterprises in Indonesia. *Journal of Global Entrepreneurship Research*, 9(1), 18. Advance online publication. doi:10.118640497-018-0140-4
- Tapscott, D. (1997). *The digital economy: Promise and peril in the age of networked intelligence*. New York: McGraw-Hill.
- Tarhan, C., & Çil, M. A. (2021). A study on hydrogen, the clean energy of the future: Hydrogen storage methods. *Journal of Energy Storage*, 40, 102676. doi:10.1016/j.est.2021.102676
- Taşel, F. (2020). Evaluation of Covid19 Pandemic From an Economic Perspective. *Journal of International Trade, Logistics and Law*, 6(2), 176–181.
- Taufiq, R., Hidayanto, A. N., & Prabowo, H. (2018, September). The affecting factors of blockchain technology adoption of payments systems in Indonesia banking industry. In *2018 International Conference on Information Management and Technology (ICIMTech)* (pp. 506-510). IEEE. 10.1109/ICIMTech.2018.8528104
- Teixeira, A. A. C., & Barros, D. (2020). Technology Balance of Payments and Countries' International Competitiveness. A Dynamic Panel Data Analysis of OECD Countries, 2000-2017. *Applied Economics Letters*, 27(12), 992–996. doi:10.1080/13504851.2019.1654599
- Telaumbanua, M., Triyono, S., Haryanto, A., & Kusuma Wisnu, F. (n.d.). *Controlled electrical conductivity (EC) of tofu wastewater as a hydroponic nutrition*. <http://www.procedia-esem.eu>
- Teo, T. S. H., & Yu, Y. (2005). Online buying behavior: A transaction cost economics perspective. *Omega The International Journal of Management Science*, 33(5), 451–465. doi:10.1016/j.omega.2004.06.002
- Tham, K. W., Dastane, O., Johari, Z., & Ismail, N. B. (2019). Perceived Risk Factors Affecting Consumers' Online Shopping Behaviour. *The Journal of Asian Finance, Economics and Business*, 6(4), 246–260. doi:10.13106/jafeb.2019.vol6.no4.249
- The Agency of and Human Resources Research and Development. (2019). *Development and Strategy of Digital Economy Development Direction*. Joint research between the Center of Research and Development on Informatics Application, Information and Public Communication, Research and Development Agency in the Ministry of Communication and Information Technology of the Republic of Indonesia and Bogor Institute of Agricultural.
- The Impact of Coronavirus On The Indian Auto Industry. (n.d.). Retrieved October 25, 2021, from <https://www.cars24.com/blog/impact-of-coronavirus-on-indian-auto-industry/>

- The Indonesian Internet Service Providers Association (APJII). (2018-2020). *Indonesia's internet penetration rate*. <https://apjii.or.id/survei>
- Theodoridis, P., & Chatzipanagiotou, K. (2009). Store image attributes and customer satisfaction across different customer profiles within the supermarket sector in Greece. *European Journal of Marketing*, 43(5-6), 708–734. doi:10.1108/03090560910947016
- Thomas, D. N. (2004). Dissolved Organic Matter (DOM) in Aquatic Ecosystems: A Study of European Catchments and Coastal Waters. The Domaine Project.
- Thomas, D. J., & Griffin, P. M. (1996). Coordinated supply chain management. *European Journal of Operational Research*, 94(1), 1–15. doi:10.1016/0377-2217(96)00098-7
- Thomas, S. (2013). Linking customer loyalty to customer satisfaction and store image: A structural model for retail stores. *Decision (Washington, D.C.)*, 40(1-2), 15–25. doi:10.1007/40622-013-0007-z
- Thompson, H. G. Jr, & Garbacz, C. (2007). Mobile, fixed line and Internet service effects on global productive efficiency. *Information Economics and Policy*, 19(2), 189–214. doi:10.1016/j.infoecopol.2007.03.002
- Tiwari, M. (2008). ICTs and poverty reduction: User perspective study of rural Madhya Pradesh, India. *European Journal of Development Research*, 20(3), 448–461. Advance online publication. doi:10.1080/09578810802245600
- Todaro, M. P., & Smith, S. C. (2006). *Economic Development*. Erlangga.
- Toivonen, T., Norasakkunkit, V., & Uchida, Y. (2011). Unable to conform, unwilling to rebel? Youth, culture, and motivation in globalizing japan. *Frontiers in Psychology*, 2, 207. Advance online publication. doi:10.3389/fpsyg.2011.00207 PMID:21949510
- Tole, C. (2018). *Dark tourism: The destinations we don't talk about*. Academic Press.
- Tomczak, W., & Ferrasse, J. (2018). *ScienceDirect Effect of hydraulic retention time on a continuous biohydrogen production in a packed bed biofilm reactor with recirculation flow of the liquid phase*. doi:10.1016/j.ijhydene.2018.08.094
- Tragust, S., Herrmann, C., Häfner, J., Braasch, R., Tilgen, C., Hoock, M., Milidakis, M. A., Gross, R., & Feldhaar, H. (2020). Formicine ants swallow their highly acidic poison for gut microbial selection and control. *eLife*, 9, e60287. doi:10.7554/eLife.60287 PMID:33138912
- Tsiakis, T., & Sthephanides, G. (2005). The concept of security and trust in electronic payments. *Computers & Security*, 24(1), 10–15. doi:10.1016/j.cose.2004.11.001
- Tu, J., Chiu, P., Huang, Y., & Hsu, C. (2013). Influential Factors and Strategy of Sustainable Product Development under Corporate Social Responsibility in Taiwan. *Mathematical Problems in Engineering*, 2013, 1–15. doi:10.1155/2013/303850
- Tung, F. C., Yu, T. W., & Yu, J. L. (2014). An extension of financial cost, information quality and IDT for exploring consumer behavioural intentions to use the internet banking. *International Review of Management and Business Research*, 3(2), 1229.
- Tun, P. M. (2020). An Investigation of Factors Influencing Intention to Use Mobile Wallets of Mobile Financial Services Providers in Myanmar. *The Asian Journal of Technology Management*, 13(2), 129–144. doi:10.12695/ajtm.2020.13.2.3
- Turner, M., Kitchenham, B., Brereton, P., Charters, S., & Budgen, D. (2010). *Does the technology acceptance model predict actual use? A systematic literature review*. doi:10.1016/j.infsof.2009.11.005
- Tu, Y., & Wu, W. K. (2021). How does green innovation improve enterprises' competitive advantage? The role of organizational learning. *Sustainable Production and Consumption*, 26, 504–516.

Compilation of References

- Udovč, A., & Perpar, A. (2007). Role of rural tourism for development of rural areas. *Journal of Central European Agriculture*, 8(2), 223–228.
- Umar, T., Egbu, C., Ofori, G., Honnurvali, M. S., Saidani, M., Shibani, A., Opoku, A., Gupta, N., & Goh, K. (2020, March). UAE's commitment towards UN Sustainable Development Goals. *Proceedings of the Institution of Civil Engineers. Engineering Sustainability*, 173(7), 325–343. doi:10.1680/jensu.19.00036
- Ünal, Y., Alır, G., & Soydal, İ. (2013, September). Students readiness for e-learning: an assessment on Hacettepe University Department of Information Management. In *International Symposium on Information Management in a Changing World* (pp. 137-147). Springer.
- UNCTAD. (2021). *Global E-Commerce Jumps to \$26.7 Trillion, Covid-19 Boosts Online Retail Sales*. Retrieved Online from: <https://unctad.org/press-material/global-e-commerce-jumps-267-trillion-covid-19-boosts-online-retail-sales>
- Unemployment. (n.d.). Retrieved October 19, 2021, from <https://unemploymentinindia.cmie.com/>
- UNEP. (2018). *Our planet is drowning in plastic pollution—it's time for change!* Retrieved 18 September 2021, from <https://www.unep.org/interactive/beat-plastic-pollution/>
- UNIDO Green Industry - Policies for supporting Green Industry. (2011). Retrieved 16 September 2021, from https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Policies%20for%20supporting%20green%20industry_UNIDO.pdf
- United Nation Conference on Trade and Development. (2019). *Digital Economy Report 2019-Value Creation and Capture: Implication For Developing Countries*. United Nations.
- United Nations World Tourism Organization (UNWTO). (2004). *Tourism Congestion Management at Natural and Cultural Sites*. Madrid: World Tourism Organization.
- Upadhyay, P., & Jahanyan, S. (2016). Analysing user perspective on the factors affecting use intention of mobile based transfer payment. *Internet Research*, 26(1), 38–56. doi:10.1108/IntR-05-2014-0143
- Urban, M. A., & Wójcik, D. (2019). Dirty banking: Probing the gap in sustainable finance. *Sustainability*, 11(6), 1745. doi:10.3390/s11061745
- Urry, J. (1990). The consumption of tourism. *Sociology*, 24(1), 23–35. doi:10.1177/0038038590024001004
- Van Ark, B., Erumban, A., Corrado, C., & Levanon, G. (2016). *Navigating the new digital economy: driving digital growth and productivity from installation to deployment*. Academic Press.
- van der Riet, W. B., Wight, A. W., Cilliers, J. J. L., & Datel, J. M. (1989). Food chemical investigation of tofu and its byproduct okara. *Food Chemistry*, 34(3), 193–202. doi:10.1016/0308-8146(89)90140-4
- Van Lier, J. B., Van Der Zee, F. P., Tan, N. C. G., Rebac, S., & Kleerebezem, R. (2001). Advances in high-rate anaerobic treatment: Staging of reactor systems. *Water Science and Technology*, 44(8), 15–25. doi:10.2166/wst.2001.0454 PMID:11730131
- Varblane, U., Dyker, D., & Tamm, D. (2007). How to improve the national innovation systems of catching-up economies? *Trames Journal of the Humanities and Social Sciences*, 11.
- Venkatesh, V., Sykes, T. A., & Zhang, X. (2011). *Just what the doctor ordered: a revised UTAUT for EMR system adoption and use by doctors*. Paper presented at the 2011 44th Hawaii International Conference on System Sciences. 10.1109/HICSS.2011.1

- Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, 39(2), 273–315. doi:10.1111/j.1540-5915.2008.00192.x
- Venkatesh, V., & Brown, S. A. (2001). A longitudinal investigation of personal computers in homes: Adoption determinants and emerging challenges. *Management Information Systems Quarterly*, 25(1), 71–102. doi:10.2307/3250959
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186–204. doi:10.1287/mnsc.46.2.186.11926
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *Management Information Systems Quarterly*, 3(2), 425–478. doi:10.2307/30036540
- Venkat, K. (2001). Digital Divide and Poverty. *Journal of Poverty*, 5(4), 113–116. Advance online publication. doi:10.1300/J134v05n04_06
- Vesković, S., Stević, Ž., Stojić, G., Vasiljević, M., & Milinković, S. (2018). Evaluation of the railway management model by using a new integrated model DELPHI-SWARA-MABAC. *Decision Making: Applications in Management and Engineering*, 1(2), 34–50. doi:10.31181/dmame1802034v
- Vial, G. (2021). Understanding digital transformation: A review and a research agenda. *Managing Digital Transformation: Understanding the Strategic Process*.
- Vietnam Ministry of Natural Resources and Environment. (2020). *Report on the current state of the national environment in 2019*. Dan Tri Publishing House.
- Vishwanathan, K. H., Govindaraju, K., Singh, V., & Subramanian, R. (2011). Production of Okara and Soy Protein Concentrates Using Membrane Technology. *Journal of Food Science*, 76(1), E158–E164. doi:10.1111/j.1750-3841.2010.01917.x PMID:21535668
- Visschers, V. H., Wickli, N., & Siegrist, M. (2016). Sorting out food waste behaviour: A survey on the motivators and barriers of self-reported amounts of food waste in households. *Journal of Environmental Psychology*, 45, 66–78.
- Vives, X. (2017). The impact of FinTech on banking. *European Economy*, (2), 97–105.
- von Kameke, C., & Fischer, D. (2018). Preventing household food waste via nudging: An exploration of consumer perceptions. *Journal of Cleaner Production*, 184, 32–40. doi:10.1016/j.jclepro.2018.02.131
- Vyas, S. D. (2012). Impact of e-banking on traditional banking services. *arXiv preprint arXiv:1209.2368*.
- Waddock, S. A., & Graves, S. B. (1997). The corporate social performance–financial performance link. *Strategic Management Journal*, 18(4), 303–319. doi:10.1002/(SICI)1097-0266(199704)18:4<303::AID-SMJ869>3.0.CO;2-G
- Wagiman, W., & Suryandono, A. (2014). A Tofu Wastewater Treatment with A Combination of Anaerobic Baffled Reactor and Activated Sludge System. *AgriTECH*, 26(1). Advance online publication. doi:10.22146/AGRITECH.9471
- Wagner, T., & Arnold, P. (2008). A new model for solid waste management: An analysis of the Nova Scotia MSW strategy. *Journal of Cleaner Production*, 16(4), 410–421. doi:10.1016/j.jclepro.2006.08.016
- Waheed, M., & Hussain, M. F. (2010). *Empirical study of e-learner contentment towards e-Learning: Influential role of key factors*. The 2010 MIT LINC Conference in Stratton Center on the MIT Campus, Boston, MA.
- Waller, M. A., & Fawcett, S. E. (2013). Data science, predictive analytics, and big data: A revolution that will transform supplychain design and management. *Journal of Business Logistics*, 34(2), 77–84. doi:10.1111/jbl.12010
- Wang, N. (1999). Rethinking authenticity in tourism experience. *Pergamon*, 6(2), 349-370.

Compilation of References

- Wang, C., Nie, P. Y., Peng, D. H., & Li, Z. H. (2017). Green insurance subsidy for promoting clean production innovation. *Journal of Cleaner Production*, *148*, 111–117.
- Wang, E. H. H. (1999). ICT and economic development in Taiwan: Analysis of the evidence. *Telecommunications Policy*, *23*(3–4), 235–243. doi:10.1016/S0308-5961(99)00005-1
- Wang, E., Shen, C., Zheng, J., Wu, D., & Cao, N. (2020). The antecedents and consequences of awe in dark tourism. *Current Issues in Tourism*, 1–15.
- Wang, G., Gunasekaran, A., Ngai, E. W. T., & Papadopoulos, T. (2016). Big data analytics in logistics and supply chain management: Certain investigations for research and applications. *International Journal of Production Economics*, *176*, 98–110. doi:10.1016/j.ijpe.2016.03.014
- Wang, H. L., & Cavins, J. F. (1989). Yield and amino acid composition of fractions obtained during tofu production. *Cereal Chemistry*, *66*(5), 359–361.
- Wang, J. Z., Chen, X., Li, X. X., Yu, J., & Zhong, R. (2020). The market reaction to green bond issuance: Evidence from China. *Pacific-Basin Finance Journal*, *60*, 101294. doi:10.1016/j.pacfin.2020.101294
- Wang, M. Y., Li, Y. M., Li, J. Q., & Wang, Z. T. (2021). Green process innovation, green product innovation and its economic performance improvement paths: A survey and structural model. *Journal of Environmental Management*, *297*, 113282. doi:10.1016/j.jenvman.2021.113282 PMID:34314965
- Wang, S. K., Wang, X., Miao, J., & Tian, Y. T. (2018). Tofu whey wastewater is a promising basal medium for microalgae culture. *Bioresource Technology*, *253*, 79–84. doi:10.1016/j.biortech.2018.01.012 PMID:29331517
- Wang, T., Lu, Y., Wang, J., Dai, H.-N., Zheng, X., & Jia, W. (2021). Eihdp: Edge-intelligent hierarchical dynamic pricing based on cloud-edge-client collaboration for iot systems. *IEEE Transactions on Computers*, *70*(8), 1285–1298. doi:10.1109/TC.2021.3060484
- Wang, W., Tian, Z., Xi, W. J., Tan, Y. R., & Deng, Y. (2021). The influencing factors of China's green building development: An analysis using RBF-WINGS method. *Building and Environment*, *188*, 107425. doi:10.1016/j.buildenv.2020.107425
- Wang, X. Z. (2010). Is China the world's largest energy consumer? *Big View*, *000*(26), 80–82.
- Warnes, S. L., Little, Z. R., & Keevil, C. W. (2015). Human coronavirus 229E remains infectious on common touch surface materials. *mBio*, *6*(6). <https://doi.org/10.1128/MBIO.01697-15>
- Weiss, B. P., Bai, X. N., & Fu, R. R. (2021). History of the solar nebula from meteorite paleomagnetism. *Science Advances*, *7*(1), eaba5967. doi:10.1126/sciadv.aba5967 PMID:33523830
- Werner, C. M., Turner, J., Shipman, K., Twitchell, F. S., Dickson, B. R., Brusckke, G. V., & Wolfgang, B. (1995). Commitment, behavior, and attitude change: An analysis of voluntary recycling. *Journal of Environmental Psychology*, *15*(3), 197–208. doi:10.1016/0272-4944(95)90003-9
- Whang, Lee, & Seungjin. (2001). *E-business and supply chain integration*. Stanford University. https://www.thebci.org/uploads/assets/uploaded/c5_0072bf-df5c-4c98-a5e1876aafb15bd0.pdf
- WHO. (2021). *Corona Virus (Covid-19) Global cases*. Retrieved Online from: <https://covid19.who.int/>
- Widayat, P. J., & Wibisono, J. (2018). Cultivation of Microalgae Chlorella sp on Fresh Water and Waste Water of Tofu Industry. *E3S Web of Conferences*, *31*, 2017–2019. doi:10.1051/e3sconf/20183104009

- Widyarani, B. B., Butar Butar, E. S., Dara, F., Hamidah, U., Sriwuryandari, L., Hariyadi, H. R., & Sintawardani, N. (2019). Distribution of protein fractions in tofu whey wastewater and its potential influence on anaerobic digestion. *IOP Conference Series. Earth and Environmental Science*, 277(1), 012012. Advance online publication. doi:10.1088/1755-1315/277/1/012012
- Widyarani, V., Victor, Y., Sriwuryandari, L., Priantoro, E. A., Sembiring, T., & Sintawardani, N. (2018). Influence of pH on biogas production in a batch anaerobic process of tofu wastewater. *IOP Conference Series. Earth and Environmental Science*, 160(1), 012014. Advance online publication. doi:10.1088/1755-1315/160/1/012014
- William, H., Jr. K. (2017). *Moles*. Retrieved 22 September 2021, from https://sfyl.ifas.ufl.edu/media/sfylifasufledu/sfyl-assets/lawn-amp-garden/pdfs/Moles-Revision_May-2017.pdf
- Woen, A., Sylvia, C., & Handoko, H., & Abdurachman, E. (2018). E-learning acceptance analysis using technology acceptance model (Tam) (case study: Stmik mikroskil). *Journal of Theoretical and Applied Information Technology*, 96, 6292–6305.
- Wong, Y.-T., Osman, S., Jamaluddin, A., & Yin-Fah, B. C. (2012). Shopping motives, store attributes and shopping enjoyment among Malaysian youth. *Journal of Retailing and Consumer Services*, 19(2), 240–248. doi:10.1016/j.jretconser.2012.01.005
- World Bank. (2018). *Assess the management of domestic solid waste and hazardous industrial waste, options and actions to implement the national strategy*. Hong Duc Publishing House.
- World Bank. (2021). *Beyond Unicorns: Harnessing Digital Technologies for Inclusion in Indonesia*. Author.
- World Economic Forum. (2018). *Future of Jobs Survey 2018*. <http://reports.weforum.org/future-of-jobs-2018/strategic-drivers-of-new-business-models/>
- World Energy Council. (2018). *The Role of ICT in Energy Efficiency Management Household Sector 2018*. World Energy Council. Retrieved from https://www.worldenergy.org/wp-content/uploads/2018/06/20180420_TF_paper_final.pdf
- World Population Review. (2021). *Gini Coefficient by Country 2021*. <https://worldpopulationreview.com/country-rankings/gini-coefficient-by-country>
- Wright, D. (2018). Terror park: A future theme park in 2100. *Futures*, 96, 1–22. doi:10.1016/j.futures.2017.11.002
- Wright, D., & Sharpley, R. (2018). The photograph: Tourist responses to a visual interpretation of a disaster. *Tourism Recreation Research*, 43(2), 161–174. doi:10.1080/02508281.2017.1409921
- Wu, W. (2020). *Online Shopping Behavior In Electronic Commerce : An Integrative Model From Utilitarian and Hedonic Perspectives*. Academic Press.
- Wulandari, P. A. (2017). Analisis SWOT Perkembangan Finansial Teknologi Di Indonesia. *Proceeding of National Conference on Asbis*, 2(1), 376–383.
- Wu, M., & Gao, Q. (2021, July). Understanding the Acceptance of Robo-Advisors: Towards a Hierarchical Model Integrated Product Features and User Perceptions. In *International Conference on Human-Computer Interaction* (pp. 262-277). Springer. 10.1007/978-3-030-78108-8_20
- Wuyts, W., Miatto, A., Sedlitzky, R., & Tanikawa, H. (2019). Extending or ending the life of residential buildings in Japan: A social circular economy approach to the problem of short-lived constructions. *Journal of Cleaner Production*, 231, 660–670. doi:10.1016/j.jclepro.2019.05.258

Compilation of References

- Xu, F., Khalaf, A., Sheets, J., Ge, X., Keener, H., & Li, Y. (2018). Phosphorus Removal and Recovery From Anaerobic Digestion Residues. In *Advances in Bioenergy* (1st ed., Vol. 3). Elsevier Inc., doi:10.1016/bs.aibe.2018.02.003
- Xu, Z., Shi, L., Wang, Y., Zhang, J., Huang, L., Zhang, C., Liu, S., Zhao, P., Liu, H., Zhu, L., Tai, Y., Bai, C., Gao, T., Song, J., Xia, P., Dong, J., Zhao, J., & Wang, F. S. (2020). Pathological findings of COVID-19 associated with acute respiratory distress syndrome. *The Lancet. Respiratory Medicine*, 8(4), 420–422. doi:10.1016/S2213-2600(20)30076-X PMID:32085846
- Yacout, O. M., & Hefny, L. I. (2015). Use of Hofstede's cultural dimensions, demographics, and information sources as antecedents to cognitive and affective destination image for Egypt. *Journal of Vacation Marketing*, 21(1), 37–52. doi:10.1177/1356766714538444
- Yadav, J., Misra, M., & Ranjan, A. (2021). *Online Shopping Behavior during COVID-19 Pandemic: An Indian Perspective*. Available at SSRN 3874348.
- Yali, Z., Wenqi, L., & Feng, W. (2020). Does energy transition improve air quality? Evidence derived from China's Winter Clean Heating Pilot (WCHP) project. *Energy*, 206, 118130. doi:10.1016/j.energy.2020.118130
- Yang, X. H., Jia, Z., & Yang, Z. M. (2021). How does technological progress impact transportation green total factor productivity: A spatial econometric perspective. *Energy Reports*, 7, 3935–3950. doi:10.1016/j.egyr.2021.06.078
- Yang, Z., Chen, H., Mi, L., Li, P. P., & Qi, K. (2021). Green building technologies adoption process in China: How environmental policies are reshaping the decision-making among alliance-based construction enterprises? *Sustainable Cities and Society*, 73, 103122. doi:10.1016/j.scs.2021.103122
- Yan, R.-N., Bae, S. Y., & Xu, H. (2015). Second-hand clothing shopping among college students: The role of psychographic characteristics. *Young Consumers*, 16(1), 85–98. doi:10.1108/YC-02-2014-00429
- Yaprak, Ü., Kılıç, F., & Okumuş, A. (2021). Is the Covid-19 Pandemic Strong Enough to Change the Online Order Delivery Methods? Changes in the Relationship Between Attitude and Behavior Towards Order Delivery by Drone. *Technological Forecasting and Social Change*, 169, 120829. doi:10.1016/j.techfore.2021.120829
- Yarli, D. (2018). Analisis Akad Tijarah pada Transaksi Fintech Syariah dengan Pendekatan Maqhasid. *YUDISIA: Jurnal Pemikiran Hukum Dan Hukum Islam*, 9(2).
- Yavuz, R. A. (2021). From GATT to WTO, Where to Now? The World Economic Order in the Midst of the Trade Wars. *The Trade Wars of the USA, China, and the EU: The Global Economy in the Age of Populism*, 27.
- Yazdanparast, A., & Spears, N. (2013). Can Consumers Forgo the Need to Touch Products? An Investigation of Nonhaptic Situational Factors in an Online Context. *Psychology and Marketing*, 30(1), 46–61. doi:10.1002/mar.20588
- Yeh, H. (2020). Factors in the ecosystem of mobile payment affecting its use: From the customers' perspective in Taiwan. *Journal of Theoretical and Applied Electronic Commerce Research*, 15(1), 13–29. doi:10.4067/S0718-18762020000100103
- Yeniaras, V., & Akarsu, T. N. (2017). Frugal doesn't mean ordinary: A religious perspective. *Journal of Islamic Marketing*, 8(2), 204–217. doi:10.1108/JIMA-06-2015-0046
- Yildirim, C., & Correia, A. P. (2015). Exploring the dimensions of nomophobia: Development and validation of a self-reported questionnaire. *Computers in Human Behavior*, 49, 130–137. doi:10.1016/j.chb.2015.02.059
- Ying, J., & Li-jun, Z. (2012). Study on green supply chain management based on circular economy. *Physics Procedia*, 25, 1682–1688. doi:10.1016/j.phpro.2012.03.295

- Yiu, C. S., Grant, K., & Edgar, D. (2007). Factors affecting the adoption of Internet Banking in Hong Kong—Implications for the banking sector. *International Journal of Information Management*, 27(5), 336–351. doi:10.1016/j.ijinfomgt.2007.03.002
- Yong, A. Y., & Lim, S. S. (2021). Plasticity of foraging strategies adopted by the painted ghost crab, *Ocypode gaudichaudii*, in response to in situ food resource manipulation experiments. *Zoological Studies (Taipei, Taiwan)*, 60.
- Yongabo, P., & Göransson, B. (2020). *Constructing the national innovation system in Rwanda: Efforts and challenges*. Academic Press.
- Yoon, K., Kim, C. H., & Kim, M. S. (1998). A cross-cultural comparison of the effects of source credibility on attitudes and behavioral intentions. *Mass Communication & Society*, 1(3-4), 153–173. doi:10.1080/15205436.1998.9677854
- Younis, H., Sundarakani, B., & O’Mahony, B. (2020). Investigating the relationship between green supply chain management and corporate performance using a mixed method approach: Developing a roadmap for future research. *IIMB Management Review*, 32(3), 305–324. doi:10.1016/j.iimb.2019.10.011
- Yousafzai, S. Y., Foxall, G. R., & Pallister, J. G. (2010). Explaining internet banking behaviour: Theory of reasoned action, theory of planned behaviour, or technology acceptance model? *Journal of Applied Social Psychology*, 40(5), 1172–1202. doi:10.1111/j.1559-1816.2010.00615.x
- Yuan, Y., Lai, F., & Chu, Z. (2019). Continuous usage intention of Internet banking: A commitment-trust model. *Information Systems and e-Business Management*, 17(1), 1–25. doi:10.1007/10257-018-0372-4
- Yu, L. L., Zhao, D. Y., Xue, Z. H., & Gao, Y. (2020). Research on the use of digital finance and the adoption of green control techniques by family farms in China. *Technology in Society*, 5, 214–218. doi:10.1016/j.techsoc.2020.101323
- Yusuf, S. A., Ojo, O. T., & Salimonu, K. K. (2007). Households’ willingness to pay for improved solid waste management in Ibadan North local government area of Oyo state, Nigeria. *Journal of Environmental Extension*, 6(1), 57–63. doi:10.4314/jext.v6i1.2766
- Yu, W., Chavez, R., Jacobs, M. A., & Feng, M. (2018). Data-driven supply chain capabilities and performance: A resource-based view. *Transportation Research Part E, Logistics and Transportation Review*, 114, 371–385. doi:10.1016/j.tre.2017.04.002
- Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualisation, and extension. *Academy of Management Review*, 27(2), 185–203. doi:10.2307/4134351
- Zhang, M. (2017). *Artist shames disrespectful holocaust memorial tourists using photoshop*. Academic Press.
- Zhang, Z., & Payne, J. (2012). *Modes of Brachiopod Body Size Evolution throughout the Phanerozoic Eon*. NASA/ADS. Retrieved 17 September 2021, from <https://ui.adsabs.harvard.edu/abs/2012AGUFM.B11A0409Z/abstract>
- Zhang, D. Y., & Vigne, S. A. (2021). The Causal Effect on Firm Performance of China’s Financing–Pollution Emission Reduction Policy: Firm-Level Evidence. *Journal of Environmental Management*, 279, 111609. doi:10.1016/j.jenvman.2020.111609 PMID:33218832
- Zhang, H., Yang, Y., Zheng, C., & Zhang, J. (2016). Too dark to revisit? The role of past experiences and intrapersonal constraints. *Tourism Management*, 54, 452–464. doi:10.1016/j.tourman.2016.01.002
- Zhang, H., & Zhong, N. (2011). Forecast of energy demand in the next decade. *Energy Procedia*, 5, 2536–2539. doi:10.1016/j.egypro.2011.03.436
- Zhang, J., & Hon, H. W. (2020). Towards responsible digital transformation. *California Management Review*, 62(3).

Compilation of References

- Zhang, K., Li, Y. C., Qi, Y., & Shao, S. (2021). Can green credit policy improve environmental quality? Evidence from China. *Journal of Environmental Management*, 298, 113445. doi:10.1016/j.jenvman.2021.113445 PMID:34375920
- Zhang, Y. M., Xing, C., & Wang, Y. (2021). Does green innovation mitigate financing constraints? Evidence from China's private enterprises. *Journal of Cleaner Production*, 264, 121698. doi:10.1016/j.jclepro.2020.121698
- Zhao, R., Liu, Y., Zhang, N., & Huang, T. (2017). An optimization model for green supply chain management by using a big data analytic approach. *Journal of Cleaner Production*, 142, 1085–1097. doi:10.1016/j.jclepro.2016.03.006
- Zhao, Y., & Bacao, F. (2020). What factors determining customer continually using food delivery apps during 2019 novel coronavirus pandemic period? *International Journal of Hospitality Management*, 91(March), 102683. Advance online publication. doi:10.1016/j.ijhm.2020.102683 PMID:32929294
- Zhao, Y., & Bacao, F. (2021). How does the pandemic facilitate mobile payment? An investigation on users' perspective under the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 18(3), 1–22. doi:10.3390/ijerph18031016 PMID:33498863
- Zhong, C. (2020). Industrial-Scale Production and Applications of Bacterial Cellulose. *Frontiers in Bioengineering and Biotechnology*, 8, 1–19. doi:10.3389/fbioe.2020.605374 PMID:33415099
- Zhongming, Z., Linong, L., Wangqiang, Z., & Wei, L. (2020). *Asteroid impact killed dinosaurs while volcanism shaped life in the aftermath*. Academic Press.
- Zhou, Y. J., & Zhang, M. X. (2017). Unlicensed companies will suspend production and shut down. Licensed companies must discharge pollution according to the license. Hebei takes the lead in launching the post-discharge permit monitoring system. *Environment and Ecology*, 24, 21–23.
- Zhu, Q., Sarkis, J., & Geng, Y. (2005). Green supply chain management in China: Pressures, practices and performance. *International Journal of Operations & Production Management*, 25(5), 449–468. doi:10.1108/01443570510593148
- Zimmermann, H-D. (2000). Understanding the Digital Economy: Challengers for New Business Models. *AMCIS 2000 Proceedings*, Paper 402.
- Zwanka, R. J., & Buff, C. (2021). COVID-19 Generation: A Conceptual Framework of the Consumer Behavioral Shifts to Be Caused by the COVID-19 Pandemic. *Journal of International Consumer Marketing*, 33(1), 58–67. doi:10.1080/08961530.2020.1771646
- Zwarthoed, D. (2015). Creating frugal citizens: The liberal egalitarian case for teaching frugality. *Theory and Research in Education*, 13(3), 286–307. doi:10.1177/1477878515606620

About the Contributors

Patricia Ordóñez de Pablos is a professor in the Department of Business Administration in the Faculty of Business and Economics at The University of Oviedo, Spain. She completed her education in The London School of Economics, UK. Her teaching and research interests focus on the areas of strategic management, knowledge management, organizational learning, human resource management, intellectual capital, information technologies, with special interest in Asia (Bhutan, China, Laos, Myanmar). She is Editor-in-Chief of the International Journal of Learning and Intellectual Capital (IJLIC) and International Journal of Asian Business and Information Management (IJABIM), respectively. She has edited books for IGI Global, Routledge, and Springer. In 2021, she earned placement on Stanford University's "Ranking of the World Scientists: World's Top 2% Scientists" list, which can be found here: https://econo.uniovi.es/noticias/-/asset_publisher/XiGH/content/enhorabuena-a-la-profesora-patricia-ordonez-de-pablos;jsessionid=7DECA9C6930CC81559878BD6A43B8483?redirect=%2F.

Mohammad Nabil Almunawar is currently an associate professor at the School of Business and Economics, Universiti of Brunei Darussalam (UBDSBE), Brunei Darussalam. He was the former dean of UBDSBE. He received his bachelor's degree in 1983 from Bogor Agricultural University, Indonesia, master's degree (MSc) from the Department of Computer Science, University of Western Ontario, London, Canada in 1991, and Ph.D in Computer Science/Information Systems from the University of New South Wales in 1998. Dr. Almunawar has published more than 100 papers in refereed journals, books, book chapters, encyclopedias, and international conference proceedings. He has more than 30 years of teaching experience in the area of information systems. His overall research interests include applications of IT in management, e-business/commerce, digital marketplace/platform, digital business ecosystem, health informatics, information security, and cloud computing. Currently, he focuses his research on digital transformation, digital marketplace, digital platform, and digital business ecosystem.

* * *

Anindita Adhikary is currently a Professor in Management, Sikkim Manipal University, India. A commerce graduate from Gauhati University, India, she happens to be an MBA from Tezpur Central University, India and was awarded Doctorate by Gauhati University in 2009. Dr. Adhikary has 21 years of professional experience in academics and corporate sector. She has 68+ research publications (select papers in Scopus) to her credit and has been abroad a number of times in order to have an enriched exposure at international level. Dr. Adhikary had participated in 31 professional workshops and delivered talks as Guest Speaker at different Orientation Programmes initiated through National Productivity

About the Contributors

Council, MSME, Govt. of India and Department of Commerce. Govt. of Sikkim. Her domain of interest includes Finance and International Trade.

Aakanksha Agarwal is a research scholar at the Department of Management Studies at MNIT, India an Institute of national importance in the area of accounting and finance.

Muhammad Anshari is researcher and academic staff at School of Business & Economics, Universiti Brunei Darussalam. His professional experience started when he was IT Business Analyst at Astra International. Research Fellowship from The Government Republic of China (Taiwan) at National Taiwan University (Jan-Dec, 2014). Research Fellowship from King Saud University - the Kingdom of Saudi Arabia 2009. Senior Associate Researcher of Informatics Department, Universitas Islam Negeri Yogyakarta, Indonesia.

Bedanta Bora is presently engaged as Head-Management Studies at Sikkim Manipal University, India. Graduated in Commerce from Gauhati University, India, he received his MBA degree from Tezpur Central University, India. He was awarded PhD by Gauhati University in 2010. Dr. Bora possesses 21 years of professional exposure. He has to his credit around 65+ research papers (select publications in Scopus) with participation in 22 professional workshops and 35 academic conferences held across the world. As far as global exposure is concerned, Dr. Bora has been abroad quite a few times in order to join and host International Conferences as a contributor, committee member, track chair, invited speaker and privileged enough to delivered few key note address as well. He claimed some Best Paper Awards too.

Arif Budimanta earned his doctorate from the University of Indonesia. Following that, he attended the Senior Executive Programme at the Harvard Business School (HBS). From 2014 to 2016, he was trusted as the Advisor Ministry of Finance, and in early 2016, the President of Indonesia appointed Arif as the Vice Chairman of the National Economic and Industry Committee for the period 2016-2019. Since 2019, he has served as the President's Special Staff in charge of economic affairs. In between his busy schedule, Arif Budimanta is active as lecturer at the ITB Ahmad Dahlan Postgraduate Program. He is also a listed Member of the Royal Economic Society (RES) London.

Omkar Dastane is a Senior Lecturer and Head of Postgraduate Center at FTMS Global Malaysia (offering UK universities' MBA in Kuala Lumpur, Malaysia). Omkar is a founder member of ASCENT international conference series and associate editor of the International Journal of Accounting, Business and Management. He also serves on a reviewer board of international journals. Omkar is also a research fellow at Curtin University. His research interests include consumer perception, choice modelling, electronic commerce, and mobile commerce.

Amri Dunan is a senior researcher of The Agency of Human Resources Research and Development, Ministry of Communication and Information Technology.

Telisa Falianty has been a lecturer since 2002 and an associate professor at Faculty of Economics and Business Universitas Indonesia since 2013. She has graduated from doctoral program in the same place, Faculty of Economics and Business Universitas Indonesia. She was graduated from doctoral program in economics in 2006. She has been also a researcher and policy advisor in several government

institutions in Republic of Indonesia. She already has many publications in international journal, book chapter, international proceeding, as well as national economic journal. She has specialization in the topic of macroeconomy, international trade and finance, digital economy, and industry issues. She is also active in economist association in national and ASEAN level.

Fahmi Ibrahim (PhD) is Assistant Professor of School of Business, Universiti Teknologi Brunei (UTB), Brunei Darussalam. He gained his PhD from Glasgow Caledonian University, Glasgow, UK and MSc in Business Information Technology Systems (BITS) from University of Strathclyde, Glasgow, UK. He has a wide range of academic experience, gained in further and higher education establishments in the Brunei Darussalam and UK. This experience includes module and programme development, programme leadership, and international collaboration. His current teaching and research areas are in the field of Strategic Management, Knowledge Management, Intellectual Capital Management, Management Information Systems (MIS), Human Resource Management, Operations Management and Tourism Management-Development within public, private and SMEs organisations. His consultancy experience is in the area of Business Transformation particularly in SMEs. The consultancy expertise is supported by and complemented by his research interests. His research output includes book chapters, journal articles and conference papers. In recent years his research interest has evolved to be contextualised around the strategic development of organisations in complex and transitional environments. Also he has developed research interest on learning and teaching drawing from cross-disciplinary initiatives. He is currently on the editorial board of four international journals. In addition, he has been a keynote speaker in international conference, regularly contributes to conference organising committees and acts as a reviewer for a range of conferences.

Andong Jiao is an independent researcher. His research interests include Green Economy, Chinese Economy and Sustainability.

Huynh Viet Khai has received the Ph.D. degree and researched as a postdoctoral fellow at Kyushu University, Japan. Now, he is an associate professor and the head of the Environmental and Resource Economics Department at the College of Economics, Can Tho University. His research involves productive efficiency of agricultural production, water pollution, the demand of agricultural insurance, the solution of poverty reduction, organic production, biodiversity conservation, as well as the economic valuation of non-market goods such as externality of agriculture and forest, waste management, environmental policy, the applications of contingent valuation and choice modeling methods.

Souren Koner (B. Sc., MBA, Ph.D.) has been acting as an Assistant Professor at Amity University, Chhattisgarh since 2019. His specialization is in Marketing. He has more than 16 years of experience in teaching. He has been teaching in the areas of Marketing Management, Advertising, Sales Management, Service Marketing, etc.

Mahadi Hasan Miraz is a lecturer at Business School (Department of Business Analytics), Sunway University, Malaysia. Prior to that, He was Assistant principal at University Utara Malaysia (UUM), Malaysia. Besides that, He is the Editor in SEISENSE Journal of Management (SJOM). He has completed his bachelor's, masters, and PhD from one of the most reputed universities in Malaysia's. Also, with outstanding performance in technology management and logistics (STML) under the College of

About the Contributors

Business (COB) Universiti Utara Malaysia, Malaysia (UUM) (AACSB). His PhD research was in the field of Blockchain.

Fadzliwati Mohiddin is a Deputy Dean at the School of Business, Universiti Teknologi Brunei (UTB). Prior to joining UTB, she was the Chief Information Officer, the Director of ICTC, and the Dean of the Faculty of Business and Management Sciences, Sultan Sharif Ali Islamic University (UNISSA). She also held the post of Deputy Dean at the Faculty of Business, Economics and Policy Studies, Universiti Brunei Darussalam from 2009 to 2010. She lectures in business information systems and general management. She was involved with several ICT projects that include knowledge management systems and e-learning systems for the Ministry of Education. And she has been appointed as a judge for several business and ICT competitions such as the Asia Pacific ICT Award (APICTA) and the Brunei ICT Award (BICTA) since 2010. She holds a BA, Management Studies (Universiti Brunei Darussalam); an MBA (Lancaster University, UK); a PhD, Information Systems (Curtin University of Technology, Western Australia). Her current research interest includes information systems success, knowledge management, e-government, and general management.

Bambang Mudjiyanto is Principal researcher of The Agency of Human Resources Research and Development, Ministry of Communication and Information Technology.

Firdha Anisa Najiya is an economist at Sigmaphi Research Institute. Her work focuses on the analysis to bring economic and social science research into sustainability. She is the main author of several Sigmaphi publications looking at the role played by a new ecological macroeconomics in addressing an economy in which stability no longer depends on relentless consumption growth. Prior to joining Sigmaphi Research Institute, Firdha worked as an economist in the Committee for National Economy and Industry and in charge on monitoring, analyzing and reporting current conditions related to the economy and industry. This was followed by the preparation of weekly strategic advice reports to the President concerning conditions with respect to trade, industry, investment and other microeconomic topics. This followed by recommendations for policy strategies in form of memos or briefs. Firdha holds degrees in Physics (BSc, Indonesia) and Sustainable Energy Systems (MSc, United Kingdom). In 2013, she was awarded as the top student of the department for the year 2013. She was also a regional Representative of the university to the 2013-2014 Indonesian Physics Olympics.

Amirul Noeh is leading the In-Country's capability development in Brunei's largest oil and gas company. His key role involves developing the local workforce capability, facilitating technology transfer opportunities and growing the innovation landscape in the oil and gas sector. He is also the secretariat for Manpower Industry Steering Committee Working Group for the Energy Industry, a coach in the Energy Business Academy and a mentor for local start-ups. He has vast experience working in the government senior civil service in managing technology, a retired naval Captain, a marine engineer by profession, and now with the energy industry. He holds a Mechanical Engineering (Hons) degree and a Masters in Public Management from the National University of Singapore. He is an alumnus of Lee Kuan Yew Fellows from Harvard University, John F. Kennedy School of Government. Also a graduate of Singapore Armed Forces Command and Staff College. Currently, he is pursuing a part-time PhD research at University Brunei Darussalam on the impact of technological innovation and the future trajectory of work in Brunei Darussalam.

Pg Dr Siti Rozaidah is an Assistant Professor in leadership at Universiti Brunei Darussalam School of Business and Economics (UBDSBE). She has worked at UBDSBE since 2008. She has a PhD in Management Learning and Leadership from the Lancaster University Management School (LUMS) United Kingdom, 2016, MA in Human Resource Development & Consulting from LUMS, 2007 and a Bachelor's Degree in Accounting and Financial Management from University of Sheffield, 2006. She is currently on writing leave to focus more on her research publications. Her current research interests are public sector leadership, islamic perspectives of leadership and cultural studies on leadership. Other areas of interest are in human resource development policies, competency frameworks and employability. She has also published several chapters on CSR initiatives in Brunei in a book entitled Green Behavior and Corporate Social Responsibility in Asia (Emerald Group Publishing) and Scopus-indexed journal articles on unemployment issues in Brunei. She has also represented Brunei at the APEC HRD Working Group Meetings under the Capacity Building Network from 2009 to 2014. She has also been invited as a guest speaker and trainer for several leadership development programmes. She welcomes research collaboration in the areas of leadership, halal studies, human resource development and cross-cultural management.

Gusti Raganata is currently a researcher and lecturer at Sigmaphi Policy Research and Data Analysis and Indonesia Open University. He took a Master's degree from the Graduate School of Public Policy, the University of Tokyo. In addition, he had the opportunity to take a short course at Stanford University, US (2018) and the Center for Alternative Finance, University of Cambridge, UK (2020). His research interests include digital economy, financial technology, financial inclusion, transportation policy and collaborative governance. Now, he is focusing research on the digital economy, especially in fintech, financial literacy, and financial inclusion.

Didi Rosiyadi received the Ph.D. degree in Computer Science and Information Engineering from National Taiwan University of Science and Technology (NTUST), Taiwan, in 2013. Currently, He is a researcher in Research Center for Informatics, Indonesian Institute of Sciences (LIPI) and also a lecturer in any universities in Indonesia. His research interests include digital image watermarking, steganography, and cyber security. He has published more than 50 research papers.

Saibal Kumar Saha (UGC NET Qualified) holds a first class Master's degree in MBA and a first class Bachelor's Degree in Electronics and Communication Engineering. He has 10+ years of experience and has worked in MNCs like Cognizant Technology Solutions and Tata Aig Life. He has served National Institute of Technology - Silchar, Jyotirmoy School of Business – Kolkata, University of Technology and Management - Shillong and is presently working as Assistant Professor at Sikkim Manipal Institute of Technology - Majitar, India.

Sangita Saha is an MBA master from Sikkim Manipal Institute of Technology and BCA graduate from Indira Gandhi National Open University. She has specialized in Human Resource and Marketing. She has active interest in academic research and her area of interest includes motivation, consumer behaviour, tourism, and digital technologies.

Ferdoush Saleheen is amongst a very few in the supply chain industry in Bangladesh who has transformed end-to-end supply chain in Household Electronics, Fast Moving Consumer Goods, Food

About the Contributors

& Beverage, and Poultry industry and worked both in manufacturing and retail platform having more than 18+ years experience. For more than 9 years, Dr. Saleheen has been actively involved in academia and teaching as an Assistant Professor (adjunct) of Supply Chain Management at the leading Business Schools of Bangladesh. He earned a Ph.D. degree in SCM from an AACSB accredited Malaysian Govt. University, Universiti Utara Malaysia (UUM) along with a Master's degree in Logistics from the Department of Industrial, Manufacturing, & Systems Engineering at The University of Texas, Arlington and an AACSB accredited MBA from Victoria University Melbourne, Australia. His Ph.D. dissertation was "Performance Evaluation of Integrated Supply Chain Management for Manufacturing Industry". In his study, he developed Integrated Supply Chain Performance Measurement (ISCPM) model to measure the overall SCM performance of the manufacturing industry.

Michael Sampat is an independent researcher working in a number of different areas including the Chinese economy, market regulation, and other business topics.

Ankita Sarangi is a major practitioner in the field of development of communication skills. As a teacher of literature as well as language she has, if not mastered, learnt, and is still learning the politics a language can offer and the range of emotions it can portray. Her domains of research are Fictions of the self, Linguistics and Translation Studies.

Desi Setiana received a BSc and MSc in Psychology Behavior of Information Technology, respectively from University of Indonesia and University of Brunei. She is researcher at the Ministry of Law and Human Right, Republic of Indonesia. Her research interests are in the areas of Psychology of Information Security, User Behaviour toward Cyberbullying, IT Emerging Technology for Psychology Education. She is now in-pipeline to pursuing Ph.D in IT Psychology for Cyberbullying and Security Protection for Prisoners.

Ahmad Budi Setiawan is a senior researcher of The Agency of Human Resources Research and Development, Ministry of Communication and Information Technology.

Shweta Sharma is a faculty in the Department of Management Studies at MNIT, India an Institute of national importance in the area of accounting and finance. She has around 13 years of industry, research, and teaching experience. She has authored papers in various reputed international peer-reviewed journals to her credit.

Neni Sintawardani is a senior researcher at Research Unit for Clean Technology - Indonesian Institute of Sciences (LIPI) in Indonesia. She graduated as a bachelor engineer in Food Technology from IPB University in Bogor, Indonesia in 1983 and begin her carrier as young researcher in National Institute of Physics in the Indonesian Institute of Sciences (since 1986 changed to: Research Center for Applied Physics) from 1984. Her scope of research is implementation of waste/wastewater treatment and sustainable sanitation for the community and focusing more in the application of anaerobic processes for treating wastewater/municipal solid waste/agro-industrial waste (improving biogas-production) and sanitation for value chains approaches. As a Visiting-Researcher at Institute of Technology, Federal Research Center for Agriculture (FAL), in Braunschweig, Germany (1987-1992), she studied the technology of fixed-bed anaerobic reactor for treating agro-waste. She got her doctoral degree in University of Hohenheim,

Stuttgart, Germany for the topic. After graduation she is back to LIPI and developed some prototypes of anaerobic digestion for treating tofu whey, and co-digestion of kitchen waste. On 2013 she got grant from NEWRI-NTU Singapore to implement this technology for treating the wastewater (tofu whey) from tofu industries in a village and distribute the biogas to the community. The plant is already handed over to the community and managed by the locals. Now she and her team are focusing on capacity building to the locals to strengthen their management on renewable energy business.

Bruno Sousa is a Professor in Polytechnic Institute of Cavado and Ave (IPCA, Portugal) Head of Master Program - Tourism Management - PhD Marketing and Strategy. He was Market Analyst at Sonae Distribuição – Modelo e Continente, S.A. (2006 to 2009) and he was Marketing Assistant - Jornal O Jogo at Controlinveste (2005) - Best Paper Award in Strategic Marketing & Value Creation (International Conference on Innovation and Entrepreneurship in Marketing and Consumer Behaviour 2020) Teaching Award of the School of Economics and Management of the University of Minho 2015/2016 - Best Thesis in Tourism Award - ICIEMC 2015 - Management Graduation, University of Minho Award - Best performance (2006) - Merit Scholarship for Students in Public Higher Education Awards of Merit Scholarship by University of Minho in 2001/02 - 2002/03 - 2003/04 Rresearch centre: CiTUR and Applied Management Research Unit (UNIAG). He is author or co-author of several papers and her research interests include tourism management, marketing and strategy. Editorial board member of several peer reviewed scientific journals and ad-hoc reviewer of several peer-reviewed scientific journals. Member of the scientific committee of several national and international congresses and conferences.

Sawarisa Suiam is an alumna of the Indian Institute of Tourism & Travel Management (IITTM) under the Ministry of Tourism India and is a graduate of BBA & MBA-Tourism. She is currently working as an Assistant Professor in Tourism at the Assam Royal Global University, Guwahati, Assam.

Heru Susanto is currently researcher at Research Center for Informatics, the Indonesian Institute of Sciences and Assistant Professor at School of Business, University Technology of Brunei. He is also an Honorary Professor in the department of Information Management at College of Management, Tunghai University, Taichung, Taiwan. Dr. Susanto has worked as an IT professional in several roles, including Web Division Head of IT Strategic at Indomobil Group, and Prince Muqrin Chair for Information Security Technologies. His research interests are in the areas of Information Security, 5G Technologies, Grid Application, Big Data, Business Process Re-engineering, and e-Marketing. Dr. Susanto received a BSc in Computer Science; an MBA in Marketing Management; an MSc in Information Systems; and a PhD in Information Security. Dr. Heru Successfully authoring more than 35 books published by Francis & Taylor Group; including 8 full authored books and 30 book chapters, and more than 80 international publication in peer review journal and high impact journals.

Widyarani finished her PhD from Biobased Chemistry and Technology Group, Wageningen University. She is now a researcher at the Research Unit for Clean Technology, Indonesian Institute of Sciences. The topics of wastewater treatment and biorefinery, including resource recovery from waste streams, currently pique her interests.

Abubakar Mukhtar Yakasai is a PhD in Management candidate at Universiti of Brunei Darussalam School of Business and Economics (UBDSBE). His research interests include E-Commerce, Digital Mar-

About the Contributors

keting, the Internet of Things (IoT), CRM, and Consumer Behaviour. He has published in peer-reviewed journals, book chapters, and presented in conferences. He also taught several undergraduate courses, such as Electronic Business, Management Information Systems, Management Theory, Organizational Change, Consumer Behaviour, and Marketing at Yusuf Maitama Sule University, Kano, Nigeria (formerly Northwest University, Kano, Nigeria). Currently, he is researching Business to Consumer (B2C) Online Shopping Use in Nigeria.

Poshan (Sam) Yu is a Lecturer in Accounting and Finance in the International Cooperative Education Program of Soochow University (China). He is also an External Professor of FinTech and Finance at SKEMA Business School (China), a Visiting Professor at Krirk University (Thailand) and a Visiting Researcher at the Australian Studies Center of Shanghai University (China). Sam leads FasterCapital (Dubai, UAE) as a Regional Partner (China) and serves as a Startup Mentor for AIC RAISE (Coimbatore, India). His research interests include financial technology, regulatory technology, public-private partnerships, mergers and acquisitions, private equity, venture capital, start-ups, intellectual property, art finance, and China's "One Belt One Road" policy.

Index

A

algae 189, 246
 application use intention 66, 68-71, 74-75
 Association of Southeast Asian Nations (ASEAN)
 109, 122

B

balance of payment sustainability 167
 Binary probit model 207
 biogas 237, 239-242, 245-247
 Brunei Darussalam 99, 107-110, 112-116, 119, 122-
 124, 127, 136
 Business Model 22, 24, 29, 35-37, 164, 185, 312
 Business-to-Consumer (B2C) 27, 85, 105

C

carbon emission 166, 174-176, 179, 232, 260, 267,
 273-274, 339
 Channel Credibility 84, 87, 90, 94, 96-98
 Circular Economy 89, 105, 142, 144, 147-150, 232,
 246-247, 313-314, 320-321
 Clean energy 247, 257-258, 260, 262, 264-266, 274
 Cloud-Based Services 43, 45, 47, 49, 64
 Consumerism 186-193, 197-198
 Corporate Sustainability 1-2, 4-5, 9-10, 16
 COVID-19 15, 27, 68, 84-99, 105, 108, 110, 157, 222,
 295-296, 303-306, 310, 329-339

D

Dark Tourism 295-306, 310
 Digital Economy 22-24, 26-27, 30-32, 34, 38, 85, 88,
 96, 98, 113, 122, 156-159, 161-163, 165, 167-
 169, 174, 178
 Digital Economy Masterplan 113, 122
 Digital Ecosystem 23-24, 29

Digital Learning 67, 123
 digital literacy 66, 68-69, 71, 74-75, 107, 156, 179
 Digital Transformation 84-88, 90, 92-93, 96-99, 106,
 113, 115, 178

E

e-Business 22-23, 37, 98
 E-Commerce 23-24, 27, 29, 31, 34, 47-49, 56, 84-85,
 89-90, 94-96, 98, 106, 147, 164-165, 312, 336, 338
 Economic Catch-Up 108
 Ecosystem 22-24, 29, 34, 37-38, 44, 107-109, 112-119,
 122, 164, 237
 environment sustainability 162, 174, 178
 Environmental pollution 162, 179, 196, 213, 258,
 265, 273-274
 E-Payment 15
 External Sustainability 157, 168, 179, 185
 Extrinsic 46, 319

F

facilitating condition 46, 66, 68-69, 71, 74-75
 Financial Risk 90, 93, 96
 Financial Technology 6, 22, 24-26, 29-37, 164, 274-275
 Food Security 161, 219-220, 228
 Food sustainability 219
 Frugality 311, 319, 327

G

Geographical Eons 189
 Gini Coefficient 167, 169-171, 173, 179, 185
 Global Halal Supply Chain 114, 122
 Green building 260, 264, 271-272, 274-275
 Green transformation 257, 260, 264-265, 267-268,
 272-275
 Green transportation 257-258, 263-264, 274-275

Index

I

Ialong Village 280, 287-288, 292
Indian Economy 8, 330-331
Information and Communication Technology 23, 124, 159, 162, 174
Information System 47, 85, 88, 126, 135
Innovation and Technology 44-45, 49, 51, 55, 64
Intellectual Property Rights 179, 185
Internet Banking 1, 6, 10, 13, 44-47, 57
Internet Users 23, 27, 31, 85, 163, 166-167, 179, 185
Intrinsic 209, 298, 312, 319
IoT 66, 68-71, 75, 163

L

Level I, II, and III Knowledge Flow 122
low pH 239, 245-246

M

Market Segmentation 295, 310
Marketing Mix 315, 327
Mobile Cellular Subscription 156, 171-173, 175-176, 179, 185
Mobile Payment 43-44, 48, 65
Moderating Variable 87, 95, 106

N

National Innovation System 107, 109-110, 112, 117, 122, 159, 168
New Normal 88, 96, 99, 108, 110, 329-331, 336, 338-339
NSI (National System of Innovation) 122
Nudge 228

O

Online Banking 6, 13, 43, 48, 56, 65
Online Shopping Use 84-88, 90-93, 95-99
Outside-In and Inside-Out Strategy 113, 122

P

Pandemic 7, 27, 66-71, 74-75, 84-99, 105, 108, 110, 136, 222, 295-297, 301, 303-306, 310, 329-330, 333, 335-339
pandemic adoption 66, 68-71, 74-75
Policy support 114

Price 93, 95, 147-148, 158, 198, 215, 239-240, 246, 282, 285, 313, 315, 317-319, 327, 331, 335
Product 23, 25, 29-30, 36-37, 64, 86-88, 90-93, 95, 97, 109, 113-115, 122, 144-146, 149, 165, 170, 188, 222, 226, 232, 234, 244, 262, 265, 267, 272, 281-286, 298, 302, 312-313, 315-318, 327
Promotion 258, 272, 288, 291, 311, 313, 315, 317-321, 327
protein 191, 231, 243-246
Psychology 297, 311, 315-316, 318-319, 327, 338

R

recycling 105, 207-214, 216, 225, 234, 236-237, 241, 246-248, 265, 273, 314
Regional Comprehensive Economic Partnership (RCEP) 122
Regulatory Framework 12, 24
Responsible Consumption 219-220, 222-224, 226-228, 247
Robo-Advisor 44, 65
Rural Tourism 280-292

S

Security Risk 90, 93-94, 96, 98
segmentation 197, 295, 310
Self-Efficacy 46-47, 56-57, 123-124, 127, 131, 134, 136
Social Distancing 90, 95, 301, 306, 330-331, 338-339
social influence 45-47, 49, 66, 68, 70-71, 74-75, 220
social sustainability 148, 156, 168
Spirituality 310
Store Image 312-315, 320, 327
Supply Chain Management 142, 144-145, 147-149
Sustainable Consumption 198, 314
Sustainable Development 2, 5, 108, 142, 145, 147-148, 150, 159, 178, 186-188, 192, 198, 219-220, 228, 232, 257-258, 263-265, 274-275, 311
Sustainable Economic Growth 107, 115
Sustainable Procurement 145-146

T

Technological Innovation 44, 147, 267, 273, 275
Technology Acceptance 11, 43, 45-46, 86-87, 96, 98, 123-128, 137
Technology Acceptance Models 123
Think Global, Start-Local 114, 122
Thrift 311-312, 314, 319-321, 327
tofu whey 234-235, 237, 239-242, 244-246

Tourism 114, 280-292, 295-306, 310, 331, 333, 338
Treasure Factory 311-312, 314-320

U

usage intention 43-44, 47-48

W

Wastewater 231, 233-237, 239-242, 244-246, 273