

Future of Work, Work-Family Satisfaction, and Employee Well-Being in the Fourth Industrial Revolution



Ethel Ndidiamaka Abe



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A volume in the Advances in Human Resources
Management and Organizational Development
(AHRMOD) 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>

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Library of Congress Cataloging-in-Publication Data

Names: Abe, Ethel Ndidiamaka, 1966- editor.

Title: Future of work, work-family satisfaction, and employee well-being in the fourth industrial revolution / Ethel Ndidiamaka Abe, editor.

Description: Hershey : Business Science Reference, 2020. | Includes bibliographical references and index. | Summary: "This book examines the future of work, work-family satisfaction, and employee well-being in the fourth industrial revolution"--Provided by publisher

Identifiers: LCCN 2019051955 (print) | LCCN 2019051956 (ebook) | ISBN 9781799833475 (hardcover) | ISBN 9781799833482 (paperback) | ISBN 9781799833499 (ebook)

Subjects: LCSH: Work. | Work and family. | Quality of work life. | Job satisfaction.

Classification: LCC HD4904 .F878 2020 (print) | LCC HD4904 (ebook) | DDC 306.3/61--dc23

LC record available at <https://lcn.loc.gov/2019051955>

LC ebook record available at <https://lcn.loc.gov/2019051956>

This book is published in the IGI Global book series Advances in Human Resources Management and Organizational Development (AHRMOD) (ISSN: 2327-3372; eISSN: 2327-3380)

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All work contributed to this book is new, previously-unpublished material.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 Human Resources Management and Organizational Development (AHRMOD) Book Series

Patricia Ordóñez de Pablos
Universidad de Oviedo, Spain

ISSN:2327-3372
EISSN:2327-3380

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This chapter examines the issues of work satisfaction, employee well-being, and the future of work from the perspective of and as impacted by two prominent and contemporary models of corporate governance. It begins with an examination of work satisfaction and leadership, informed by motivation, leadership, and workplace attachment theories, then discusses how these theories have been impacted by changes in corporate governance. Present-day implications of corporate governance on work satisfaction and well-being are examined, followed by the implications of these considerations for the future of work in the fourth industrial revolution.

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This chapter explored the readiness of a South African university to take part in the fourth industrial revolution by exploring the experiences of students in science and technology on the impact of COVID-19 in the learning of their practical modules. Guided by two research questions, namely how the COVID-19 has impacted students' engagement with their practical modules and students' readiness to learn remotely and carry out the practical aspects of their modules, the chapter employ a qualitative case study approach to explore the views of students that offer courses that involve practical. Seven fourth-year students were purposively selected as study sample. Data were generated online using Google forms and were analysed thematically. The chapter was framed using the technology acceptance model. Findings revealed the following: ease and clarity of concept, lack of interaction with others, lack of motivation, lack of access to ICT facilities, lack of relevant materials to execute practical tasks, and lack of conducive learning environment.

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This chapter analyses the effects of remote work on family relationships during confinement due to the COVID-19 pandemic. The study is centered on faculty and staff members from a private business school in Puebla, Mexico. The research was conducted almost five months after the university closed its doors and moved all its activities online, having participants time to adapt to the new normal. A scale was developed and validated, and later on, it was applied in a country where family values, cultures, and traditions are strong. The scale included five distinct areas of study: remote working conditions, time and task management, work performance, stress, and family relations. All the business school faculty and administrative staff were invited to participate in the study. Results show employees' perceptions about how working remotely positively or negatively affected their relationships at home and their productivity at work, leading to the design of best practices and useful guidelines that will minimize the adverse effects of remote work while enhancing the positive ones.

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Digital disruption brought by the Fourth Industrial Revolution (4IR) technologies has a major impact on cultures, strategies, structures, and processes of organizations. This change also requires a shift in leadership mindset to respond to opportunities, challenges, and dilemmas in the implementation of Industry 4.0 (I4.0). Moreover, effective leadership in the digital age requires developing a wide variety of core components of leadership. Therefore, improving the essential characteristics, capabilities, and skills of leaders plays a pivotal role in accelerating the path to success in the I4.0. In this regard, this chapter provides an in-depth discussion on leadership aspects of I4.0. The purpose of this chapter is to first present emerging leadership styles in I4.0. The chapter also explores what leadership roles have become more relevant in the age of I4.0 and what kind of fundamental leadership skills they need to possess in order to succeed.

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Relationships have been documented to be the hub of employee social activities in the workplace. With the disruptions of Industry 4.0, much value and attention is given to machines and technology. Concepts of leadership and followership held by organizations may no longer hold water to determine the place of man and machines as relational tools in the workplace and to highlight the promotion of values in the man-machine interface in the 4IR. The centrality of this chapter will be to determine whether the leadership and followership theories are relevant to organizations in the face of 4IR. In the 4IR, practitioner's attention should be on human development to lead despite technological advancements and the development of artificial intelligence.

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As the Fourth Industrial Revolution (I4.0) technologies continue to evolve and converge, the role of the managers needs to urgently adjust and change accordingly. While some are delighted with the promises of increased flexibility in industries in tandem with productivity and better quality, others are concerned with mass unemployment. This is a chilling vision of how robots will completely reshape industries and disrupt jobs, thus creating societal change of an unforeseen magnitude and speed. But one thing remains the same: management is the hinge on which the fate of every organization swings. Managers remain the key driver to build long-term success in organizations. In this context, managers need to deal with emerging challenges, opportunities, management practices brought about by the 4IR technologies. In this context, they have to address the six crucial transformations namely in technology, the pattern of work, business, society, lifelong learning, and leadership, and provide countermeasures to thrive within this brave new tech-driven and globalized business world.

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Employees globally are expected to flourish amidst the uncertainty, volatility, and complexities of the muddy waters of Industry 4.0. To identify changes in the perceived workplace relationships and consider initiatives that will improve interpersonal relationships at work in the 4IR. A review of literature will be conducted on the following key variables: 4IR. In the 4IR, provision of interpersonal other than digital means of communicating with employees, effectiveness in intra-organizational information sharing among employees, constant training on new and improved technological tools of working will be useful. Human resource practitioners should focus on designing strategies to improve IR at work, in order to minimize interpersonal conflicts, provide social support and improve organisational performance.

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Capitalist corporations seek ever-new opportunities for trade and gain. As competition intensifies within markets, profit-seeking corporations innovate and diversify their products in an unceasing pursuit of new market niches. The incessant changes and unpredictable nature of capitalism often leads to insecurity regarding job loss. Job insecurity has been empirically proven to have negative effects on individuals and organisations. It associates to reduced job satisfaction and decreased mental health. A longitudinal Swedish study showed an indirect effect of trust on job satisfaction and mental health of employees. The advent of AIs, humanoids, robotics, and digitization present reason for employees to worry about the future of their work. A recent study conducted by the McKinsey Global Institute reports that by 2030, a least 14% of employees globally could need changing their careers as a result of the rapid rate of digitization, robotics, and advancement in artificial intelligence disruptions in the world of work.

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Employee wellness is an important aspect of human resource management system that has to be considered in the various phases of industrial revolution. It should be noted that during the industrial revolutions work has been transformed from handmade methods to machines. Work productivity improved, yet at the same time the number for those required for manual labour slightly reduced. In each of the revolutions the need to maintain employees remained significant. Therefore, it becomes imperative in the 4th industrial revolution even though managed heavily by machinery and technology to continue with employee wellness for effective productivity within organisations going forward. This chapter will deal with the employee wellness as a strategy that deals with enabling employee welfare. A healthy workforce enhances employee wellness.

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Industry 4.0 centers on the connection of physical and cyber networks to allow actionable insights and real-time information flow such that the well-being of the creatures, workplace, and the environment is guaranteed. Plastic pollution has been a major menace in South Africa and the proposed ban has not been implemented by the government. With the current measures of reducing the pollution, it was evident that the use of fourth industrial revolution has not been effective. Thus, it was recommended that government should enforce labelling of very single-use plastic and an associated fine should be attached to every single-use plastic found polluting the environment. It should be made mandatory for all management accountants to include cost for plastic pollution as one of the operating costs of each organisation. Also, it is recommended that robots can be erected around the cities, towns and workplace picking plastic waste. This will show the seriousness of the government to combat the single use plastic pollution and automatically curb the littering of the environment with plastics.

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The need for pertinent skills is invaluable in every industrial evolution and will not be any different for the fourth industrial revolution. Appropriate employee wellness programmes will enable an increase in the potential of employees to develop the required skills necessary for the fourth industrial revolution. The fourth industrial revolution is having the blurring line effect between the physical, digital, and biological spheres characterised by systems, scope, and velocity. This chapter shall address the need of changing skills and its relevance to the fourth industrial revolution, employee effectiveness, and efficiency. The fourth industrial revolution requires employees to be multi skilled rather than being specialist skilled.

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The uncertainties around the future of work has engendered and continue to provoke stimulating discussions amongst scholars interested in the dynamics of the world of work, and other allied researchers. While the construction of these uncertainties is not far-fetched, scholars have somewhat reached a consensus, that the emergence of globalization spanning over four decades ago, has further exacerbated the magnitude of these uncertainties. To be sure, the apologists of globalization have argued that the emergence of globalization, rather than prospering the future of work, has provoked several threats to the continued relevance of work, rather than progression.

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Idris Olayiwola Ganiyu, University of KwaZulu-Natal, South Africa

Ola Olusegun Oyedele, Federal University of Agriculture, Abeokuta, Nigeria

Evelyn Derera, University of KwaZulu-Natal, South Africa

The Fourth Industrial Revolution has resulted in the disruption of the world of work whereby technological innovation such as artificial intelligence (AI) and robotics. These disruptions may be creative in that as some jobs are lost due to the development of artificial intelligence, new ones are created. This chapter explored the impact of disruptive technological innovations on the future of work. The skill gaps brought about by the emergence of the Fourth Industrial Revolution was also explored in this chapter.

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Green Work-Life Balance and Global Leadership in Industry 4.0 200

Idris Olayiwola Ganiyu, University of KwaZulu-Natal, South Africa

Olufemi Michael Oladejo, University of KwaZulu-Natal, South Africa

Industrialization brought about by the development in science and technology is like a double-edged sword. Despite the benefit of the massive industrialization to humanity, it is noted to exert huge pressure on the ecosystem and the environment. Green work-life balance is an emerging concept aims at reshaping the work-life debate by introducing environmental dimension. Employees as agents of change are saddled with the implementation of organizational green work-life balance policy. However, the implementation of green work-life balance policy across the diverse culture by multinational companies poses a serious challenge. This chapter explores green work-life balance and global leadership in Industry 4.0.

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Future of Work: Skill Obsolescence, Acquisition of New Skills, and Upskilling in the 4IR 217

Ethel Ndidiamaka Abe, University of KwaZulu-Natal, South Africa

Isaac Idowu Abe, Cape Peninsula University of Technology, South Africa

Olalekan Adisa, University of KwaZulu-Natal, Durban, South Africa

Work as we know it has changed with the emergence of the Fourth Industrial Revolution (4IR). Prior to the advent of the 4IR, skill gaps have been widening. Though the 4IR comes with bright projections, it also will predict the way things are done and the requisite skills to have. Clearly, not everyone will be up to date with the needed skills in the future work environment. Intricate underlying factors about the future of work have fuelled debates bothering on the issues of digitization on work and professions, artificial intelligence (AI), and the uncertainty of work and careers left after automation. The changing patterns of work and work arrangements, the gig economy, as well as fissured jobs (involving employment as outsourced services) are of great concern. Also rife are matters around work-skill misalignment expected in the 4IR as the presentation skills that employees have may not be relevant in the new world of work. Therefore, skill obsolescence and the need to reskill and/or upskill is expected.

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Olufemi Michael Oladejo, University of KwaZulu-Natal, South Africa

This chapter carries out extensive review of literature on the 4th Industrial Revolution. In the last decades, many stakeholders such as industries, governments, employers and employers' organisations, workers and their unions, and academics have expressed divergent opinion of the 4th Industrial Revolution. The 4th industrial revolution is the 4th stage of a mechanical movement process that began towards the end of the 18th century where mechanised production replaced manual production process. Research shows that the 4th Industrial Revolution brought about 'disruptive technologies' such as artificial intelligence, robotics, blockchain, and 3D printing, which transforms social, economic, and political systems, often in unpredictable ways.

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Eniola Olutunde Lisoyi, Richfield Graduate Institute of Technology, South Africa

Isaac Idowu Abe, Cape Peninsula University of Technology, South Africa

The chapter identifies factors that influence readiness, acceptance and skill acquisition that are relevant in the Fourth Industrial Revolution (4IR) and to expose the reader to the advantages the 4IR offers. To harness and embrace changes cum strategies that can be adopted to equip individuals across generations with the core skills needed in the workplace. A systematic literature review approach will be adopted to expand on the variables of the activated classroom model, which can create a teaching and learning environment that empower learners with needed creativity and an innovative mindset to better position them for the fourth industrial revolution. This chapter will highlight issues in conventional teaching and learning methods, how they limit creativity in learners and how the activated classroom model solves these issues. It is imperative to focus on teaching and learning methods, as the world is a constantly changing global village and will require individuals to learn, unlearn and relearn concepts to acquire new skills to stay relevant.

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Fourth Industrial Revolution (4IR) in the Global South: The Future of Work in Tourism –
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Future trends within the field of tourism research vary, whilst the predictions continue to be at the forefront of the discussions among the tourism practitioners and researchers. The change is so evident and continues to accelerate at a tremendous speed while at the same time the tourism industry remains fragmented and interdisciplinary. This chapter intends to present the view from the global south on the fourth industrial revolution concept in the tourism industry. Reviewing the literature on tourism and the 4IR as a research method is more relevant than ever because literature reviews play an important role as a foundation for all types of research. The future trends in the tourism industry are highlighted in this chapter, together with the common pitfalls and advantages of the 4IR in the tourism industry.

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The Relationship Between Technoference, Work-Family Interface, and Telework in the Age of 4IR279

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In the age of 4IR, working life is generally characterized by penetration of technological devices and online platforms to individuals' social lives through teleworking. There is no consensus about teleworking whether it has negative or positive impacts on work-life balance of employees. Since teleworking is directly related with technological devices, researchers discuss technoference and its effects on teleworkers' lives. So, in terms of its impact, teleworking and work-family interface should be taken into consideration with the concept of technoference. This chapter will analyze the relationship between teleworking and work-family interface in the context of technoference in depth. Due to pervasiveness of teleworking at the age of 4IR, this analysis seems like a necessity for both individuals and companies in terms of teleworkers' work-family satisfaction. Suggestions and protection methods in order to decrease negative impacts of teleworking will also be discussed.

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Fourth Industrial Revolution: A Way Forward to Technological Revolution, Disruptive
Innovation, and Their Effects on Employees 297

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The Fourth Industrial Revolution is being implemented as technological revolution in every field of life. FIR has not only impacted the employees' behavior, well-being, and future of work but also brought a disruptive innovation everywhere. This chapter is beneficial for the reason that Fourth Industrial Revolution has affected the behavior of employees tremendously. With many opportunities from the fourth industrial revolution, rapid change, and excessive use of technology has stressed the employees. Digital transformation or era of digitalization has changed the future of work by automating the work performed by the human resource manually in the past. Automation of work is decreasing the labor requirement. Pressure of being unemployed and new skills learning after new technological change made employees' toxic. Fear of being unemployed and stress of earning new technologies has decreased the well-being of employees. This Fourth Industrial Revolution also has positive impact on the work and family life satisfaction by providing them the opportunities of remote and gig working.

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Foreword

The world has dubbed the post COVID era the ‘new normal’. Similarly, the advent of the 4th Industrial Revolution (4IR) is signalling an impossible-to-ignore, giant of a new normal. This book problematises this new normal. In all the chapters of the book, there is a very clear message, among many others, that this new normal will not and cannot be some tame space into which we all comfortably relocate. It is going to be disruptive, abrasive, and unprecedented for both the developed and developing worlds, the rich and the poor. It is evident in the book that there will be uncertainties, job insecurities, mental health issues, stress, etc. However, as the saying goes, every dark cloud has a silver lining. The chapters in this book successfully engage the reader into understanding and appreciating both the dark cloud and more importantly the silver lining therein.

The book locates itself meticulously at the crucial intersection of work, family, and employee well-being within the framework of the 4IR. This is very important in many ways. First, it is not rocket science that our world is, and shall continue to be, defined, and shaped by the work of human hands, hearts, and minds. Second, organisations are populated by people and every one of such persons belongs to a family of one kind or another. Third, for people to work successfully in organisations, it is imperative to invest in their well-being, both as family and organisational members. Fourth, as the book clearly articulates, the 4IR will come across with robotics, digitisation, you name it, but the human being will remain an important feature in the equation. Thus, in the book, a number of chapters discuss implications regarding crucial matters such as re-skilling and up-skilling.

I commend the authors for foregrounding the role of leadership in re-defining the world in the 4IR. Where organisations fail, where employee well-being is low, where motivation is low, and so on, leadership is often the missing link. But leadership without management is useless and management without leadership is equally fruitless. The two are inextricably intertwined. Chapters in this book show this marriage and emphasise the importance of these two functions in steering organisations towards success in the 4IR. To illustrate, one chapter discusses the development of leadership talent and discusses what leadership roles are likely to be crucial in the 4IR. In this connection, the book also shows that it is not always about leadership and management it is also about understanding followership.

Chapters in this book collectively show a multiplicity of the dynamics involved in the 4IR. One such is that science and technology shall be important pillars of the 4IR. Another is that the impending new globalisation and its impact on the world, both the good and the not so good, will be more visible. There will be huge pressure on the ecosystem; the future of interpersonal, intra- and inter-organisational relationships will drastically change. Thus, the 4IR will influence all aspects of life, business, education, tourism, to cite just a few.

Foreword

This book provides a rich and robust engagement of a wide range of cutting-edge issues about the future of family, work and the 4IR interface. The book shows that the success of organisations will depend on a delicate management between the latter trinity. I commend the editor and chapter authors for putting together work that will challenge the imagination of a broad spectrum of readers including those in business, human resources, leadership, management, education, science, social science, sociology and technology.

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Preface

Work is done in an environment that is dynamic and in a continuous state of change. In 2008, as the world was delightfully traversing a fiscal prosperity, it was suddenly hit with what could be described as one of the most devastating economic recessions a few months later. When the national governments, corporate organisations and individuals started to feel that innovative ways of comprehending and outlasting the economic slump in a flourishing manner through the Fourth Industrial Revolution (4IR) had been found, the Coronavirus disease also known as COVID-19 pandemic, struck a more deadly blow on the global economy. The pandemic has changed the way work is done, the way people live, learn, and do business.

The cutting-edge and specialised management of human capital central to ensuring that organisations can achieve their strategic objectives, remain competitive, and adapt to the ever-changing world of work, is under severe threat. Unemployment rate is at an all-time high level, and the race to attract and retain the best skills and create digital systems that exploit organisational and workforce potentials is keenly competed among organisations. Furthermore, the issue of employee health and well-being is dominating discussions among governments, organisations, and individual groups. This first edition of *Future of Work, Work-Family Satisfaction, and Employee Well-Being in the Fourth Industrial Revolution* aims at refining and sharpening the thinking, as well as equipping human resource experts, managers, owners of businesses (both large and small), skills development experts, academics, students and governments with pertinent and updated knowledge, skills and behaviours to approach the 4IR, and the post-COVID-19 era.

The first industrial revolution, based on the steam engine, created a middle class of skilled factory workers, who had a significantly different work and social life to their agricultural predecessors - long working hours, unsafe conditions, child labour, etc. The second industrial revolution, supported by electrification, mass production and science, led to increasing urbanisation, changes in how people lived and worked and was the basis of the modern world. The third industrial revolution, the move from analogue to digital technology, was based on computerisation, information technology (IT) and the Internet, leading to globalisation, automation, robotics and fundamentally changing the way people live work and communicate. All these revolutions changed the nature of work, reduced some types of jobs, and increased the demand for others.

The 4IR, involving disruptive digital technologies like the Internet of Things (IoTs), robotics, virtual and augmented reality, biological innovations, and artificial intelligence (AI), and their convergence, is leading to social transformation unimagined a few decades ago. The speed, unpredictability and complexity of these transformations make it difficult to understand the impact this will have on our individual identities, communities, workplaces, and political structures. All we did know was that our lives, both social, working and leisure, would be changed in dramatic ways. Some people would become unemployed, some would find new opportunities, some would find it difficult to cope, while others would thrive on the new developments. However, the COVID-19 pandemic drew the changes that we could only imagine a while ago so close that it caused world systems to stagger under its impact.

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The development and dissemination of knowledge about how work has changed, how these changes would affect employees' satisfaction with their working lives and how the changes would affect the work-life balance is essential. For this reason this book, *Future of Work, Work-Family Satisfaction, and Employee Well-Being in the Fourth Industrial Revolution*, is timely and is a respectable effort to draw attention to potential problems, and opportunities, we face.

ORGANISATION OF THE BOOK

The book is applicable to the international arena. Published by IGI Global Publishers and edited by Dr. Ethel Abe with contributions from Deans of Colleges, academics and consultants, this book comprises the views of 20 authors from seven countries on five continents and outlines some of the key issues which need to be urgently addressed in the context of the 4IR and post COVID-19 era.

Below is a synopsis of each of the twenty-chapter contributions to the book.

Chapter 1, "Corporate Governance and the Future of Work, Work-Family Satisfaction, and Employee Well-Being in the Fourth Industrial Revolution," converses on work satisfaction and leadership by examining studies on motivation, job design and leadership via the social person era of management and leadership theories, workplace attainment theories and psychodynamic theories. The author further explored the interaction between shareholder governance and stakeholder governance, where the models of governance that consider the needs and interests of all who had interest in the firm were explored, by placing competing models in a continuum through the employee well-being perspective. This chapter clarifies the implications of governance for employee satisfaction and well-being, and the implications of the 4IR. In the new world of work, the roles of AI, IoT, Big Data, and Cloud Computing cannot be overemphasised. The author clearly presents the threats and opportunities to workers and the future of work from the advent of these new technologies and the interface between them. With foresight, the chapter took a shot at forecasting a possible future where the predictions of previous studies on employees and organisations' psychological contract with intrinsic qualities would regain relevance.

Chapter 2, "Readiness for the Fourth Industrial Revolution: Experiences of Students in Practical Courses During COVID-19 Pandemic at a University in South Africa," discusses the findings of an empirical study. Digitisation of teaching and learning processes in the educational sector is at the centre of concerns in the 4IR. Prior to the COVID-19 pandemic, public and private institutions' concerns were based on the readiness of the South African economy with the requisite infrastructure needed for effective transition into the revolution. However, the pandemic forced higher education institutions to maximise the use of new technologies in teaching and learning. Although the University of South Africa (UNISA) had perfected the delivery of her teaching and learning services online, many other tertiary institutions did not have this capacity because their programmes had already been designed to follow the traditional face-to-face approach (Letseka, Letseka & Pitsoe, 2018; Mohamedbhai, 2020). This chapter explored the experiences of science and technology students in practical courses at a South African university to establish their readiness to successfully conduct their studies with new technologies in the 4IR. The findings have implication on theory and practice of education in South Africa.

Chapter 3, "The Effects of Remote Work on Family Relationships: Examples From Academia," assesses the effects of remote work on the family relationships of faculty and staff of a private university in Puebla, Mexico. The unprecedented demands of the COVID-19 pandemic led to the sudden closure of the institution, like every other higher education institution in Mexico. The need to settle down to

a new way of work and living which no staff or faculty member had foreseen jostled interpersonal relationships on the domestic front. Theoretical foundations relevant to the analysis of remote work, family dynamics, work interfering in family domain, cultural orientations of the Mexican population, stress and burnout were engaged in the study. Interestingly, a six-dimensional scale assessing working conditions and requirements, time and task management, work performance, work-related stress, family relationships and overall effects, was developed for this study. The findings, among others, confirm that working conditions and job requirements significantly affect work performance and family relationships.

Chapter 4, “Developing Leadership Talent for Success in the Fourth Industrial Revolution,” addresses the issues that need to be considered by the leadership of organisations to respond to opportunities, challenges, and dilemmas in the implementation of the 4IR. For instance, four factors were identified to change radically in the factory of the future, namely tools, organisational structure, working environment, intra-organisational and inter-organisational cooperation. This implies that new practices, new management structures, new workplace relationships, new qualification requirements and new employment models would be developed to suit the 4IR for firms to achieve a decisive competitive advantage. The chapter concludes by highlighting the leadership skills that would assist firms in keeping pace with changing conditions, sustaining their goals and being competitive in the global business environment. The chapter further provides significant insights for scholars and practitioners that are interested in leadership and the future of work in the digital revolutionary world, and opens the gate for further enquiries since both the 4IR and leadership mindset are in a continuous development process.

Chapter 5, “Leadership/Followership Interface and The Workplace of The Future: Who Leads?” Provides a critical interrogation of existing interpersonal relationships among employees and the interface between men and machines in the workplace of the future. The chapter brings to the fore the classical concepts of leadership and followership held by organisations vis-à-vis the position of man and machines as relational tools in the workplace. The authors examined the leader-member exchange (LMX), responsible leadership concept and leadership and followership theories for relevance in the 4IR. New theories to answer workplace relational issues were suggested to assist human resource practitioners on human capital development in the 4IR. Fears of the leadership question amid human-machine interface were laid to rest in the discussions of this chapter. The chapter concludes with a request that the trust level in the human-machine interface should come under serious scrutiny since there could be possibilities of sabotage and unforeseen risks by parties in the relationship. Human-machine workplace interface seems to be the new workplace pivotal relationship, hence organisations that are slow to invest in digital technology may become the laggards of the 4IR.

Chapter 6, “Are Managers Still Necessary in the Era of the Fourth Industrial Revolution?” critically examines the background of management from the First Industrial Revolution through the 4IR, noting the 4IR as the revolution that introduced the most disruptive innovations. The chapter posits that although through technological advancement manufacturers and service providers gain progress in their 4IR journey, the reinvention of managers and skilled workforce will be central to physical-to-digital transformation and then digital-to-physical transformation. Hence, as disruptive technologies and innovations continue to accelerate and machines begin taking care of themselves, certain skills will become irrelevant. For instance, with the decentralisation and data-driven decision-making required in the new world of work comes a fundamental shift in traditional management roles. The chapter appraised the relevance of the manager in the 4IR by giving an overview of the present and the past revolutions, Management 4.0 and the attendant issues, and the related solutions. It concludes that management, not just technology, is at the heart of 4IR.

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Chapter 7, “The Dynamics of Workplace Relationships, Employee Well-Being, and the 4th Industrial Revolution,” addresses the concepts, trends, and challenges of interpersonal relationships at work in the 4IR. The predictability of the progressive knowledge of workplace relationships through different theories in the past has assumed a new meaning because of the disruptions of the 4IR. The 4IR through digital technologies has affected the way employees interact and relate at work. The scope of interpersonal relationships has widened, what used to be private and confidential information is no longer classified thereby highlighting the need to address the challenges of relating in the workplace due to the changes taking place in the operations of organisations. The need to unlearn, learn and relearn is inevitable under the unfolding circumstances that employees may find themselves in this new era. Demographic factors may impact the ability of several employees to cope with the changes in the workplace. The author recommends that a higher level of support be made available for employees who may lose their jobs in the new innovations of the 4IR.

Chapter 8, “Future of Work and Its Implication on Employee Well-Being in the 4IR Era,” provides a shift in the model of assessing the 4IR with respect to employee well-being. The world of work has changed and so should the management of employee health and well-being. Organisational members are required to adjust to fit into the new ‘normal’, however, this will not be without mental, physiological and psychological implications to employees. Proactive organisations are making quick and necessary adjustments to adapt to the new ‘normal’ following the disruptions and unpredictable challenges resulting therefrom. The future of work as we knew it before has now changed and it has been understood that it will not be the same again. As the issue of mental health is being reported to be on the increase among organisational members, the situation may not be easily distanced from the changing workplace of the 4IR era. The authors demand that immediate actions be expedited to address the outfalls of digitisation of the world of work on the labour force, to preserve overall employee well-being in a digitally evolving world of work.

Chapter 9, “Appraising the Future of Employee Health and Wellness Programmes in the Fourth Industrial Revolution: Wellness Programmes,” offers a road map to the investigation of the future of work, work-life balance and employee wellness in the 4IR. Globally, the well-being of workers is important for the survival and advancement of organisations, hence, the wellness of employees is of immense concern to all stakeholders in the workplace. In the era of speedy transformation where human resource is challenged by substantial changes particularly in the matters concerning jobs and workforce, employees experience difficulties in balancing work and personal day-to-day life. In the emerging 4IR, employees’ inability to succeed in balancing their work and family duties could be compounded and result in an increased number of stress-related ill-health in organisations. Although several organisations adopted the Employee Health and Wellness Programmes to assist their employees in addressing their work and family-related stressors, the ability of these traditional programmes in managing novel stressors resulting from digitisation in the workplace remains uncertain. The chapter concludes by recommending that management support, workplace flexibility, change from traditional wellness programmes, among others, are needed in addressing employee wellness issues in the 4IR.

Chapter 10, “Fourth Industrial Revolution, Accounting Profession Well-Being, and Environmental Well-Being in South Africa,” provides an overview of the accounting profession in the face of digitisation. Generally, professional accountants play vital roles in providing professional judgement for organisations. For this judgement to be sound to stakeholders and clients, confidence in the implementation and reporting of principle-based standards are important. The advent of the 4IR brought inevitable AI, machine learning and robotics that are designed to be super-efficient with advanced processing power

that overrides the traditional accounting job. Machine efficiency notwithstanding, the demand for skilled and high-quality accountants is on the increase. The chapter suggests that accountants and stakeholders in the sector are abreast of the changes needed for the implementation of 4IR and suggest that adoption of professional development programmes and competence frameworks to ensure accountants fit in are inevitable.

Chapter 11, “Changing Skills and Attendant Stressors Appraising the Efficacy of Traditional Wellness Programmes in the 4IR: Skills Development,” examines the 4IR and its impact on skills as well as the attendant stressors of job insecurity, work-life balance, employee well-being and past, present and future trends in skills development. Ongoing debate regarding jobs and skills has recently dealt with the changes that have been brought about by new technologies as well as the future of work. Presently, developing countries struggle to attain the education necessary to improve skills due to poverty, lack of skills advancement and language barriers. These challenges present major concerns about the 4IR in the context of essential skills which individuals and organisations may require to thrive and be competitive, especially in developing economies. The chapter assesses the nature of skills needed in the 4IR, the possible changes in skills that would be demanded in the 4IR and the implication of training and retraining of available skills on organisations and individuals.

Chapter 12, “Future of Work, Globalisation, Technology, and Work-Family Satisfaction in the Fourth Industrial Revolution (4IR),” discusses the undeniable fact that the 4IR and globalisation have brought about uncertainties around the future of work. Evidently, the pace of globalisation and rapid changes associated with the 4IR, and digital technology are set to be adopted by companies in several industries. This chapter explains the main opportunities in the 4IR through the integration of innovative technologies into different scientific, commercial and technical activities. Scholars suggest that smart human intelligence, knowledge and new skills are required to fit into the scope of the 4IR and the new jobs being created by industries. The fear of skill obsolescence is rife among workers who do not have the requisite advanced skills. The interface between globalisation and new technologies will impact on the future of work and work-family satisfaction as clearly articulated in this chapter. The authors recommend that although globalisation may be a potential threat, its impact on increased employment in developing countries should be a significant contribution to reducing poverty. They conclude by advising employers and employees to be abreast of the technological space as well as globalisation trends to be relevant and competitive in the 4IR.

Chapter 13, “Disruptions of The Fourth Industrial Revolution: Implication for Work-Life Balance Strategies,” clinically explains the term ‘disruption’ and the implication of disruptive innovation in the 4IR. Disruptive innovation, originally developed by Clayton Christensen, explained development in technology, invention and ideas which defy conventional knowledge and is being used in various arenas, even in the 4IR. As the 4IR continues to birth various technological innovations which make life worth living, the revolution in technology could also widen inequality and disrupt global labour markets. This chapter expatiated on skills and argued that the widest and possibly most universal criticism about skills is the knowledge that there exists a systematic shortfall in skills across a whole age group of the population, that leaves a skills gap. Work as it was known is uncertain due to the global shift in the world of work brought about by the 4IR, and the future is uncertain. The authors believe that the disruptions of the 4IR will also impact work-life balance. The concept which emerged from the notion that every employee deserves to have a good quality of life so that time and effort devoted to work does not encroach on the quality of time devoted to non-work activities, is under threat. The implication of the disruptions of the 4IR on human capital development was marshalled as well as recommendations for practitioners and academics.

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Chapter 14, “Green Work-Life Balance and Global Leadership in Industry 4.0,” explains the concepts of work-life balance and global leadership. The chapter submits that work and family are the most vital facets of an individual as both domains are interconnected and a deficiency in one could spill over to the other. Imbalance in work and family domains results in conflicting outcomes. Based on the literature, the authors drew inferences on work-life balance, work-life balance strategies and behaviours necessary to achieve work-life balance including employees’ green work behaviour. The link between Green Work-Life Balance and Green Human Resource Management was established through the critical review of extant literature. In the face of undeniable evidence that digitisation of the workplace causes work interference with life, green work-life is recommended for safeguarding the future of human civilisation as we know it, developing a conscious resolve to tackle environmental challenges and work-life balance in the 4IR. The chapter extensively x-rayed global leadership literature in terms of its types, nature and imperativeness in benchmarking strategic capabilities in managing disruptions.

Chapter 15, “Future of Work: Skill Obsolescence, Acquisition of New Skill, and Upskilling in the 4IR,” provides a paradigm shift in the discourse about the 4IR and the post COVID-19 eras in the world of work. The uncharted course that nations, organisations, societies and individuals are learning to navigate because of technological advancement in the 4IR was already challenging. The arrival of the COVID-19 pandemic on the scene further complicated issues that were already complex. Work as it was known before has now changed and so has the way people work, live and even learn. The future of work in various sectors, skills gaps and need to reskill and upskill were critically examined in this chapter. The trends indicate that development, rapid technological advancement, aging population, globalisation and the COVID-19 pandemic have interacted to influence disruption in all sectors. These disruptions will cause skill obsolescence, lead to employees losing their jobs, and/or reskill and upskill to be relevant in the future workplaces and jobs. Recommendations made in the chapter speak to policy discussions about employee development and associated learning policies.

Chapter 16, “Developing Global Relevant Skills in the 4th Industrial Revolution,” provides an analysis of extant literature on the past industrial revolutions and the conceptualisation of the 4IR, its implication on jobs, employment, skills, and workforce strategy. Seeing that smart human intelligence, knowledge and skills are required to fit into the scope of the 4IR, the author suggests that there is an urgent need to develop a special skill-set, business mind and orientation and a high level of intellectual capital to aid the production process for the digital era. The chapter sees to focus on the way to develop special skills that will place human capital at the cutting edge of innovations, a paradigm shift from production-based economy to a knowledge-based economy. Trends suggestive of the effect of AI on economic activities were identified, and conclusions that these systems (AI) that rationally solve complex problems, though having potential to facilitate great economic growth, pose a threat to many kinds of employment. Thus, low skilled and low wage jobs will be replaced by computers and digitisation while higher paid jobs requiring more skills are less likely to be replaced. The author suggests that this heightened dichotomisation of skills could lead to an increase in social tensions. The findings have implications for policy and research.

Chapter 17, “Reskilling and Upskilling to Develop Global Relevance in the Fourth Industrial Revolution,” offers a clear explanation on the implication of the 4IR on job creation, job security, skills development, and education. The 4IR urges organisations and individuals to think creatively about the manufacturing process, value chain, distribution, and customer service processes. Meanwhile, the future of education emphasises the immense need to look beyond these areas and strategically utilise the better teaching and learning approach to prepare the coming workforce for the challenges ahead. Universities emphasise their role in shaping future technology by being the testbeds for innovation and educating

future generations. This chapter acknowledges that traditional education has contributed greatly to the current levels of the industrial revolution and technological advancement, however, for higher education to deliver future generations with the right set of skills and knowledge, an imperative question must be asked regarding how higher education institutions would be affected by the 4IR and how the delivery of education will be transformed. The different opportunities available that will shape the role which can be undertaken by higher education in the 4IR were identified. The authors concluded that combining the strength of traditional higher education with the Activated Classroom Teaching (ACT) model represents necessary steps to scale quality education.

Chapter 18, “Fourth Industrial Revolution (4IR) in the Global South: The Future of Work in Tourism – Challenges, Opportunities, and Future Prospects,” introduced the First, Second, Third Industrial Revolutions and the 4IR, however, focus was given to the tourism sector. The chapter critically reviewed future trends in the tourism industry along with the common pitfalls and advantages of the 4IR in the tourism industry. The authors believe that the high rate of unemployment which has not kept up with economic development of South Africa has created a mismatch between those who are unemployed in the majority, and those that work in the minority. They are of the view that the tough economic conditions on the African continent generally and South Africa in particular could be solved through the digitisation of the economy, made possible by the 4IR due to its potential opportunities to drive the next level of human innovation, development and therefore new jobs. From increased connectivity internationally to the advent of responsible tourism, the world of travel has changed dramatically in the past 20 years and will continue to change dramatically. Statistics show that 1.5 billion international tourist arrivals were recorded around the world in 2019. This number represents about one fifth of the global population, going on vacation. The chapter concludes that countries that provide digital infrastructure and an enabling environment for technology to flourish will reap the rewards of innovation and technology-initiated economic growth.

Chapter 19, “The Relationship Between Technoference, Work-Family Interface, and Telework in The Age of 4IR,” discusses the age of the 4IR from the perspective of the blurring of boundaries between the physical, digital, and biological worlds. The 4IR is a synthesis and fusion of benefits in AI, robotics, the IoT, 3D printing, genetic engineering, quantum computing and other technologies. New technologies in the age of the 4IR are vital and essential for working life as they support teleworking which is more pervasive in this era of digitisation. The chapter examines teleworking, and technoference vis-à-vis the issues, controversies and problems and posits that when used consciously and correctly, digital technology can become an affirmative tool for teleworking and work-family relationship. However, when technoference occurs because of the abnormal use of technological devices different types of interference on interpersonal relationships at home occurs as the line between work-life interface becomes blurred. The series of interferences cause problems among couples who feel that their spouses are physically present and together, but their interactions are low. Characteristically, work-life conflict, role demands conflict, work-family dissatisfaction, and interference results. The author feels that teleworking could be harmful and damaging on teleworkers’ mental and physical health and recommends that awareness about the negative impacts of technoference in terms of work-life interface is vital to prevent negative consequences of teleworking.

Chapter 20, “Fourth Industrial Revolution: A Way Forward to Technological Revolution, Disruptive Innovation, and Their Effects on Employees’ Behaviour,” explains that the 4IR has revolutionised the world. Organisations, businesses, and the work-life of people have been affected in both positive and negative ways. There is a massive disruption in the market and consumers’ lives. The revolution has

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created many new jobs in the market although it has also cost some employees their jobs. Some of the negative effects of the 4IR and automation on the employees and jobs result from the transformation from analogue to digital technology. The authors suggest that any agenda to implement the 4IR should be able to smoothen the impact of this disruption for people and organisations. These effects could be minimised by learning new skills related to the 4IR. The chapter identifies two major changes that the 4IR has introduced, namely the revolution of technology and the disruption of the previous one. These major changes have created many opportunities and challenges for all. The chapter concludes by observing that as work-life satisfaction seems to be decreasing, digital transformation is overcoming by providing the facilities for reducing hard work. Similarly, while the pressure of the 4IR is enhancing the toxic behaviour of employees, workers are open to and more satisfied with the digitalisation of processes.

CONCLUSION

How should we as individuals, as employees, as managers and as employers, address the challenges we face now and, in the years, ahead? How can we make sure that as many people as possible benefit from the 4IR and that as few as possible suffer negative consequences in the post COVID-19 era?

The editor of this series of articles, having been involved in lecturing, research, training and consulting for many years in the fields of corporate strategic planning, management, work-life balance, interpersonal workplace relationships, domestic relationships and the conflict, violence and juvenile problems often faced by families experiencing the changes and challenges in our modern world, is well positioned to be acutely sensitive to a number of the issues covered in this book. In this new age of uncertainty and, for some, fear of the future, it is necessary to provide human resource and psychology practitioners, business owners and management, and those responsible for developing and implementing the new technologies, with state-of-the-art knowledge on the new nature of work, its effect on workers and their families, and how we can maximise good work-life balance.

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Acknowledgment

I would like to express my gratitude to the many friends and colleagues who, through their work and interest, helped me clarify my thinking about *Future of Work* from a multi-disciplinary perspective by contributing chapters to the book. I am especially grateful for the valuable help rendered by those who reviewed the chapter contributions and the manuscript drafts of the *Future of Work*, *Work-Family Satisfaction*, and *Employee Well-Being in the Fourth Industrial Revolution*. Their evaluations and suggestions helped greatly in the preparation of this book. These reviewers, who are affiliated with several institutions globally, are listed among the Editorial Advisory Members.

I appreciate the strong support that I have had from my publisher and would like to express my special thanks to the editorial team of this book, to my meticulous and conscientious production editor, Maria Rohde, and to Jan Travers who helped in innumerable ways.

My earnest gratitude goes to Professor Roger Bruce Mason for his guidance, support, and mentorship. I owe one to my family whose invaluable support cannot be expressed correctly.

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Chapter 1

Corporate Governance and the Future of Work, Work–Family Satisfaction, and Employee Well–Being

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ABSTRACT

This chapter examines the issues of work satisfaction, employee well-being, and the future of work from the perspective of and as impacted by two prominent and contemporary models of corporate governance. It begins with an examination of work satisfaction and leadership, informed by motivation, leadership, and workplace attachment theories, then discusses how these theories have been impacted by changes in corporate governance. Present-day implications of corporate governance on work satisfaction and well-being are examined, followed by the implications of these considerations for the future of work in the fourth industrial revolution.

WORK SATISFACTION AND LEADERSHIP

This examination of employee well-being and work-family satisfaction starts by looking at the research on motivation, motivation and job design, and leadership. All of these have their roots in the social person era of management and leadership theory, which was ushered in by a series of studies that took place in the Hawthorne plant of the Western Electric Company (Wren, 2004).

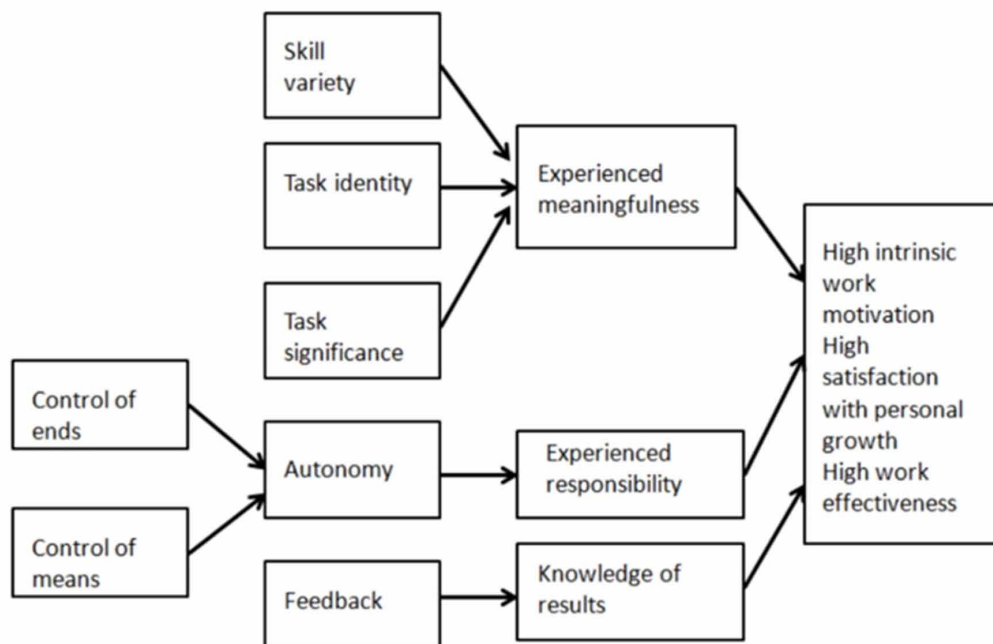
The key finding of the Hawthorne studies was that the interactions of people in an organization are important determinants of organization effectiveness and success. These findings led to the human relations movement, which studies the links between productivity and both worker satisfaction and worker wellbeing. It informed motivation theories, leadership theories, as well as workplace attachment theories (Wren, 2004).

DOI: 10.4018/978-1-7998-3347-5.ch001

Under the influence of the social person era, motivation theory grew from primarily instrumental-only (extrinsic) to include more explicitly the intrinsic bases of motivation. With extrinsic motivation, there must be either some reward or some punishment on which performance is contingent. It is transactional; essentially, one gets what one pays for. With intrinsic motivation, the actor performs various acts because it is inherently satisfying to perform them; no incentive is required to gain compliance in the workplace because the worker already wants to work at the assigned tasks (Herzberg, 1987).

The notion of intrinsic factors in motivation led to the development of the job characteristics theory (Figure 1), which prescribes what job characteristics need to be present in order for a job to have a high motivational potential (Hackman & Oldham, 1980; Hackman, Oldham, Janson, & Purdy, 1975). Core job characteristics lead to critical psychological states, which lead to worker personal outcomes. High levels of skill variety, task identity, and task significance lead to experienced meaningfulness of work. Autonomy leads to experienced responsibility for the work. Feedback from the work leads to an understanding of the agency of the worker in producing the desired outcomes. Experienced meaningfulness, experienced responsibility, and knowledge of results are the key psychological states that lead to worker outcomes of high intrinsic work motivation, high satisfaction with personal growth, and high work effectiveness. This has led to quite a lot of research and practice regarding job enrichment.

Figure 1. Jobs characteristics model



In the area of leadership theories, the social person era saw the development of relationship-oriented theories (Bass, 1990). Relationship oriented theories posit that the relationship between the leader and follower is an important determinant of the motivation of the worker as well as the degree of affinity that the worker will develop towards the leader. French & Raven's (1960) typology of power broadly demarks the power of the leader as having two sources – positional and personal. Positional power comes

from the authority one holds that is attached to the position, as well as the ability to reward and punish; it is extrinsic in nature. But personal power arises from the qualities of the leader and of the relationship between leader and follower. Personal power includes both expert power – the ability to solve problems for the follower – and referent power – the degree to which the follower identifies with the leader and is therefore willing to do just about anything the leader wishes. Personal power is intrinsic in nature.

Progression of the relationship oriented leadership theories has led to the development of transformational leadership (Bass, 1999; Bass & Avolio, 1992) and servant leadership (Greenleaf.org, 2011). Transformational leadership is structured around the leader growing the capabilities of followers and then empowering them to take on higher levels of autonomy and responsibility. Similarly, servant leadership is structured around the leader ensuring that all the needs of the follower are met, so that the follower can perform at high levels. Both leadership approaches entail what is essentially a spiritual, connected relationship between the leader and followers.

Workplace attachment theories examine the linkages between job design, job satisfaction, satisfaction with leadership, and organization commitment (Katz & Kahn, 1978). Organization commitment is basically of two types – continuance commitment, in which the worker stays with the organization because the cost of leaving the job exceed the gains of finding a different one, and affective commitment, in which the individual emotionally identifies with the organization and its vision, and will exert great efforts in order to help the organization achieve its vision. Continuance commitment is extrinsic in nature, while affective commitment is intrinsic in nature. Summing these relationships up, essentially, intrinsic qualities of work, coupled with satisfaction with leadership lead to high levels of job satisfaction, which in turn leads to an affective commitment to the organization as well as high levels of performance.

St. Clair (2000) examines organizational attachment from the perspective of psychodynamic theories of human developmental attachment. She notes that infants who have positive relationships with their caregivers develop a secure pattern of attachment and interaction, in which they seek proximity to the caregiver. On the other hand, infants who do not have positive relationships with their caregivers develop an avoidant attachment, in which they seek to distance themselves from caregivers' particularly when they are experiencing stressors in their personal environments. St. Clair further argues that individual attachment styles persist into adult life, and set the pattern for attachment with other adults, and with organizations. However, the attachment style for the organization is predicated on individual beliefs about the motives and attitudes of the organization; that is, if the individual feels that the organization is reliable, ethical, and concerned for the individual's wellbeing, then the attachment is likely to be secure, fostering an affective organizational commitment.

A related concept is the psychological contract, which consists of the expectations that exist reciprocally between employers and employees (Armstrong, 2006; Katz & Kahn, 1978). Expectations held by the employee reflect what they believe the organization wants from them as well as what they want, in return, from the organization. Similarly, the organization has expectations of what is expected of the employee, as well as the organization's responsibilities to the employees.

Armstrong (2006) discusses the model of the psychological contract developed by Guest, Conway, & Briner (1996), which includes causes, content, and consequences. In their model, expectations, experience, alternatives, organization culture, and HRM policy and practice are viewed as causes or determinants of the content of the psychological contract. Content of the psychological contract includes such issues as fairness, trust, and the mechanisms of enacting the contract, which they term "delivery of the deal." The unfolding of the content of the psychological contract leads to consequences in terms of satisfaction and well-being, motivation, organizational citizenship, and organizational commitment. One might

add that the consequences of the unfolding psychological contract also include the status of employee well-being. Historically, the psychological contract has included a commitment by the organization to the well-being of the employee, and in return, a commitment on the part of the employee to the well-being of the organization..

Synthesizing the foregoing, high performing individuals work at meaningful, empowered jobs, aided and potentiated by relationship-oriented leaders with whom they identify, and exhibit both a secure affective attachment to the organization and high levels of employee well-being. But all of this takes place in a broader context, which includes organization culture, the strategic objectives of the organization, and the manner of corporate governance, and the manner of governance is critical to worker wellbeing and the future of work.

SHAREHOLDER GOVERNANCE AND STAKEHOLDER GOVERNANCE

In 1976, two economists, Jensen and Meckling, published an article titled “Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure” in the *Journal of Financial Economics*. A broad implication of their work suggested that corporate managers were not providing the returns to stockholders that they could provide, the implicit message being that managers should do whatever it takes to maximize corporate profitability. This would seem to mark the beginning point of an explicit focus on shareholder value as a model of corporate governance, in which the focus is on maximizing the rate of return on investment to the owners of the corporation (Ntim, 2018). Nothing else matters, really, in terms of motivation, leadership, psychological contracts, and organizational attachment, because compensation to the top management of the corporation is tied to that metric.

A competing model of governance was proposed by Freeman (1984), who proposed that one must consider the needs and interests of everyone who has an interest in the organization, to include the owners, managers, workers, community, suppliers, and customers (Ntim, 2018). The stakeholder model, he felt, should drive organizational strategy, which should seek to maximize the outcomes of the largest number of stakeholders possible. This would entail, among other strategic concerns, investing in the organization’s human capital. Consistent with the philosophies of the human relations movement, this requires that one hire the best people for the job, invest in building their capabilities, and provide a secure and psychologically healthy work environment.

Viewed from the perspective of worker wellbeing, one might put these competing models on a continuum, with shareholder primacy at one end, and with stakeholder primacy at the other. Balance of governance between these models, then, is an important concern. Too much concern for shareholders leaves stakeholders’ interests vulnerable, while too much concern for stakeholders leaves shareholders’ interests vulnerable. Ho (2010) proposes an enlightened shareholder value model, which, she proposes, transcends the stakeholder-shareholder divide. Under this approach, attention to the interests and concerns of corporate stakeholders is viewed as critical to the long-term creation of shareholder value.

Although the stakeholder model is intuitively appealing and received quite a bit of attention and research after it was proposed by Freeman, many major corporations today, perhaps most, operate within the shareholder value paradigm, within which one way to maximize shareholder return is to minimize the cost of human capital. It seems that this approach is increasingly prominent today.

Minimizing the cost of human capital has taken the form of outsourcing, offshoring, creation of part-time jobs with no benefits to replace full-time jobs with benefits, and the rise of the gig economy. Corporate donations in the political arena have led to legislation to break the unions (euphemistically called “right to work” laws), and stagnate the minimum wage. In most of the United States today, a minimum wage worker cannot, alone, afford the cost of an apartment that will house two people. Increasingly, workers must rely on public assistance in order to make ends meet. Meanwhile, executive salaries have risen to extreme levels, as have shareholder returns, resulting in widespread concern in the U.S. and elsewhere of wealth inequality (Benhabib, Bisin, & Luo, 2017).

Present-Day Implications of Governance for Satisfaction and Well-Being

The bulk of the most influential research on behavior in organizations was done before the shareholder paradigm was predominant. In evaluating the wisdom of the behavior in organizations findings reviewed above, one must take into account the psychological contract between workers and organizations that were present then, versus today. Corporate governance ran more along the lines of stakeholder concern than along the lines of shareholder concern. The psychological contract then was one of mutuality, recognizing that the worker is a valuable asset to the organization that must be protected, nurtured, and developed.

One might speculate that the shift from high stakeholder concern to high shareholder concern would predict an erosion of the mutuality and trust in the psychological contract. Although research in 1998 suggests no significant erosion of the psychological contract (Armstrong, 2006), the psychological contract under shareholder governance, by and large, is purely instrumental. Value is to be extracted from the human resources by any means necessary, including those that are not favorable to the workers. With mutuality out of the picture, this calls into question the generalizability of much of the organizational behavior research that was done before shareholder governance was prevalent.

Armstrong (2006) summarizes three research projects that reviewed the state of the psychological contract, one published in 1997, another in 1998, and a third in 2004. The pattern that would seem to emerge from this research is an erosion of the mutuality and trust of the psychological contract. In the 1997 survey, 90% of workers surveyed felt that they were fairly treated by their employers, while in the 1998 survey that figure was 67%. In the 1998 survey, 88% felt very secure or fairly secure in their jobs, while that figure was 63% in the 2004 survey. In the 1998 survey, 64% felt pay was fair, but in 2004 41% reported that they were either dissatisfied or very dissatisfied, with 26% reporting feeling neither satisfied nor dissatisfied (Armstrong, 2006). This could reflect an erosion of employee perceptions of pay. More recently, a Eurobarometer survey (April 25, 2014) of the 28 European Union states found that 53% of respondent workers felt that their working conditions were good, though 57% of the respondents also felt that their working conditions were not as good in 2014 as in 2009. In the years since, there has been a growing perception, particularly among the U.S. middle class, of growing wealth inequality, as well as an erosion of the buying power of workers' wages.

As stated above, organization commitment is the attachment that a worker feels towards the organization, and that it runs along a continuum, ranging from purely intrinsic to purely extrinsic. At the intrinsic end, it is termed *affective commitment*, while at the extrinsic end it is termed *continuance commitment*. Affectively committed workers are emotionally attached to the organization; they identify with the goals of the organization and want to be an integral component in the organization attaining those goals.

Continuance commitment is purely instrumental. The worker essentially does a cost-benefit analysis of her/his role in the organization, and connection to the organization and its goals is predicated on how beneficial that is to the worker. When the combined intrinsic and extrinsic costs of staying with the organization exceed the cost of leaving, such as loss of pay and benefits and the psychological costs of leaving, the worker is likely to attrite.

Affective commitment, with its intrinsic focus, likely is an implicit assumption behind the research on the relationships between motivation and leadership, as well as research on job design, job satisfaction, satisfaction with leadership, and organization commitment. In organizations with a shareholder focus, the psychological contract is largely extrinsic, which calls into question both the findings of the research on worker satisfaction and wellbeing, and the prescriptive models based on that research.

So, of what value is all that research, if it is not generalizable to shareholder organizations? One may take note of the ideal states which that research describes, retain those ideal states as desiderata, and continue to examine the same relationships via research in organizations with a more shareholder orientation. One may also conduct research in organizations operating under both governance paradigms in order to more explicitly map the impact of governance model on those variables. In the end, noting the convergence of research done with respect to worker outcomes under both paradigms, it will be possible to compare the two governance paradigms in a meaningful, empirical manner.

Implications for the Fourth Industrial Revolution – the Future of Work

The foregoing discussion sets the context for considerations of the impact of the fourth industrial revolution (4IR) on the future of work and worker wellbeing. It is a future with mixed possibilities, with this era posing both threats and opportunities to workers and the future of work. Various possible outcomes are being predicted by expert futurists, including unemployment as high as 80%, stable job numbers but with increasingly unstable jobs (United Nations, 2018), and workers using information technology and social media to mobilize the workforce to mass action (Sourcewatch, 2017).

Overview of the Fourth Industrial Revolution

Philbeck and Davis (2018) afford a cogent overview of the fourth industrial revolution (4IR), noting that it builds off of the data-centric and rapid-communication capabilities developed in the third industrial revolution (aka, the information revolution), but while taking for granted the digital technologies which have enabled it. While the information age gave us knowledge on demand, 4IR gives us technologies and technological applications on demand. At the heart of 4IR lies artificial intelligence, robotics, advanced materials and materials fabrication, neurotechnology that interfaces between machines and the brain, genetic sequencing and modification, all of these “integrated into our physical, social, and political spaces, altering behaviors, relationships, and meaning (p.18).” 4IR poses both threats and opportunities for worker wellbeing and the future of work.

Threats

Threats to workers and the future of work arise in part from the advent of robotics, artificial intelligence, and the interaction between these. The incorporation of these poses a tremendous threat to the future of human work. Robots are already automating many low-skilled jobs, while artificial intelligence is

automating many jobs that call for human-like judgment. Soon, a robot will be available for less than the annual cost of a full time human worker, capable of doing the workers' jobs. It will not require being paid, will never call in sick, can work virtually always without a break or time off. Large retailers like Wal-Mart are rolling out self-checkout kiosks, powered by advanced enterprise database systems, relegating low-skilled cashiers to the unemployment line. Autonomous vehicles are already in operation, and will become increasingly common, displacing millions of people who drive for a living. Artificially intelligent applications read CT scans with a higher degree of accuracy than the average radiologist, for a fraction of the cost. And artificial intelligence has acquired the ability to be self-teaching, and self-programming. This means artificially intelligent systems will soon be able to take over human jobs with high intellectual requirements.

Although estimates of future unemployment due to automation and artificial intelligence vary, it is widely acknowledged that there will be substantial job displacement, particularly for unskilled workers and women (Ugurlu & Pajo, 2019). An additional threat arises from business owners' recognition of these effects on the willingness of workers to work for lower real compensation and in less secure jobs, particularly in organizations that align with the shareholder governance model. And this is visible in the workplace today, via stagnating compensation, loss of job security, and rising concern for wealth inequality (United Nations, 2018). Further erosion of worker security likely would also erode the quality of work, work satisfaction, and even possibly general life satisfaction.

Opportunities

4IR, particularly in communications and social media, reflects among other things a revolution of consciousness, an enabling of the noosphere, or collective consciousness of humankind (Van Cleave, 2012). These technologies bring a tremendous structural fluidity to human interactions in the present, such as the emergence of social media as an instrument of mass human action (The Guardian, 2011).

The labor movement of the late 1800s into the early 1900s were a mass action that brought about workplace reforms that were needed to save workers' lives, and to give workers a decent standard of living. The unions, as well as the gains they won for workers, have been severely undermined over the last thirty years (Adler, 2006). But now, the information technology and social media are enabling mass actions on a scale unimagined by the union organizers of a hundred years ago, in part via a new form of organization, the self-assembling dynamic network (Matai, 2011).

A self-assembling dynamic network is a collective of individuals, sharing a common interest, who spontaneously come together, usually without formal leaders, who enact large scale change, then dissipate. Notable examples of this are seen in Arab Spring (The Guardian, 2011), and in the yellow vest movement in France (Al Jazeera, 2018; Cigainero, 2018). So while there are many threats to the future of work, the technology also offers this important opportunity.

Further, while lower skilled jobs will continue to be eliminated by automation and artificial intelligence, new jobs are being created in the areas of programming, technical support, and systems engineering (Ugurlu & Pajo, 2019). From the perspective of the job characteristics model (Hackman & Oldham, 1980; Hackman, Oldham, Janson, & Purdy, 1975), these will be jobs that are inherently high in intrinsic motivational content. However, unskilled workers will need to be trained (Ugurlu & Pajo, 2019), and not all workers possess the cognitive capacity needed to succeed in the training and on the job.

ONE POSSIBLE FUTURE

Assuming that technology and artificial intelligence do cause widespread unemployment, perhaps in the 40% range predicted by Pistono (2012), it might become necessary to tax automation (Abbott & Bogenschneider, 2018; Gedik, 2018; Zhang, 2019), and from those taxes institute a guaranteed minimum income for all. That minimum would be sufficient to meet most basic needs, but not so much that people would not be willing to work for the additional income. The concept of “working for a living” would become an historical footnote, with people taking on employment in areas in which they have a particular interest, calling, or passion, and in which they find a high degree of meaning and satisfaction. Alternatively, a guaranteed minimum income would free them to serve their communities in various ways. This being the case, the previous research on workers and organizations, predicated on a psychological contract with intrinsic qualities, would regain relevance.

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Chapter 2

Readiness for the Fourth Industrial Revolution: Experiences of Students in Practical Courses During the COVID-19 Pandemic at a University in South Africa

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ABSTRACT

This chapter explored the readiness of a South African university to take part in the fourth industrial revolution by exploring the experiences of students in science and technology on the impact of COVID-19 in the learning of their practical modules. Guided by two research questions, namely how the COVID-19 has impacted students' engagement with their practical modules and students' readiness to learn remotely and carry out the practical aspects of their modules, the chapter employ a qualitative case study approach to explore the views of students that offer courses that involve practical. Seven fourth-year students were purposively selected as study sample. Data were generated online using Google forms and were analysed thematically. The chapter was framed using the technology acceptance model. Findings revealed the following: ease and clarity of concept, lack of interaction with others, lack of motivation, lack of access to ICT facilities, lack of relevant materials to execute practical tasks, and lack of conducive learning environment.

INTRODUCTION

With the outbreak of the Coronavirus otherwise referred to as COVID-19 pandemic globally, many organisations and institutions around the world are at a crossroad on how to manage various activities within the confines of their traditional programmes (Burgess & Sievertsen, 2020). This is because the outbreak of the pandemic has forced serious changes on how people live, work, do their businesses and

DOI: 10.4018/978-1-7998-3347-5.ch002

even school. Therefore, this has led to the closure of schools, colleges and universities in Africa and other parts of the world (Burgess & Sievertsen, 2020; Mohamedbhai, 2020).

Consequently, the major challenge brought about by the outbreak of the pandemic is the introduction of social distancing and lockdown, which is intended to discourage the gathering of people, flatten the infection curve and reduce the spread of the virus (Ferrel & Ryan, 2020). This has, therefore, halted the entire economic and social activities around the globe, thereby causing more harm than good, particularly for educational institutions that operate the normal on-campus traditional approach to teaching and learning.

Hence, in a bid to keep the academic year afloat, higher educational institutions in Africa and other parts of the world resorted to online remote teaching through the use of information and communication technologies (ICTs). This is to ensure the delivery of programmes at a distance to their enrolled students (Mohamedbhai, 2020; The introduction of these innovative approaches by educational institutions is not just to ensure the continuity of academic programmes, but to also circumvent the disruptions and other issues emanating from the outbreak of the pandemic.

However, the introduction of remote learning using ICTs in education during the COVID-19 outbreak has revealed the digital divide and inequalities that exist between countries in the African continent (Mohamedbhai, 2020). These disparities exist between countries with better infrastructure than others, between institutions in the same country with some far equipped than others; between students within same institution; the rich who live in urban areas and the poor in the rural settings, who can barely afford to access internet, when and if it is available (Mohamedbhai, 2020). In South Africa, the case is not different, as access to ICT infrastructure specifically in education is impeded due to digital divide and inequality which is associated to poverty (Chinemhiri, 2017; Gillwald, 2017; Choung & Manamela, 2018; Letseka, Letseka & Pitsoe, 2018). ICTs are the core platforms for which the fourth industrial revolution operates (Hariharasudan & Kot, 2018).

The fourth industrial revolution is the transformation of work from manually dominated approach to the use of technologies such as internet of things (IoTs) and robotics among others (Wichmann, Eisenbart & Gericke, 2019). The use of ICT-supported teaching and learning processes are the core concepts of the fourth industrial revolution in education (Hariharasudan & Kot, 2018). Obviously, the pandemic created avenues for higher education institutions to maximise the use of ICTs in teaching and learning. However, when compared with open universities such as University of South Africa that delivers its programmes online, some of these institutions do not have the capacity because their programmes had already been designed to follow a traditional face-to-face approach (Letseka, Letseka, & Pitsoe, 2018; Mohamedbhai, 2020). Corroborating this, is the study of Kayembe and Nel (2019) that found that ICT infrastructure among others may constitute part of the major challenges of higher education in South Africa in their adoption of the fourth industrial revolution.

It is on this premise that this chapter explored the experiences of science and technology students in practical courses at a South African University on their readiness for the fourth industrial revolution. The chapter explored two objectives namely, how remote teaching, resulting from COVID-19 pandemic, has impacted students' engagement with practical modules; and their readiness to learn remotely as well as carry out the practical aspects of their modules. To address these objectives, a qualitative case study approach was employed. Since the focus of the study hinges on the use of ICTs in teaching and learning, the Technology Acceptance Model (TAM) was adopted to frame the study. The findings of the chapter is significant to stakeholders within and outside higher education as it contributes to the body of knowledge in the following areas namely: firstly, it revealed the impact of remote teaching resulting

from COVID-19 on practical courses; secondly, the readiness of students to engage in remote learning; and finally, the readiness of the South African university in the deployment of the necessary digital infrastructure required for the implementation of the fourth industrial revolution in education.

Consequently, the following sections present insights on the overview on pandemics, antecedents of various industrial revolutions, and fourth industrial revolution in the education sector, among others.

BACKGROUND

Coronavirus (COVID-19) Pandemic

One peculiar issue associated with the term *pandemic* is that, there seem to be a non-unification on a generally accepted definition. Qiu, Rutherford, Mao, and Chu (2017) described pandemic as disease outbreaks that become widespread resulting from contact in human-to-human infection. According to Honigsbaum (2009), the term *pandemic* originates from the Greek word 'pan', which means "all" and demos "the people", this is commonly used to refer to a widespread of epidemic of contagious disease throughout the entire country or beyond to one or more continents simultaneously.

In history, diseases considered as pandemic due to their spectrum of aetiologies, mechanisms of spread and eras of emergence include acute haemorrhagic conjunctivitis (AHC), acquired immune deficiency syndrome (AIDS), cholera, dengue, influenza, plague, severe acute respiratory syndrome (SARS), scabies, West Nile disease, tuberculosis, Zika, H7N9, Ebola and obesity (Morens, Folkers & Fauci, 2009; WHO, 2011; Mirdha & Rewar, 2015; Maurice, 2016). These diseases were characterised as pandemic because of their distinctive features namely, wide geographic extension, disease movement, high attack rates and explosiveness, minimal population immunity, novelty, infectiousness, contagiousness, as well as severity (Morens, Folkers & Fauci, 2009).

Over the years, several deaths have been recorded across the world emanating from pandemic outbreak. Evidently, this was revealed by the World Bank Group (2019) in the 'Pandemic Preparedness Financing' report, it was estimated that more than 50 million people were killed in the 1918 by 'Spanish Flu'. In 2003, 774 deaths were recorded from SARS, whilst MERS has claimed 823 lives since 2012. The 2013-2016 Ebola epidemic caused 11 310 deaths in Guinea, Liberia, and Sierra Leone, while the ongoing Ebola outbreak in the Democratic Republic of Congo has accounted for more than 2 000 deaths. The 2009 H1N1 influenza pandemic resulted in more than 18 000 deaths. On the other hand, WHO (2018) estimates that about 32 million people have died of HIV since the beginning of the epidemic.

Retrospectively, all these features are associated with the recent Corona Virus Disease that erupted in Wuhan-China in 2019, otherwise referred to as COVID-19. COVID-19 is a new type of virus that surfaced towards the end of 2019 in Wuhan, China. According to the Centre for Disease Control and Prevention (2019), this type of disease is caused by a virus known as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which resembles the Middle East respiratory syndrome coronavirus (MERS) and severe acute respiratory syndrome (SARS). This coronavirus is suspected by scientists to have been transmitted from an animal such as bat to human or other species (Ji, Wang, Zhao, Zai & Li, 2020).

It is observed that, the symptoms of COVID-19 include fever, cough and difficulty in breathing, and surfaces between two to fourteen days after being exposed (Yang, Zheng, Gou, Pu, Chen, Guo ... & Zhou, 2020). COVID-19 pandemic shares same characteristic features as described by Morens, Folkers and Fauci (2009). These include wide geographic extension, disease movement, high attack rates and

explosiveness, minimal population immunity, novelty, infectiousness, contagiousness, as well as severity. As at April 10, 2020, as reported by Guardian Weekly (2020), the virus has spread around the world with 1,612,646 confirmed cases, 96,786 deaths and 329,544 recoveries.

The COVID-19 is spread by human-to-human transmission via droplets or direct contact, and infection has been estimated to have mean incubation period of 6.4 days and a basic reproduction number of 2.24–3.58 (Lai, Shih, Ko, Tang, & Hsueh, 2020). The attack and explosion rate of COVID-19 is high, was said to have expanded from Hubei to the rest of Mainland China within 30 days as reported by the Novel, Coronavirus Pneumonia Emergency Response Epidemiology (2020). COVID-19 is classified as an infectious disease and has a higher risk of being transmitted within approximately one meter (about 3 feet) from an infected person (Peeri, Shrestha, Rahman, et. al., 2020). It is said that one medium for transmitting the COVID-19 is through contact with environmental surfaces (Rothan & Byrareddy, 2020); and currently estimated to kill at least 10 people per thousand infected (1%) (WHO, 2020). “It is about ten times more lethal than the seasonal flu.

The impact of the COVID-19 pandemic felt around the globe led to the closure of educational institutions around the world in a bid to curtail its spread, thereby placing about 1.2 billion students in 183 countries out of school (Li & Lalani, 2020). Thus, to avoid the loss of one year of the academic calendar of educational institutions as a result of the COVID-19 pandemic, there was a drastic need to migrate to online learning where teaching and learning is undertaken remotely through diverse digital platforms.

Remote Online Learning: Advantages and Disadvantages

Remote learning, according to Ray (2020), is the type of learning that takes place outside the classroom and provides opportunity for teachers and students to remain connected and engaged with the content whilst working at the comfort of their homes. This type of learning makes use of online technologies for synchronous connections such as videoconferencing software, discussion boards, learning management systems or applications such as FaceTime, Google Hangouts, Skype, Microsoft Teams, Zoom, or What’s App where trainers and their students are separated by distance and time (Ray, 2020). This is because, online teaching and learning has proven to be of great benefit to educational institutions in times of crisis resulting from contextual disruptions and pandemics around the world (Fox, 2004; Dahya, 2016; Moon, Kavanagh, Jeffrey, Gebbels, & Korsgaard, 2016; Hallgarten, 2020).

Online teaching and learning makes use of information and communication technology facilities such as laptops, internet connection, and cell phone among others (Tristiana & Rosyida, 2018). It is believed that online learning offers some useful advantages which include the ability for students to learn wherever they are, and at their convenience without restriction, as well as avail participants the opportunity to go through an already delivered lesson over and over again for better understanding (Alexander, Truell, & Zhao, 2012; Armstrong, 2013; Clover, 2015; Pappas, 2015). However, as reported by some scholars, no matter the benefits attached to online learning, there are some huge disadvantages to this method of learning. These disadvantages include lack of understanding of concepts taught when compared to face-to-face learning, its isolated-devoid of human interaction, lack of motivation, not useful for disciplines with hands-on activities, (Alexander et al., 2012; Qiu, M., & McDougall, 2013; Arkorful & Abaidoo, 2015; De Paepe, Zhu & Depryck, 2018). Besides, from different studies, it has also been revealed that, there are challenges related to hardware and software as associated to with adoption of online teaching and learning. These include lack of access or availability of information and communication technol-

ogy facilities such as computers, low or no internet network (access), lack of data, (Muslem, Yusuf & Juliana, 2018; Srinivasa & Soma, 2018). Accordingly, online technologies are at the heart of the fourth industrial revolution

FOURTH INDUSTRIAL REVOLUTION

The emergence of the fourth industrial revolution (hereafter referred to as 4IR) is basically on how technologies and automation of work replaces tasks executed by humans (Schwab, 2016). According to Schwab (2017), *“the fourth industrial revolution is fundamentally different from the previous revolutions as it is characterised by a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries”*. In few years to come, the nature of work, business and society will be substituted by technologies such as robotics, artificial intelligence (AI), internet of things (IoT) and nanotechnology among others within the horizons of the 4IR (Arntz, Gregory, & Zierahn, 2016; Brynjolfsson & McAfee, 2014; Ford, 2015; Frey & Osborne, 2013).

It is argued that, not all tasks may easily be automated (Autor, 2015). However, one area that will be affected by this change is education (Schwab, 2016). It is on this premise that Butler-Adam (2018) argued that, one of the implications of the 4IR in education sector has to do with curricular, teaching and learning rather than with robotic tutors. Butler-Adam (2016) further explains that, there is need for students in the field of humanities and social sciences at least to have an understanding on the foundations on which AI is based, and how it functions. According to Kayembe and Nel (2019), it is believed that 4IR cuts across all disciplines, whereby humanities and social sciences join technologies to solve problems. This is because, generally, the 4IR curriculum should respond to political and social tensions resulting from the rapid pace of technological development as argued by Penprase (2018). Consequently, Penprase (2018) argues that, in terms of teaching and learning, online instruction as well as expanding the use of AI necessitate new guidelines to provide theoretical basis for digital pedagogy.

According to Brown-Martin (2017), to participate effectively in the global society, to benefit from the digital economy, and drive new opportunities for employment, innovation, creative expression as well as social inclusion, basic literacy is a necessary requirement for students in developing adaptive capabilities. According to Kayembe and Nel (2019), digital education strategy should consider the impact of such change as online teaching and learning on the school system. It is on this basis that Marshall (2016) declared that, the adoption of digital literacy could affect the quality of graduates if the students are ill prepared and there is insufficient investment in resources needed to drive such transformation. Hence, the need for education to respond rapidly to the advancement of technological innovation (Penprase, 2018). Failure by education to yield will mean a huge number of challenges, such as produce a workforce that cannot develop new applications and product, interpret the effect of these technologies on society as well as use their training to provide ethical uses of science and technology (Penprase, 2018)..

Kayembe and Nel (2019) suggest that, there are some challenges associated with the development and use of new technologies in education; hence, the need to plan carefully to mitigate such inhibitors. They submit that inequality is one of the major challenges that the 4IR poses to education. According to them, inequality and income distribution are social issues in South Africa. Therefore, it is possible that only the wealthy proportion of the student population will be able to afford new technologies whilst the poor is left behind. Other challenges associated with the successful implementation of the 4IR on education include lack of funds for the procurement of infrastructure and marginalisation of certain socio-economic

groups from participating. A study conducted by Meyer and Gent (2016), for the National Education Collaboration Trust on the status of education and technology in South Africa, revealed limited access to technology across provinces and quintiles (different categories of schools). Therefore, to develop the education sector to effectively reap the dividend of the 4IR, government and other stakeholders, higher education institutions inclusive should invest massively in the development of infrastructure and new curricula, among others (Kayembe & Nel, 2019). Therefore, a new curriculum should take into consideration the technologies involved for online teaching and learning. This corroborates Fein and Logan's (2003) argument that, in the transition from face-to-face to online learning, any technology adopted must support the interaction that exists between students alike and other stakeholders within the school system. According to Bernard et al. (2009), when these different levels of interaction are meaningfully integrated, they increase learning outcomes.

THEORETICAL ORIENTATION

This chapter was framed using the Technology Acceptance Model (TAM) popularized by Davis (1989). According to the theory, the adoption of technology by users depends on the perceived usefulness and the ease of use of the system. As remarked by Sunkara and Kurra (2017), the principle underpinning the development of TAM is hinged on its relationship with information technology. Perceived usefulness according to Davies (1989) is the extent to which people consider the application of technology to be useful to them in the performance of their job. Whilst the perceived ease of use refers to the difficulty in using such technology. Empirical evidence from several studies (Diop, Zhao, & Duy, 2019; Portz, Bayliss, Bull, Boxer, Bekelman, Gleason, & Czaja, 2019) on the application of TAM, shows the interconnectedness that exists between the usefulness, ease of use and technology use (Adams, Nelson & Todd, 1992).

Consequently, the choice of TAM for this research is premised on the focus of the study which is hinged on the impact of COVID-19 pandemic on the learning of their students' practical modules and their readiness to engage in remote online learning. The study involves the use of technology for the learning, which is captured in the underlying principle of TAM. Therefore, the aim is to explore Science and Technology students' perceived usefulness and perception on the ease of use of remote online learning for the learning of their practical modules.

METHOD

This chapter attempted to answer two research questions. To achieve the purpose of the study, a qualitative case study approach framed within the interpretive paradigm was employed. This is because, the purpose of the chapter was to explore science and technology students' experiences of the impact of remote teaching resulting from COVID-19 on their engagement in practical courses and how ready they are to do so. Case study was deemed appropriate because it provides the researcher the opportunity for an in-depth study of a single entity (Flyvberg, 2011). In the case of this chapter, the single entity being a group of science and technology students in practical courses in a South African University. The focus was to explore participants' experiences and interpretations of the impact of remote teaching and their readiness to engage in it through their own eyes (Denzin & Lincoln, 2005).

The sample consisted of seven fourth year students from four departments namely, Biological/Life Sciences, Natural Sciences, Physical Sciences and Technology Education (though eight were proposed, two for each department but Physical Science had only one response. Data was generated using semi-structured questionnaire through online medium. Some of the questions asked to elicit information included the effect of remote teaching on learning of practical modules, challenges to the learning of your modules as a result of the lockdown due to COVID-19, and the availability of necessary digital tools and infrastructure at their current location to cater for remote learning. Data generated was analysed thematically. The data was read and reread to have a perfect understanding of participants' experiences. The next step was coding and noting similar categories. This was followed by grouping and naming before reporting.

Before the commencement of the research, ethical clearance was applied for and received from the University Ethics and Research Committee. The aim of the research was explained to participants and their confidentiality granted. Consequently, all data are reported anonymously in the format B/LS 16 & 18; NS 21 & 22; PS 25, and TE 17 & 20, representing Biological/Life Sciences, Natural Sciences, Physical Sciences and Technology Education, respectively.

RESULTS

This section presents results on the impact of COVID-19 on students' engagement in practical modules as well as their readiness to participate in remote learning. From the analysis of the findings, the following themes emerged: ease and clarity of concept; lack of interaction with others; and lack of motivation in online learning as the impact of COVID-19 pandemic on their engagement with practical modules. Findings linked to their readiness to engage in remote online learning highlighted the following, namely: lack of access to ICT facilities; lack of relevant materials to execute practical tasks; and lack of conducive learning environment.

Impact of COVID-19 on Students' Engagement in Practical Modules

Amongst the seven participants that participated in the study, six of them expressed their dissatisfaction on the change from traditional face-to-face learning approach to online. These six participants indicated in their various comments that the preference they have for traditional face-to-face learning approach is due to diverse benefit it offers when dealing with fellow students and lecturers. These are evident in the excerpts below.

Ease and Clarity of Concepts

Two students that commented on the understanding derived from face-to-face learning shared their views as follows:

I miss going for lectures as they help me attain an insight to the concepts that will be taught. English 420- the lecturers give me an insight as to what the novels are about. The lecturers always give us pointers, and this has affected my learning as I sometimes rely on my lecturers for explanations. (NS 21)

Readiness for the Fourth Industrial Revolution

In the excerpt above, the Natural Science 21 student shows preference to traditional classroom learning approach, as opposed to the online method resulting from COVID-19. Reasons being that, it aids easy understanding and insights to concepts taught. More so, when explanations are needed, lecturers are there to provide prompt response. Furthermore, another natural Science student shares similar view that:

contact lessons are essential due to better understanding.... (NS 22)

From the comment above, it is indicative that, a transition from traditional learning approach to online will affect the way he learns. This is because, the student enjoys a traditional classroom learning approach because it offers better understanding to what is being taught and provides the platform for shared ideas among fellow students during group tasks. On the possibility of performing practical task, a technology student has this to say:

....it(online) has affected the style of learning as technology is a hands-on module which requires building and designing...A practical point of view,...we learn from being hands on and making mistakes, merely watching a YouTube video does not provide the same experience as there aren't videos on all sections and some videos can be complicated (TE17)

Consequent upon the comment of the technology student above, it can be deduced that online learning does not offer the same benefit as a traditional face-to-face method. Her comment also shows that contact practical lesson afford them the opportunity to make mistakes and get corrected, which they cannot enjoy by mere watching YouTube videos. More so, there are no YouTube videos that cover for all they need to learn through a face-to-face practical.

Lack of Interaction With Other Students

On discussion with other students in contact practical lessons, a Natural Science student remarked that:

...group work will be affected as well and its very helpful in terms of sharing knowledge. (NS 22)

The excerpt above indicates that, remote online learning resulting from COVID-19 will affect students group tasks which she considers very helpful in terms of the ideas shared through interaction with others. In a like submission, a technology student concluded that:

Group tasks cannot be completed without face to face learning.... (TE20)

Considering the excerpt above, one can deduct from the Technology student's perspective that, the completion of group tasks is only possible through a face-to-face learning method when compared with the online means. Suggestively, this could resonate from the fact that much interaction among other members of the group are required for the success of the task. Similarly, on interaction with other learners, another student added that:

.... we will be no longer discuss and there will be no contact practical and observations (PS 25)

As indicated in the Physical Science student's comment above, the adoption of online learning brought about by COVID-19 has eliminated the room for discussion amongst students alike. Besides, his comments also imply that practical lessons/tasks cannot be executed through online means. Consequently, it is possible that lack of interaction among students could lead to lack of motivation.

Lack of Motivation

The only student who spoke of loss of motivation because of remote online learning resulting from the impact of COVID-19 has this to say:

.... I prefer contact as opposed to self-learning (online)...Mostly a loss of motivation.... purely because campus makes you feel more driven to meet your goal...(B/LS16)

From the Biological/Life student's comment above, it can be seen that her preference for contact face-to-face lesson is built on the fact that online learning demotivates her, whilst visiting the campus for lectures stimulates the passion and motivation to be goal-driven. By implication, she feels such motivation cannot be achieved through an online means.

The analysis of the findings presented above show the preference students have for traditional face-to-face learning, and how they dislike the online method as resulting from COVID-19. The findings highlighted ease and clarity of concept; lack of interaction with others; and lack of motivation in online learning as the impact of COVID-19 pandemic on their engagement with practical modules.

The following section presents results on the readiness of students to engage in remote online learning of their practical modules.

Students' Readiness to Engage in Remote Online Learning of Their Practical Module

The findings on analyses of data generated highlighted three major themes on the readiness of Students to engage in the online learning of their practical module. These include lack of access to internet network and computer, as well as lack of relevant materials needed for practical tasks and conducive learning environment. In the following sections, these findings are presented.

Lack of Access to Information and Communication Technology (ICT) Facilities

Participants in the study were vociferous on lack of access to ICT facilities such as laptop computer, internet network, and data. These are evident in their various comments below.

Well Online learning is going to be difficult for some individuals who do not have access to internet and a laptop Well since everyone in my household is at home, everyone wants to use the laptop so there's not enough time for me to focus on my studies. Also, data gets finished really quick so that has been a challenge (NS 21)

Readiness for the Fourth Industrial Revolution

From the Natural Science student's comment above, the difficulty of online learning according to her depends solely on access to internet network and a laptop. Such lack of access to a computer which is considered artificial results from the lockdown imposed by COVID-19 that forced everyone to stay at home, thereby leading to survival of the fittest on her laptop usage. This is because, every member of her household who have been forced to stay at home are forced to make use of her laptop, thereby limiting her access to it. Retrospectively, it is possible this student has a laptop issued to her by the university, but due to the present situation, the ownership of the computer system is then tied to the entire household. This could be the same issue with a student from Biology/Life Sciences as remarked in the comment below:

I do not have access to a computer or WiFi whenever I wish (B/LS16)

An analysis of the above excerpt from B/L student 16 points to the fact that, access to a computer or internet WiFi for online learning is dependent on other factors outside the control of the student which could be related to that of NS21. From her comment, it can also be seen that she does have access to both computer and WiFi, but not on regular basis. Similarly, another student lamented that the impediment of her remote learning is due to irregular access to internet connection. This she declared in her comment below:

I do not have internet all the time to do remote learning (B/LS18)

Consequently, it is indicative from these students' perspectives that, a successful engagement with the practical learning of their modules online depends on unfettered access to laptop computer and internet connectivity. Similarly, another tied her ability to complete a task at hand to the availability of resources such as laptop and good internet connectivity. She made this declaration in her comment below:

The fact is that I do not have the resources like a laptop or good quality internet service to complete specific tasks at hand. (TE20)

From the Technology student's comment above, it is possible to conclude that, his ability to complete some specific tasks lies on the availability of laptop and good quality internet service. His comment seems to suggest a total lack of resources such as laptop and internet connection to engage in an online learning. In a related comment, the second student from Natural Science added the cost of data to that of laptop as another hindrance to the engagement of online learning, as she declared that:

No laptop, money for enough data, data costs.... (NS 22)

Analysis of the excerpt above suggests that, lack of laptop and money for the procurement of internet data are also contributing factors that limits her from successful engagement on online learning. Her statement also suggests that, there is insufficiency of data maybe due to high cost of subscription. Another student from Physical Science lend his voice on network as a part of the limiting factor to engagement in online learning of practical modules as he claimed in his comment below:

It is difficult to consult because of network. (PS 25)

The analysis of the above excerpt from the Physical Science student suggests that internet network is one factor that hinders his engagement in online learning. Although he was not clear on how this contributes, but it is obvious that, he considers internet network is as a problem to him.

From the above section, it is evident from the analyses of different students' comments that the availability of laptop computer, internet connectivity and data play a major role on students' readiness to engage on online learning of their practical module. This suggest that, the absence of these facilities as listed by Science and Technology students mean lack of engagement on online learning which portrays a bleak future for them.

Outside ICT facilities, other factors contribute to their lack of readiness to engage in online learning such as lack of relevant materials for practical tasks and unconducive learning environment. The analyses of these factors are presented below:

Lack of Relevant Materials to Execute Practical Tasks at Home

Some students believed that the introduction of remote learning resulting from COVID-19 has removed the affordability of the relevant materials and resources made available on campus environment for face-to-face practical exercises. This is evident in the comments below.

.... practical will be hard to perform without the relevant materials. (NS 22)

An analysis of the comment from the participant above suggests that the performance of practical tasks online will be difficult due to lack of relevant materials. This is because, she also believes contact learning grant her ease of learning in the performance of practical tasks, due to the provision of the necessary materials required for practice which she feels are not readily available through online learning, but are made possible in the campus environment during a face-to-face contact lesson. This is confirmed in comment from a Technology student, that:

...some tools used to make products for practical's I do not have at home, and it is only available on campus. (TE17)

The comment from the Technology student above further buttresses the difficulty of performing practical tasks at home due to the unavailability of the relevant tools which He alleged are only found on campus. Her comment further indicates that, practical tasks cannot be performed online as highlighted by NS22 above, which to some extent suggests lack of conducive learning space for their module which seem to reflect the reason given by the same Natural Science student in her comment below.

Lack of Conducive Learning Environment

This implies a space considered by students as not suitable to undertake the desire learning. The only student who commented on this problem below asserted that her lack of readiness to engage in an online learning as due to:

.... non-conducive learning environment, privacy, no space to study, unable to concentrate, stress and anxiety. (NS 22)

From the excerpt above, lack of a conducive learning environment as a result of privacy and space to study lead to this student's inability to concentrate in her study; thereby causing stress and anxiety which in turn contribute to her lack of readiness to engage in an online learning as alleged.

This section presents the summary of findings of the analyses of data generated on how COVID-19 impacted on students' engagement with their practical modules; as well as their students' readiness to learn remotely and carry out the practical aspects of their modules. The results of the study revealed the following findings namely: ease and clarity of concept; lack of interaction with others and lack of motivation in online learning as the impact of COVID-19 pandemic on their engagement with practical modules. Findings linked to their readiness to engage in remote online learning highlighted the following namely: lack of access to ICT facilities; lack of relevant materials to execute practical tasks; and lack of conducive learning environment.

DISCUSSION OF FINDINGS

The discussion on the findings of this chapter is presented in this section. For ease of understanding, the section is divided into two, where the first presents discussion of findings with respect to research question one, whilst the second will dwell on two. The following themes emerged from the findings: ease and clarity of concepts, lack of interaction with other students, and lack of motivation in online learning for research question one. Whilst lack of access to information and communication technology (ICT) facilities, and lack of relevant materials to execute practical tasks at home emerged for the second research question.

On ease and clarity of concepts, some of the participants that commented were of the view that face-to-face lectures avails them better understanding when compared to remote online learning. One of the participants remarked that: *"I miss going for lectures as they help me attain an insight to the concepts that will be taught"* the second participant was of the view that: *"contact lessons are essential due to better understanding...."* According to these participants, without going to the classroom, it will be very difficult to understand whatever is taught through an online medium. These findings corroborate the work of Abramenska (2015) as well as Arkorful and Abaidoo (2015). In their studies it was reported that, online learning is ineffective when compared with face-to-face, in that it makes clarification, explanation, and interpretation ideas difficult for learners. Consequently, Pappas (2015) remarked that, some persons absolutely need personal contact with their teachers or lecturers for them to understand whatever is taught. He attributed this to the difficulty of online method to address some learning problem.

Another finding that emerged was linked to lack of interaction between students which they considered a benefit enjoyed in face-to-face traditional learning environment. For instance, a participant declared that *"...group work will be affected as well and it's very helpful in terms of sharing knowledge."* In this participant's opinion, remote online learning limits the benefit sharing of ideas when executing group tasks. This result agrees with that of Dumford and Miller (2018). In their study, it was found the adoption of online approach to schooling limit students' engagement in collaborative learning. In that case, one of the underlying principles of TAM, the perceived usefulness is brought to bare. This is because, from participants' perceptions, the online learning is of no use since it limits them from interacting or collaborating with fellow students. The study also found the loss of motivation resulting from online learning, and how face-to-face learning makes students feel goal-driven as spelt out in the comment *"I prefer contact as opposed to self-learning (online)...Mostly a loss of motivation....purely because campus*

makes you feel more driven to meet your goal". This finding is in line with the report of Armstrong (2013) who stated that on-school learning is stimulating, because it allows for competition between colleagues as students benefit from them. According to him, such opportunities are not available in online learning.

On the other hand, findings from the second research question revealed lack of access to ICT facilities as a major inhibitor to online learning. The dominant challenge from participants perspective that hinder their effective engagement in online learning are lack of access to internet, cost of internet data and laptop. This result is in line with the findings of Mathew and Ebelelloanya (2016), as well Muslem, Yusuf and Juliana (2018). According to them, lack or limited access to internet, high cost of internet data, and lack of access to ICT infrastructure are major hinderances to effective engagement in online learning. Another challenge brought to the fore by one of the participants is lack of relevant materials for practical tasks as seen in the comment: *"...some tools used to make products for practical's I do not have at home, and it is only available on campus"* This finding is supported by the findings of Arkorful and Abaidoo (2015). In their study, they reported that online learning in education cannot be adopted for all fields. According to them, the purely scientific fields that include practical tasks cannot be studied through online means.

To compare the findings of this study with the propositions of TAM, it is concluded from the students' perspective that the perceived usefulness of the online approach to learning of their practical modules cannot be achieved. Also, a participant complained about the issue of conducive learning space as reported by one of the participants thus: *"...non-conducive learning environment, privacy, no space to study, unable to concentrate, stress and anxiety"* This result is confirmed by the submission of Hu and Potter (2012) who reported that, it is difficult for learning to take place in an atmosphere that is not conducive. Reasons being that, physical, social, cultural, and psychological factors of a learning environment all have effect on student's assimilation. They further recommended that, making online learning successful requires the establishment of safe and supportive environment among others

The findings of the chapter also reveal the readiness of the South African university to participate in the fourth industrial revolution. Specifically, the findings from the second research question indicated that most of the students lack the required ICT facilities to engage in remote learning. This simply imply a lack of readiness in the part of the university to engage in the 4IR. The findings in this chapter is in agreement with Kayembe and Nel (2019) who listed lack of ICT infrastructure in their study as one of the factors that will impede higher institutions in South Africa from participating in the 4IR.

This chapter explored the readiness of a University in South African in the deployment of the necessary facilities required to undertake remote teaching and learning of practical courses in Science and Technology Education Cluster during the COVID-19 pandemic. A review of the literature on pandemic, COVID-19, 4IR and its challenges on education was carried out. The chapter adopted a qualitative case study approach in generating data that addressed the two questions namely; the impact of COVID-19 on students' engagement with their practical modules; and their readiness to learn remotely and carry out the practical aspects of their modules. The findings highlighted include lack of clarity and understanding of concepts taught, lack of interaction with instructors and fellow students and lack of motivation. Others include lack of access to ICT infrastructure, relevant materials for practical and conducive learning environment. These findings hold major implications for the readiness of higher education in South Africa to take part in the 4IR.

IMPLICATIONS FOR THE FOURTH INDUSTRIAL REVOLUTION

It is possible that most educational institutions around the globe have invested to ensure the continuity of their programmes. Therefore, a post-pandemic educational system will see some of these technologies adopted as part and parcel of the school programme. Hence, an insight on the readiness of higher education to participate for the 4IR could be seen on their ability to effectively cope during this period of COVID-19 pandemic.

Consequently, the findings of this study hold the following implications for the readiness of higher education in South Africa to take part in 4IR. These include:

1. The need for government and higher education institutions to invest massively in the provision of ICT infrastructure for all stakeholders concerned to effectively engage in the implementation of the 4IR.
2. The planning, designing and implementation of a new university curriculum should take into consideration the level of interaction that exists between students alike and their instructors. Thus, this should be integrated in the development of programme contents, with specific interest in practical modules.
3. The designing of any programme content should be made simple for easy comprehension by students who will undertake such module.

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Chapter 3

The Effects of Remote Work on Family Relationships: Examples From Academia

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ABSTRACT

This chapter analyses the effects of remote work on family relationships during confinement due to the COVID-19 pandemic. The study is centered on faculty and staff members from a private business school in Puebla, Mexico. The research was conducted almost five months after the university closed its doors and moved all its activities online, having participants time to adapt to the new normal. A scale was developed and validated, and later on, it was applied in a country where family values, cultures, and traditions are strong. The scale included five distinct areas of study: remote working conditions, time and task management, work performance, stress, and family relations. All the business school faculty and administrative staff were invited to participate in the study. Results show employees' perceptions about how working remotely positively or negatively affected their relationships at home and their productivity at work, leading to the design of best practices and useful guidelines that will minimize the adverse effects of remote work while enhancing the positive ones.

DOI: 10.4018/978-1-7998-3347-5.ch003

INTRODUCTION

This chapter presents the effects of remote work on faculty and staff members' family relationships in a private university in Puebla, Mexico. UPAEP University had to close its doors and move its operations online due to the COVID-19 crisis. Working from home resulted in unforeseen challenges that all employees had to face, with almost no time to prepare. Still, with the confinement extending over several months, people started adapting to the new conditions.

The chapter presents theoretical foundations regarding the current conditions of the COVID-19 pandemic and how they are being faced in remote work and family dynamics. It also integrates the main characteristics of Mexican families, those of remote work, stress, and burnout syndrome. The university is briefly described, along with the contingency plan developed to ensure that faculty and staff could continue their tasks while working from home. A scale was designed and validated and is briefly described along with the procedure followed in conducting the research.

This chapter aims to show the current remote working conditions of faculty and staff and how these have affected their family relationships. The chapter is oriented towards answering the following questions: What are the critical dimensions of remote work that can affect family relationships? And, how have family relationships been affected since work has moved online?

BACKGROUND

The business school at UPAEP University was founded in 1973 and is located in Puebla, Mexico. When the World Health Organization declared COVID-19 a pandemic, all students were sent home. In this challenging scenario, faculty worked regular hours, starting the process of migrating their courses to online platforms. Just as decisions were made to close the campus, the university developed a continuity plan to ensure that academic activities would not be interrupted. A website was created to integrate the information about the plan, including the technological resources to accompany the migration process, official communications, updates on the pandemic, and a series of health and wellbeing recommendations.

Compulsory courses for staff and faculty about the use of video conferencing tools, focusing on fast-track technology-based courses that were developed entirely online. At first, faculty members were thrilled about working from home -because no one knew how long the situation would last- but as time progressed, difficulties emerged. It took time to redesign courses and materials. Some had to take their office computer home, as other family members would also be working or studying from home, and not all would have access to a personal computer. Few members had experience teaching online and some had never used specific digital tools. There was a gap between inexperienced and digitally dexterous employees. Some were teaching and learning at the same time.

THEORETICAL FRAMEWORK: CONCEPTS, DEFINITIONS AND EXISTING THEORIES

The unprecedented situation has revealed the necessary analysis of the New Ways of Working (NWoW) within the New Ways of Life (NWoL). The conflicts associated with NWoW and NWoL have repercussions in two directions: from work to family, and vice versa. Work from home can have a negative spillover

effect when pressures from work and home are mutually incompatible (Bellavia & Frone, 2005). Flexible work-home arrangements have been found to negatively associate with time-based and strain-based interferences (Dickkers, Geurts, Kompier, Taris, Houtman & Van den Heuvel, 2007).

Spillover creates conflicting situations affecting relationships, such as communication, privacy, the balance between life and work, general wellbeing and health, satisfaction, and even the family economy. Work can be affected in terms of performance, punctuality, concentration, commitment, and collaborative work development at a distance (Sok, Blomme & Tromp, 2014). Nevertheless, recent studies have also suggested that working from home can positively affect both work and family relationships (Evans, Mikocka-Wlatus, Klas, Olive, Sciberras, Karantzas & Westrupp, 2020).

Working from home has become widespread in recent years, reaching its highest level in response to the health crisis and the closure of work centers. Many businesses found ways to continue their operations, even while employees stayed at home (Trapp, 2020). In this sense, technology provides tools to fight the pandemic by facilitating work from home, allowing the safeguard of public health and the economy (Berg, Bonnet & Soares, 2020). Before the pandemic, working from home was considered a perk offered by some companies, which had started giving employees the option of doing home-office one or more days a week. Ideally, working from home was supposed to be an advantage because it removed daily stress (Rosenbaum, 2020) from commuting (McKeown, 2018) and finding an adequate balance between work and family. Because of the crisis, home-based work was forced upon many families. Their members had to study and work remotely in a continuous coexistence affecting both the relationships in the household and labor productivity.

The potential for working from home varies due to differences in occupational structures and the infrastructure available (Berg, Bonnet & Soares, 2020). Working from home might not be a good fit for everyone, as life tends to get in the way (ILO, 2020). Most remote work happens in the space of private life. Only 8% use coworking spaces, while 4% use public spaces such as coffee shops (Buffer, 2020). However, some families are not used to spending that much time together, and households are ill-prepared to provide a formal working space free from unwanted noise and interruptions (Dizik, 2017).

Various family relationships are affected by remote work and the emergence of employment in private life geography. The kitchen counter, the dining table, and even the bed have become the home office, with no furniture ergonomically designed for long working hours (Lufkin, 2020). In open-plan homes, problems intensify with added noise, delaying work or normal activities in the household (Lojeski & Reilly, 2020). Moreover, numerous households do not have devices such as laptops or desk computers for every family member, and more than one person requires to use them, generating chaos.

Furthermore, several issues appear, including how work is distributed along the day, communication disruptions, and even the need for interactions with others besides the people living in the same household (Cote, 2020). In some homes, problems of mothers and wives include having to shoulder extra domestic work, having to take care of children as daycare centers closed, and for older ones, it requires helping with their learning activities (Petersen, 2020). Additionally, more cooking is done because, during the pandemic, numerous restaurants were closed (McMillan, 2020), resulting in a never-ending spiral of constant cooking and cleaning.

These situations result in overlapping between family-life and work-life, with the added stress of entire families being confined to the home, and there seems to be no time to disconnect from the screens and connect with family members (Rosenbaum, 2020). The following subsections approach, in further detail, the issues presented in this section. Several theories, concepts and definitions are introduced to better understand the context surrounding the study, as well as the elements of analysis.

The COVID-19 Pandemic

COVID-19 is a respiratory disease, named as an acronym for Corona Virus Disease - 2019. It was recognized in December 2019, being the city of Wuhan in China (Fauci, Lane & Redfield, 2020), the reported epicenter of the outbreak. In January 2020, the World Health Organization (2020) declared the outbreak a public health emergency of international concern, and, in March of that same year, announced the outbreak as a pandemic. By September 2020, there was no effective treatment or vaccine, although several inoculations were being developed and tested worldwide.

If contracted, the disease could cause a variety of degrees of illness, from flu-like symptoms to more severe problems that could result in the death of the patient (Nussbaumer-Streit, Mayr, Dobrescu, Chapman, Persad, Klerings, Wagner, Siebert, Christof, Zachariah, & Gartlehner, 2020). For governments, keeping the mortality rate at a minimum became a priority. In order to do so, quarantine, social distancing, and isolation measures were enforced (Anderson, Heerterbeek, Kilnkenberg & Hollingworth, 2020). Other health recommendations included hand hygiene, the use of face masks, school and workplace closures, and travel restrictions.

Lockdown measures had various impacts on those who had to stay home, which included stress, anxiety, insomnia, and even depression (Rossi, Soggi, Talevi, Mensi, Niolu, Pacitti, Di Marco, Rossi, Siracusano, & Di Lorenzo, 2020). Changes meant that workers had to adapt to a new environment, battling a different set of distractions, as well as the unprecedented fusion of work and private life (Deloitte, 2020). Studies have been conducted to assess different issues associated with the COVID-19 confinement. In China, the wellbeing of adults one month into the confinement was evaluated, analyzing psychological distress and life satisfaction (Zhang, Wang, Rauch & Wei, 2020), as well as the way in which overcrowded housing may result in strained relationships (OECD, 2020).

Confinement Conditions in Higher Education (HE)

The COVID-19 pandemic affected all aspects of human life, including education. Universities worldwide faced the problem of suspending academic activities and resuming them when the pandemic ended, creating significant disruptions to educational programs. The only alternative was to develop new strategies for the courses to follow the scheduled deadlines through ICT use. More than 1.5 billion students worldwide have been affected by schools and universities closing due to the COVID-19 outbreak (IAU, 2020). In total, 102 countries on three different continents declared the closure of schools and universities (UNESCO, 2020).

New patterns for coexistence and opportunities have emerged in different sectors forcing universities to switch their entire instructional apparatus to online mode practically overnight (Govindarajan & Srivastava, 2020). Responses to the state of emergency did not come without problems. Students and teachers were equally affected by the adoption of instructional measures through technology (Lederman, 2020). Students had to begin to study and work more independently, while teachers had to redesign and reinvent the courses to adapt them to the new reality.

Hybrid programs without an established online education plan were developed. Initial changes were improvised to speed up the response time. The transition was a temporary solution, as it generally takes at least six months and sometimes a year to design, develop and build an online course to do it properly (Besset, Chick & Friber, 2020). The campus extended to the home, and digital devices became the me-

dium of instruction. Available tools and technologies such as e-mail, digital educational platforms, and video conferencing systems started to be used daily. For faculty, it was uncharted territory.

Crawford, Butler-Henderson, Rudolph, Malkawi, Glowatz, Burton, Magni & Lam (2020) have conducted research to determine how HE services in different countries have responded to the COVID-19 pandemic. They have suggested that some providers have had responses to social isolation strategies on campus while others were rapid in curriculum redevelopment for fully online offerings.

Relationships in the Family During the COVID-19 Pandemic

The family appears implicitly as an institution and as a form of logical extension (The Centre for Social Justice, 2008). It is a domain where theories, ideologies, and political views intermingle because the family is connected to the moral and ideological orientations of the society to which it belongs (Lück & Castrén, 2018). Changes in family relationships due to COVID-19 can be analyzed from multiple theoretical standpoints. Social conflict, social exchanges, and systems theories were selected because they appeared to be complementary in understanding family behavior in the pandemic context.

Social Conflict Theory

This theory helps explain how changes affect the way families function when the home becomes the space of work, study, and leisure. Social conflict theories analyze the perspective that families constitute groups in which their members fight to control and protect resources and handle both positive and negative emotions (Farrington & Chertok, 2009). Conflicts in the family can arise from a variety of sources, such as goals not being oriented, differences in beliefs, viewpoints, financial issues, and changing family situations. In this sense, working from home can create tension and anxiety as it is challenging to accept enforced change (Cardinus Risk Management, 2020). It becomes harder to engage in constructive behaviors, such as responsive support, constructive problem solving, and accommodation (Pietromonaco & Overall, 2020).

Social Exchange Theory

The perspective of social exchange considers activities as a series of transactions. Relationships will last while exchanges remain rewarding for everyone (White, Martin & Adamsons, 2019). Relationships are tied to emotional and physical support (Pietromonaco & Overall, 2020). Exchanges include multiple forms of transfer, such as personal care, practical help, and emotional support (Hämäläinen, Tanskanen, Danielsbacka, & Arpino, 2020). Social exchange perspectives indicate that family relationships become interdependent, or interactional, and assessing the power that is held among the actors in those relationships is essential to understand them (Chibucos, Leite & Weis, 2005).

The concepts of equity and reciprocity are embedded in the social exchange theory, as family life is replete with relationships that promote perceptions of inequality. Chibucos, Leite, and Weis (2005) explained that there are three potential costs of social exchanges in the family that can result in a perception of inequality, and that can lead to conflict: investment costs, including energy, emotional and cognitive investments; direct costs based on time, financial and structural resources; and opportunity costs or possible rewards that might be lost during an exchange, for instance, the time that a parent needs to invest in helping a child with school-related activities.

Social Systems Theory

This theory analyzes the family as a series of different relationships that are significantly connected and why they function well or fail (Cadenas, 2015). There are different types of relationships that include members, the instances that affect the individual and, the socio-ideological context (Le Camus, 1997). The COVID-19 pandemic created unparalleled conditions that affected all relationships.

The systems theory was proposed by Von Bertalanffy (1968). A system is a set of interactive elements that can be opened or closed. Within the family, the individual is part of a social system to which he must adapt, and the characteristics of the system govern his actions. This theory approaches human functioning based on the interactions between people in a family, and the family in the context in which it is embedded (Watson, 2012). The systemic perspective also includes considerations on the way in which certain constraints affect a whole system. When analyzed from the standpoint of restrictions to physical movements, the effects can be observed in politics, working from home policies, finances, the legal system, and even in families spending more time together. Also, exclusion from other areas of society needs to be analyzed (Esposito, 2020).

The pandemic has increased the rate of marital breakdowns as it exacerbates existing marital problems and creating new ones (Prime, Wade, & Browne, 2020). Conflict and dissolution can be associated with numerous factors, including financial issues due to job loss (Amato & Rogers, 1997), confinement conditions, and others. However, times of hardship can also allow for opportunities to build stronger relationships (Cluver, Lachman, Sherr, Wessels, Krug, Rakotomalala, Blight, Hillis, Bachman, Green, Butchart, Tomlinson, Ward, Doubt, and McDonald, 2020).

Mexican Culture, Family, and WORK

Mexican culture can be defined as collective; therefore, social contact is essential (Lewis, 2006). People are warm, although emotional and impulsive. They often multitask and have problems with keeping up with time and agendas. Studies have shown that 75% of Mexicans have faced work-related stress and fatigue problems, and the country has been in the first position of work-related stress two years in a row (Mexico News Daily, 2019). Together, anxiety and depression affect almost 25% of the population (Secretaría de Salud, 2017). Society is hierarchical, showing inherent inequalities. There is high uncertainty avoidance, low long-term orientation, and great respect for traditions. They focus on achieving quick results and have very high indulgence (Hofstede Insights, 2018). The country has medium to high context communication, uses medium indirect negative feedback, decisions are made top-down, trust is relationship-based, they mildly avoid confrontation, work on flexible time, and persuasion is slightly oriented towards principles (Meyer, 2014).

Mexicans are generally satisfied with their lives (OECD, 2020). They possess an overall positive attitude, and there is a tendency toward optimism. An essential part of their satisfaction comes from family life. There is a strong connection between members who are loyal and committed to each other (Evanson, 2018), creating close-knit relations that provide a network of security and support. Food is an essential part of the relationships as affection and connection are shown particularly at the table.

Remote Work

Traditionally, work has been associated with a physical location, but not anymore. Jobs with flexible contracts and without a specific location or schedules are the new rule, allowing people to work anytime, anywhere, and in any way (Eurofund-ILO, 2017; Müller & Niessen, 2019). This trend reflects flexibility and is supported by non-traditional practices and settings, as well as technologies (Johns & Gratton, 2013). New technologies improve workflows, promote new ways of storing and sharing information, and contribute to the possibility of remote connectivity and mobility, transforming work into something more digital, fluid, informal, and flexible (Jacobs, Kagerman & Spath, 2017). Remote work, as a flexible work practice, is an option to the workforce whose job responsibilities are considered non-essential and that can be done using different technologies (Iqbal, Suh, Czerwinski, Mark & Teevan, 2020).

Working from home can create unique challenges for remote workers because the work role is integrated into the family domain (Allen, Cho & Meier, 2014). Studies have shown that people who work from home tend to work longer hours due to the limited control of the time they work (ILO, 2017). Work competes with private life and free time, since people carry out their activities outside of regular business hours, in the evenings, on weekends, and holidays (Thulin, Vilhelmson & Johansson, 2019).

Most remote workers have difficulty disengaging from their employment activities, and they usually think they spend more hours than when they were in a traditional work setting. Checking e-mails or messages before going to sleep is common practice amongst this type of employee, who also works when sick. This is partly why remote employees often feel overworked and stressed (Mulki, Bardhi, Lask & Nanavaty-Dahl, 2009). Working independently and managing time and tasks are essential skills, followed by balancing priorities and setting personal goals (Flores, 2019). Despite the challenges that arise, remote work continues to expand. Gartner (2018) estimated that by 2020, 62% of employees would be working virtually, and these figures were calculated before the pandemic. With the health crisis, the number of people working remotely has increased substantially, proving not only that this type of work is a solution in difficult times, but that, in many sectors, it is a sustainable method that reduces costs related to the presence of employees in a physical workspace.

Working remotely raises issues regarding teamwork dynamics, communication models, new types of leadership, technology management, performance, productivity, stress, anxiety, and personal relationships (Mukhopadhyay & Mukhopadhyay, 2020). There is also the matter of job satisfaction (Schall, 2019) due to perceived autonomy and the association with fewer work disruptions concerning family time. It is necessary to consider the boundaries that exist or that are blurred in the remote work environment to understand how they can cause stress or job satisfaction and work-family conflict or conciliation. Edleston and Mulki (2017) mention that because gender roles are still deeply implanted in work-family interactions, they may also affect remote workers' experience.

Stress and Burnout Syndrome

Organizations are facing complex and uncertain environments. Job insecurity and instability prevail. Continuous technological advances and digitalization have led to ever-growing demands, resulting in overwhelmed employees living in more stressful settings. In the workplace, stress affects workers' physical and psychological health. It is also a variable that contributes to different pathologies, including depression, anxiety, obesity, and overweight (Pinto-López, Montaudon-Tomas, Montaudon-Tomas & Muñoz-Ortiz, 2020).

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Crisis conditions and the high number of deaths resulting from the disease among colleagues and/ or family members result in emotional trauma that can affect family and work life. Staff feel increasingly angry, demoralized, helpless, and hopeless, and eventually become burned out (Bloom & Farragher, 2010). When people experience stress continuously, they can become less creative and less productive, bad decisions are made, and engagement with the organization is eventually lost. When this happens, businesses risk their competitiveness (Pinto-López et al., 2020; Barsade, 2014; Demerouti, Bakker, Nachreiner & Schaufeli, 2001).

Emotional fatigue generates negative consequences on human talent; these occur on physical, psychological, work, and socio-family health (Amutio, Ayestaran & Smith, 2008). People tend to get sick, they are poorly motivated, have low performance in their activities, and there is a high probability that they will abandon their job (Calderón-Hernández, Murillo-Galvis & Torres-Narváez 2003). Burnout has an exhaustion component that can be job-related, physical, emotional, or a combination (Schaufeli, 2017), and can be considered an occupational disease (Chirico, 2017).

People working from home have been exposed to specific psychosocial risks due to isolation, a change in workloads, and blurred boundaries between work and family. Heavy workload is related to mental disorders such as depression, anxiety, burnout syndrome; however, work underload, associated with monotonous or under-stimulating tasks, can also increase work-related stress and have adverse effects on job satisfaction (ILO, 2020). One of the objectives of this study is to determine if the people who participated have been working more or less than before, if the situation has led them to be more stressed, and if they have experienced burnout syndrome and other problems related to remote work that affect family relationships.

METHODOLOGY

Research Process

The research was conducted in August 2020. By then, faculty and staff members had been working from home for five months, since the confinement began on March 20th, 2020; hence, they had somewhat come to terms with the situation of remote work at the time data was being collected. When confinement started, the university was in the middle of the spring semester. Students were sent home a week earlier, and faculty and staff had to undergo extensive training to use specific tools for videoconferencing. All faculty were already using the Blackboard platform since it was part of the introductory training and continued skills development programs adopted by the university earlier.

Research Design

The study is cross-sectional (Hernández, Fernández & Baptista, 2014), as it describes variables associated with remote work and their effects on faculty and staff's family relationships in one single moment in time. It is a descriptive study that attempts to identify the main effects of remote work on family relationships. To obtain greater reliability in the results, and since the total number of elements of the population was one hundred and thirty-nine (139), it was decided to carry out a census, which allows to include all the cases of the population, which in this case were all the faculty and staff from the business

school. One hundred and thirty-nine (139) employees integrated the population, but twelve (12) were on temporary leave or on holiday, and two (2) questionnaires had to be eliminated because of missing information. Therefore, one hundred and twenty-five (125) valid questionnaires were used for the study.

The study is quantitative because it measures the variables associated with remote work and family relationships. The choice of a questionnaire as the method for data collection is linked to the research strategy, the type of variable, the required reliability, the availability of resources, the researcher's skills, the relationships between a variable and its sources, and practical methods for collection (Rojas, 2011). The questions were close-ended with multiple choice answers, and the results are the product of statistical analysis.

Scale Design and Testing

In the instrument design stage, items were generated based on the theoretical framework, and the levels of measurement and coding were determined (Hernández et al., 2014). It was considered that the instrument should not take more than 6 minutes to be answered. In all, 50 items or questions based on a 7-points Likert scale were developed. The instrument was named Effects of Remote Work on Family Relationships Scale (ERWFRS) because of its scope. Additionally, demographic information and yes/no questions were also included.

Altogether, five distinct dimensions were analyzed: working conditions and job requirements, time and task management, performance at work, work-related stress, and family relationships. Experts from the areas of family studies and methodology evaluated the construct and suggested modifications to avoid problems in its configuration and clarity. A pilot test was conducted to review the coding, the adequate fluency, the extension, and the comprehension of the questionnaire (Bethlehem, 2000), as well to justify the methods used in terms of their validity and reliability (van Teijlingen, Rennie, Hundley & Graham, 2001). During the pilot test, the questionnaire was applied to 30 people from other areas of the university. The instrument was reviewed and adjusted.

The pilot test provided an overall alpha of 0.810. The instrument can be considered as reliable because the requirements established by Cronbach (1951) were met. For the study, the overall alpha changed slightly to 0.796, and the confidence level was 95%, as can be observed in Table 1.

Table 1. Cronbach alpha

Dimensions	Cronbach
Overall	0.796
Working conditions and requirements	0.681
Time and task management	0.681
Performance at work	0.685
Work-related stress	0.743
Family relationships	0.652

Source: Developed by the authors, 2020

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The demographic data showed that the participants had a mean age of 45 years, the youngest being 25 years old, and the eldest 77. The business school faculty and staff are predominantly feminine (62% are female, and 38% are male); in fact, it has an all-female administrative staff. In terms of their marital status, 32% are single, 56.8% are either married or have a living partnership, 9.6% are divorced, and 1.6% are widows or widowers. Of all members, 63% have children, and from those, 60.8% must help them with online learning activities. In 75% of the cases, there are 2 to 4 people in a household, in 5%, there is one, and in 20% of the households, there are five or more people living together.

RESULTS

The results of the study are displayed in Table 2. Results from each dimension and item are presented considering their mean, standard deviation, and level of agreement or disagreement on the Likert scale.

Table 3 shows additional questions that had yes/no answers, which are complementary to those in Table 2.

Table 2. Results from each dimension and item

	Dimension/ items			Level of agreement or disagreement (%)		
Item	Working conditions and job requirements	Mean (μ)	Standard deviation (σ)	Disagree (1-3)	Neutral (4)	Agree (5-7)
1	Have an adequate space to work remotely	5.420	1.760	15.2	12.8	72
2	Have a good internet connection	5.482	1.462	11.2	11.2	77.6
3	Experience frequent internet failures	3.732	1.948	45.1	13.7	41.7
4	Have furniture that is adequate to work from home (ergonomics)	3.342	2.126	56.4	10.5	33.1
5	Have access to information and tools required for work	5.862	1.450	7.3	7.3	85.4
6	Have been provided with the required communication tools	5.516	1.914	16.9	4.8	73.8
7	Have received the necessary training to start working from home	5.232	2.056	20.8	8.8	70.4
8	Need more training to make the most out of the digital tools	4.344	1.832	36	12.8	51.2
9	Participate in more meetings than before	5.464	1.790	12	14.4	73.6
	Time and task management	μ	σ	Disagree (1-3)	Neutral (4)	Agree (5-7)
10	Are able to separate time between family and work	4.605	2.176	30.6	16.1	53.3
11	Have tended to family issues during business hours	4.824	2.254	26.4	9.6	64
12	Has been hard keeping motivated to work for continuous periods of time	3.798	2.255	46.4	8	45.6
13	When needed, have taken separation from the rest of the family	3.994	2.209	30.6	16.1	53.3

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The Effects of Remote Work on Family Relationships

Table 2. Continued

	Dimension/ items			Level of agreement or disagreement (%)		
14	Feel more distracted than in the office and lose more time	3.618	2.340	29.6	7.2	63.2
15	Have been working on weekends	5.605	1.778	12.8	8	79.2
16	Are working more than before	6.284	1.260	3.2	5.6	91.2
17	Are able to maintain the same schedule	3.520	2.302	55.2	11.2	33.6
18	Have been having time management problems	3.734	2.200	46.7	11.3	42
19	Have to be on call 24/7	3.519	2.126	54.2	12.2	33.6
	Performance at work	μ	σ	Disagree (1-3)	Neutral (4)	Agree (5-7)
20	Before the pandemic, had the required digital skills to work from home	5.387	1.723	17.7	13.7	68.6
21	Have had difficulties adapting to the NWoW	2.661	1.995	73.9	2.4	23.7
22	Job performance has been negatively affected	2.411	1.743	74.4	10.4	15.2
23	Feel that the household noise affects job performance	4.408	2.007	36.8	15.2	48
24	Have been able to organize for work	5.895	1.330	5.6	8.8	85.6
25	Feel integrated with team members, even virtually	5.528	1.830	15.5	9.8	74.7
26	Have faced more digital distractions than at the office	3.640	2.308	72.8	7.2	20
27	Have daily contact with superiors	4.792	2.041	27.2	14.4	58.4
28	Have experienced difficulties using specific digital tools	3.089	1.967	58.9	12.1	28.1
29	Have seen digital skills improve since the beginning of the pandemic	6.274	1.115	7.3	2.4	90.3
	Work-related stress	μ	σ	Disagree (1-3)	Neutral (4)	Agree (5-7)
30	Have less patience	2.993	2.061	62.4	6.4	31.2
31	Have been yelling more	3.145	2.218	59.6	7.3	33.1
32	Are angrier than before	3.224	1.975	57.6	12	30.4
33	Are more irritable than before the pandemic	3.339	2.048	55.6	14.7	29.7
34	Have experienced burn out syndrome	3.516	2.318	50.8	11.3	37.9
35	Are more sensitive to work demands	3.720	2.130	48.8	12.8	30.4
36	Feel more stressed when working from home	3.602	2.2895	61.2	12.2	36.6
37	Feel the need to have some free time	5.218	2.020	22.6	6.5	70.9
38	Feel that others have invaded the private working space	2.895	2.2409	62.9	8.0	29.1
39	Feel that you have more supervision	4.560	2.041	27.2	20.8	52
	Family relationships	μ	σ	Disagree (1-3)	Neutral (4)	Agree (5-7)
40	Confinement has created rivalries among members	2.073	1.664	80.4	9.8	9.8
41	Feel that excess of contact has created conflict	2.581	2.012	70.1	8.9	21

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The Effects of Remote Work on Family Relationships

Table 2. Continued

	Dimension/ items			Level of agreement or disagreement (%)		
42	Over time, family relationships have been negatively affected	2.605	1.910	68.4	10.5	21.1
43	Feel that conversations with family members have become difficult	2.637	1.966	69.4	6.5	24.1
44	Have received support from family regarding digital technologies	4.621	2.245	29.3	14.6	56.1
45	Feel that problems quickly turn into conflicts	2.952	1.991	65.4	8.1	38.4
46	Spend more quality time with the family	5.256	1.987	17.6	12	70.4
47	Feel that the relationships with other family members have solidified	5.488	1.651	9.8	19.5	70.7
48	Have enjoyed time together with other family members	5.960	1.369	5.6	10.5	83.9
49	Have been able to create a space to have family meals together	5.548	1.884	13.7	12.1	74.2
	Decision about working from home in the future	μ	σ	Disagree (1-3)	Neutral (4)	Agree (5-7)
50	If possible, would like to continue working remotely after the confinement is lifted	5.266	2.1033	21.8	10.5	67.7

Source: Developed by the authors, 2020

Table 3. Additional yes/no questions

Question	Yes	No
(If married) Have considered separation or divorce	4.2	95.8
Own a private space in which the door can be closed for privacy during videoconferences	76.8	23.3
Need to help younger children with their coursework and other learning activities	40.6	58.4

Source: Developed by the authors, 2020

Interpretation of Findings

As shown in Table 2, when analyzing working conditions and job requirements, 72% of the respondents have an adequate space to work remotely, but only 33.1% of participants have appropriate furniture for working from home. An interesting aspect is that 76.8% have a space in which they can close the door for privacy during video conferencing. Although 77.6% of respondents consider that they have a good internet connection, 41.7% have experienced frequent internet failures. 85.4% believe that they have access to information and tools required to do their jobs, 73.8% have been provided with the communication tools that they need, and 70.4% have received the required training to start working from home, although 51.2% believe that they need more training to make the most out of the digital tools at hand. 73.6% voiced that they participate in more business-related meetings than before the pandemic.

In the time and task management dimension, 42% of respondents consider having time management problems. 53.3% of respondents can separate time between family and work, although 64% have tended to family issues during business hours. 45.6% consider that it has been hard to keep motivated for long periods, and 63.2% feel more distracted than in the office and lose more time. 53.3% have taken a separation from the rest of the family when needed. Only 33.6% have maintained their same schedule; that same percentage feel that they need to be on call 24/7. Among the participants, 79.2% have been working on weekends, and a large majority, 91.2%, voiced that they are working more now that they are working remotely than when they were at their traditional workplace.

The dimension of performance at work showed interesting results. 68.6% of all participants considered that, before the pandemic, they already had the digital skills to work from home, and only 23.7% had difficulties adjusting to the new working conditions. 85.6% believe that they have been able to organize for work, 74.7% feel integrated with their teams even virtually, and 58.4% have daily contact with supervisors.

In terms of the negative spillover on job performance, only 15.2% believe that their job performance has been negatively affected since they started working remotely, 20% have faced more digital distractions than at the office, and 28.1% expressed that they had difficulties when using specific digital tools. It is relevant to notice that 90.3% of all participants have seen their digital skills improve since the pandemic started.

When asked about work-related stress, 31.2% of participants believe they have less patience than before, 33.1% have been yelling more, 30.4% feel angrier, and 29.7% are more irritable. 30.4% are more sensitive to work demands, and 37.9% have experienced burn out syndrome. 29.1% feel that others have invaded the private working space, 52% feel that they have more supervision than before, and 70.9% feel the need to have some free time. Overall, 36.6% of participants feel more stressed when working from home.

In the dimension of family relationships, in only 9.8% of the cases, the confinement has created rivalries. 21% of the participants feel that excess contact has created conflict, and almost the same amount and 21.1% consider that relationships have been negatively affected. 24.1% feel that conversations have become complicated, 38.4% consider that problems quickly turn into conflict, and 40.6% had to help children with their school activities.

It is relevant to notice the positive effects; 56.1% of the respondents have received support from family members regarding digital technologies, 70.4% have spent more quality time with the family, and 70.7% have seen their family relationships solidify. Furthermore, 74.2% have created a space for family meals, 83.9% have enjoyed their time together with other family members, and only 4.2% have considered separating or getting a divorce. When asked if they would like to continue working remotely once the confinement conditions were lifted, 67.7% responded they would.

Discussion of Findings

This section analyzes the results of the study when compared to the theories and previous studies presented in the theoretical framework. At home, the furniture is not ergonomically designed for work (Lufkin, 2020), and participants work under uncomfortable positions that might damage their health. When gender is analyzed, for women working conditions include shouldering extra work, especially when there are children in the household, because gender roles are deeply implanted in work-family

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interactions (Eddleston & Mulki, 2017; Petersen, 2020; Cluver et al., 2020). At the business school, most members are female, and a large percentage of them are also mothers, some of whom had to help their younger children with school activities.

Time management has arguably been one of the most prevalent problems in remote work, associated with time-based interferences (Dikkers et al., 2007). This is a fact that is also embedded in the culture in Mexico, as people have problems with keeping up with time and their agendas (Lewis, 2006), especially when it comes to finding an adequate balance between family and work and spending extra hours at work (McKeown, 2018), as people tend to work on flexible time (Meyer, 2014). Tending to family issues during work hours is standard, as life gets in the way (ILO, 2020). How work is distributed along the day is critical (Cote, 2020), especially maintaining a schedule, which for one-third of participants was not possible. Employees work longer hours because they do not have control over their work (ILO, 2017; Mulki et al., 2009), sometimes they end up working on weekends, which complies with Thulin, Vilhemson & Johansson's (2019) conclusions about people feeling overworked and stressed (Mulki et al., 2009).

Theoretical perspectives on performance suggested that work could be negatively affected in terms of concentration, productivity, effectiveness, and efficiency (Evans et al., 2020). Results from the present study show that job performance was affected only in a few cases. Perhaps a relevant factor is that two-thirds of the participants have acquired the digital skills to work remotely beforehand. Studies have also suggested that it is hard to find an environment free from unwanted noise in the household (Dizik, 2017; Lojeski & Reilly, 2020), and almost half of the participants considered that the household noise affects their performance. Over two-thirds of participants have a space in which they can close the door for privacy during video conferencing, which can be, in part, a reason for them thinking their work is not being interrupted. Even with the problems, they are able to organize their work. Faculty should have been affected by the sudden adoption of certain technologies (Ledermann, 2020), but because the university had provided training, it only occurred in less than one-third of the cases.

When considering stress, it has been suggested that working from home removes some of the sources of daily stress (Rosenbaum, 2020). Nearly two-thirds of participants agreed with this. However, other studies show that stress and anxiety have been issues in organizational and personal behavior (Mukhopadhyay & Mukhopadhyay, 2020). Anger and stress are also the results of traumatic events in the workplace, such as change (Bloom & Farragher, 2010), which helps explain why more than a third of participants reported feeling more stressed. The excess work that participants manifested in the section about time management can be correlated to anxiety and burnout syndrome, as the International Labor Organization (2020) has established.

According to Evans et al. (2020), working remotely can have positive effects on work relationships; results show that participants are in close connection with their superiors and have been able to fully integrate with their teams virtually, which is part of the new teamwork dynamics and communication techniques of the NWoW (Mukhopadhyay & Mukhopadhyay, 2020). Still, some theorists believe that there seems to be no time to connect with family members (Rosenbaum, 2020). The results of the study show otherwise.

Studies by Bellavia & Fone (2005), Dikkers et al. (2007), and Sok et al. (2014) suggested that there could be a negative spillover effect of work in the family environment when working remotely, but also that positive effects could be identified (Evans et al., 2020). In the case of faculty and staff at the business school that was analyzed, the spillover effects in family relationships were positive, including spending more quality time, solidifying relationships, and enjoying each other's company, which agrees with

Cluver et al. (2020) who revealed that times of hardship could help build stronger relationships. This is in line with the characteristics of the Mexican culture as affection and connection are shown at the table (Evanson, 2018); this appears to be true in the analysis as over two-thirds of participants have been able to respect time for family meals. Prime, Wade, and Browne (2020) had even considered that the pandemic increased the rate of marital breakdowns. However, when faculty were asked whether they had thought of separating or getting a divorce due to confinement conditions, very few said they had thought of it.

The fact that over two-thirds of participants would like to continue working from home speaks about the perceived benefits with regard to the problems encountered. The research presented valuable information about remote work in the academic sector, specifically in a private business school in Mexico. The results were analyzed, leading to the development of best practices as remote working conditions continue for the rest of the year, and will possibly be useful later if some faculty or staff members continue working from home.

IMPLICATIONS FOR MANAGEMENT

Best practices and guidelines were developed from the results, which can be useful in the business school and also in other organizations that faced similar problems with remote work and its effects on family relationships. The best practices presented in Table 4 were obtained from current activities that faculty and staff have been able to perform to reduce the adverse effects of remote work while increasing the positive ones. The best practices are divided according to the five dimensions used in the study.

Table 4. Best practices by dimension

Dimension	Best practices
Working conditions and job requirements	Members have been able to “create” space for remote working. Access to information and communication tools have been successful.
Time and task management	Taking a separation from the rest of the family is essential for work performance. This also helps reduce additional distractions from the household.
Performance at work	Employees felt they had the required skills to work from home, due to different courses the university provided. This has helped maintain a steady workflow. Employees believe their digital skills have improved substantially, which is crucial in the digital age. They have been able to organize their work and have integrated successfully with their teams.
Work-related stress	Work-related stress has not escalated to a dangerous level. Different institutional practices seem to be working.
Family relationships	Faculty and staff profited from the confinement conditions, spending quality time with their families. Relationships among family members have solidified, enjoying each other, and receiving help from others.

Source: Developed by the authors, 2020

Suggestions that might improve the conditions of remote work, work performance, and family relationships are presented in Table 5, in the form of guidelines. Just as the best practices, the guidelines have also been divided according to the dimensions analyzed in the study: working conditions and job requirements, time and task management, performance at work, work-related stress, and family relationships.

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Table 5. Guidelines by dimension

Dimension	Guidelines
Working conditions and job requirements	Adequate furniture is essential to avoid health problems related to wrong body positioning and tiredness. The university might consider sending the office equipment to the faculty and staff's homes. Although training has been provided, employees will benefit from additional training to make the most out of the digital tools that they use and those that continue evolving. The number of essential and required meetings needs to be reviewed, as people are spending more of their valuable time in meetings than before. An institutional policy to provide employees with better internet access in their homes, maybe through an agreement with their own providers, can be developed.
Time and task management	It has been difficult for employees to separate family and work time. Tending to family issues, working on weekends, and not been able to keep working schedules result in people feeling that they have been working more. Software for time management can be offered to maintain motivation while working more effectively. Activities scheduled after regular hours should be avoided.
Performance at work	Daily contact with the boss needs to be evaluated. Accountability practices sometimes have a better effect.
Work-related stress	The amount of supervision required needs to be evaluated to determine the ways in which it can be done in a positive way to reduce stress instead of causing it. Short virtual breaks or virtual coffee sessions can be established so that people can relax for a moment while at work. The university can promote exercises that employees can do to reduce stress and physical discomfort related to being on the computer for hours on end. Employees need to designate private spaces inside the home so that each member of the household can have their own space and not feel invaded by others.
Family relationships	It is important to distinguish when there is a conflict in order to address the issue promptly and avoid escalation. Family members need to keep in mind that confinement conditions make any situation appear as a conflict. Keeping a clear mind is essential.

Source: Developed by the authors, 2020.

FUTURE RESEARCH DIRECTIONS

A parallel study is being conducted in different universities in Latin America. Further research will include comparisons about the way in which remote work has affected family relationships in different latitudes. This will help create support to develop valuable correlations among variables.

For the university, establishing comparisons between different schools and areas might be useful, primarily since a great deal of effort has been invested in creating conditions for employees to work at their best from home. It will also be of importance to determine whether the participation of employees in the wellness programs has resulted in reduced stress, better working conditions and performance, and whether the idea of a healthy workplace can be translated into the virtual workspace.

CONCLUSION

The study provided relevant information about remote work in the faculty and staff, allowing them to understand how the business school has been working remotely and the problems they have faced, as well as the benefits that they have obtained. It is essential to acknowledge that research was performed five months into the pandemic, once the participants had already created new habits and adapted to confinement conditions.

Overall, the benefits seem to have exceeded the problems. Participants strongly believe that their digital skills have improved. Regardless of the working conditions and job requirements of remote work, time management issues, and work-related stress, most participants do not consider that their performance has been negatively affected, nor have they had severe problems adapting to the new conditions, quite the opposite. The family has been a support in the use of digital tools for work, and families are creating stronger relationships. Surprisingly, it has been observed that in the case of a private business school in Mexico, the dimension that most affects family relationships is time management. Furthermore, the overall effects that remote work has on family relationships have been positive. Also, most employees would like to continue working remotely once the confinement is lifted.

The change brought on by the pandemic was more demanding on some people than on others. In HE, jobs were maintained as working conditions could easily be adapted through the use of new technologies. How well participants had adapted to change by working remotely varies, but overall, people take between 18 to 254 days to fully adapt, depending on the life changes at hand, and habit formation involves around 84 days (Lally, van Jaarsveld, Potts & Wardle, 2010). It can therefore be suggested that after 150 days doing remote work, faculty and staff were well adapted to its conditions.

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KEY TERMS AND DEFINITIONS

Burnout Syndrome: A state of physical exhaustion and emotional fatigue.

Confinement: Being kept in a restricted space or situation.

COVID-19: An infectious disease caused by a strain of coronavirus that causes respiratory infections.

Faculty: The academic staff of a university.

Positive Family Relationships: Loving relationships based on communication, commitment, and conflict management that results in strong family structures.

Remote Work: Work that is performed outside the traditional working space or office environment.

Stress: A bodily response to physical and mental factors.

Chapter 4

Developing Leadership Talent for Success in the Fourth Industrial Revolution

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ABSTRACT

Digital disruption brought by the Fourth Industrial Revolution (4IR) technologies has a major impact on cultures, strategies, structures, and processes of organizations. This change also requires a shift in leadership mindset to respond to opportunities, challenges, and dilemmas in the implementation of Industry 4.0 (I4.0). Moreover, effective leadership in the digital age requires developing a wide variety of core components of leadership. Therefore, improving the essential characteristics, capabilities, and skills of leaders plays a pivotal role in accelerating the path to success in the I4.0. In this regard, this chapter provides an in-depth discussion on leadership aspects of I4.0. The purpose of this chapter is to first present emerging leadership styles in I4.0. The chapter also explores what leadership roles have become more relevant in the age of I4.0 and what kind of fundamental leadership skills they need to possess in order to succeed.

INTRODUCTION

Over the centuries, the pursuit for innovative approaches to gain competitive edge in emerging economies has led to industrial developments. Current developments in Information and Communication Technology (ICT) used in various aspects of organizations have produced large-scale remarkable and rapid changes in industries. These revolutionary developments aimed at achieving digital transformation have been called the Fourth Industrial Revolution (4IR), also known as Industry 4.0 (I4.0) (Mohanta, Nanda & Patnaik, 2020). Not surprisingly, transition to I4.0 has made a profound global impact on organizations and businesses. Increased connectivity with digitalization in this age has caused major

DOI: 10.4018/978-1-7998-3347-5.ch004

disruption and volatility in the industry (Hlupic, 2020) and has brought different perspectives to value creation and value capture strategies (Gilchrist, 2016). In other words, 4IR that is currently underway with their manifold effects on the future of the work has begun to disrupt existing business models and has reshaped industries (Moueddene et al., 2019). Accordingly, the consequences of digitalization for the business world have been inevitably divided into two blocks: the first block is about the gradual elimination of simple job descriptions through rationalization, standardization and automation. The second block is about the emergence of new business types and new workplace models that must take into account the requirements of digital transformation (Ternes & Wilke, 2018). Consequently, the following four factors are expected to change radically in the factory of the future: tools, organizational structure, working environment, intra-organizational and inter-organizational cooperation (Gehrke et al., 2015). This means that new practices, new management structures, new workplace relationships, new qualification requirements and new employment models should be developed during this period to create a decisive competitive advantage.

Regarding I4.0 the main question faced in the business world is the adaptability of companies to digital transformation. It is a common knowledge that most global businesses are ready to embrace the digital revolution with the aim of reducing costs and increasing efficiency (Kumar, Zindani & Davim, 2019). However, a fast, open and responsive new business environment brought by the ongoing digital transformation has resulted in not only opportunities, but also several organizational challenges to contemporary organizations (Bawany, 2019). One of the great challenges is a lack of required skills in the organizations (Oberer & Erkollar, 2018). Due to the rapid advances in I4.0 technologies, especially the skills which are essential for today's workforce have changed at unprecedented scale and advanced new skills have been needed for employees to succeed in the future workplace. Identifying future employment trends at all levels in terms of the required knowledge and skills is considered as a key element of I4.0 (Schwab, 2016). On the other hand, leadership in I4.0 has a crucial role in the long-term survival of companies (Tulasi et al., 2019). Therefore, one of the main issue to be addressed in the successful implementation of the I4.0 is leadership. All in all, forward-thinking companies realize that they need effective organizational leadership skills to survive in today's volatile, uncertain, complex, and ambiguous (VUCA) environment (Moldoveanu & Narayandas, 2019). Although some traditional leadership abilities such as establishing and communicating a clear vision, motivating and empowering others are still critical to be able to successfully lead in the digital age, there are also new qualification requirements for leaders at the rapidly changing industrial environment (Bawany, 2017).

As a result, it is important to overview what kind of leadership talent is expected to succeed in the 4IR. On this basis, this chapter first provides an overview of I4.0 paradigm. Next, it examines the relationship between I4.0 and future of work. Then, it points out leadership fundamentals in the digital disruption by analyzing emerging leadership styles, leadership roles and essential leadership skills in I4.0.

INDUSTRY 4.0 PARADIGM

I4.0 is an industrial revolution that takes the meaning of the digitalization to an advanced level by radically changing the interaction between suppliers, producers and customers (Harper, 2019). Recently, it has drawn attention from both the research community and industry with the objectives of providing smooth operations and timely delivery of services (Mohanta, Nanda & Patnaik, 2020). In a general sense, in order to respond to change and improve their performance, modern companies have started to invest

in tools that enable their processes, equipment and employees to be integrated into a single network structure (Nagy et al., 2018). Linking cognitive systems and people's talents makes business processes more efficient, flexible and sustainable. Smart factories emerging in this environment enable to achieve competitive power in the fast-changing digital world (Wang & Wang, 2016; Bauer & Vocke, 2020). The vision of I4.0 emphasizes boosting business performance by utilizing digitization to unify physical and the virtual systems. It also aims to connect all units together and allow the real-time interaction between them. This is achieved through the key innovative technologies such as ICT, big data and analytics, cloud computing, industrial internet of things, augmented reality and cyber physical systems (Kumar, Zindani & Davim, 2019; Kumar & Nayyar, 2020). Its basic characteristic is the usage of cyber physical systems which provide the linkage of real objects and people via information networks and intelligent materials (Devezas, Leitao & Sarygulov, 2017).

Features and attributes of I4.0 described so far have a strong technological focus. However, I4.0 is more than a technological progress. In a broader sense, I4.0 is a changing way of thinking in the context of organizational strategy development. This includes creating visionary ways of thinking, developing new business models and processes, integrating internal and external stakeholders in value chains, and combining products with high quality services (Schönfelder, 2018). Briefly, winning in 4IR is about uninterrupted strategic change that enables the organization to achieve its goals (Perry & Wiens, 2018). The fundamentals of I4.0 consist of interoperability, virtualization, decentralized systems, real-time operations, service orientation and highly modular production systems. Although it has many advantages such as cost efficiency, flexible management and hyper-customization, some challenges concerning business models, practical implications, cyber security and infrastructure still persist (Kumar & Gupta, 2020).

INDUSTRY 4.0 AND FUTURE OF WORK

Digitization has gradually transformed the whole business world. Notably, it has profoundly influence professions, business interactions, requirements of users and nature of work (Andre, 2019). Rapid advances in Artificial Intelligence (AI) and cognitive systems have required rethinking people and processes in the future's working life (Bauer & Vocke, 2020). In line with the new vision developed for the future of working at 4IR, digital transformation has become imperative for modern businesses to meet the needs of the digitally connected era (Gilchrist, 2016). No industry or company can avoid such a transformation. Successful implementation of digital technologies in general will be decisive for the competitiveness of companies (Dahm & Thode, 2019). Therefore, businesses aware of digital disruption, innovation, turbulence, change and competition are probably concerned with how to best respond to these changes (Brett, 2019). In other respect, there is both a rapid increase in the adoption of technology-based works, and anxiety on the negative impacts of digital technology. Job losses and privacy losses are just two of these anxieties.

It is a well-known fact that I4.0 has comprehensive results not only in technology, but also in the field of human factor. Digitalization also highlights human and strategy issues that need to be addressed to shape the future (Ternes & Wilke, 2018). Without doubt, the classic distinction between blue collar workers and white-collar workers become increasingly blurred in this era. Although machinery replace many business processes in production step by step, more tasks are required in the planning and control functions. In addition, the organizational structures and management styles of companies no longer fit into a digital society, employee habits, and employee needs. Hence, several classic management tools

have become ineffective in a digitized world. The I4.0 transformation process in an organization is only successful if the management strategies, management methods and managers' attitudes are compatible with digitization (Moskaliuk, 2019). Therefore, many organizations try to harmonize business models, organizational structures, and policies to take advantage of the possibilities offered by I4.0 (Heukamp, 2020). For example, a radical change in hierarchical roles emerges with the decentralization and automation of the decision-making process in I4.0. Strict hierarchical structures and authoritarian management style are no longer up to date. Hierarchy and control tools are replaced by flexible structures in the form of self-organizing teams (Schönfelder, 2018).

Beyond that, there is a special focus on the talent management and improvement of skills for the smooth transition of companies to I4.0 applications (Kumar & Gupta, 2020; Kumar & Nayyar, 2020). In order to achieve success in 4IR, people must be the primary consideration in all activities and actions. Companies need a qualified workforce to operate advanced production systems and analyze data collected from machines, consumers, and global sources (Gehrke et al., 2015). In other words, the advent of new automatic business models in the 4IR creates skilled and intelligent workforce need to manage new processes. As a result, as achieving the objectives of I4.0 requires having the right skills, talent development has become an indispensable element for survival in this era. That is why, it is essential to capture new talents and reshape the existing talents in line with changing needs of the industry (Sharma & Jain, 2020).

Future human resources employees, whose main task is to increase the value of the entire company, need different skills as thought leaders. In the new digital age, self-organizing abilities are important as well as their ability to effectively deal with the ICT structure. Additionally, responsibility, communication, teamwork skills and tolerance to uncertainty and fault are among the core competencies employees need to acquire in the future. Moreover, it is necessary to have more sophisticated qualifications about new processes to overcome the complex problems resulted from digital transformation (Ternes & Wilke, 2018). The study of Aulbur & Bigghe (2016) summarizes the important qualifications and skills to have for I4.0 as follows: knowledge on ICT-based resources and service, ability to work with data proficiently, technological competence and personal qualities. According to Deckert (2019) the knowledge, skills and competences of future that can be of great importance to employees are: skills on technology and data, data analysis knowledge in all disciplines, information technology security, data protection, competencies related to social technology, critical thinking, problem-solving skills, creativity, mental flexibility, communication, cooperation, skills associated with people in their diversity and cultural agility, systems thinking, entrepreneurial thinking and leadership capacities. As mentioned in Skills Revolution 4.0 Report of Manpower Group (2019), the most common growth at this age will occur in engineering, customer orientation and management roles which utilize skills like communication, negotiation, leadership and adaptation. So, I4.0 working systems also require the basic competencies built on science, technology, engineering, and mathematics fields which have positive effects on innovation, technological growth and economic development (Karacay, 2018). Given these points, it is important to note that, the companies will not only meet with challenges in attracting and recruiting the qualified employees, but also a few other challenges such as up-skilling and re-skilling of current employees, continuous learning and mindset change in the digital transformation (Aulbur, CJ & Bigghe, 2016; Karaçay, 2018).

LEADERSHIP IN INDUSTRY 4.0

The growing new industrial landscape blurs the boundaries between people and technology, and typically requires leaders to be at the forefront of adapting to these changes (Herold, 2016). The only way to shape changes and capture them as an opportunity is to rethink leadership talent in the business world (Schönfelder, 2018). New leadership cultures, skills, behaviors, views and ideas are necessary to adapt to fast-changing and technology-driven digital business (Brett, 2019). Leaders who do not want to lag behind in the digital age should have basic skills, make fast decisions and form their own teams in order to create a high performance organizational culture (Perry & Wiens, 2018; Tulasi et al., 2019).

Strategic shifts, technology adoption and organizational change during the digital transformation process have raised new demands on management and leadership capabilities (Heukamp, 2020). Leaders' qualifications and skills required to fulfill the tasks have significantly differentiated under new conditions (Gehrke et al., 2015). Therefore, it is time for leaders to embrace new ways of thinking that can respond to change and innovation (Hlupic, 2020). Being successful in the I4.0 era is dependent highly on whether a company's leaders embrace the right mindset and future-oriented skill set or not (Wagner, 2020). Generally, leaders should be equipped with new mindsets regarding collaboration, interconnectiveness, culture of openness, transparency, collective intelligence, sense-making, and shared innovation breakthroughs. In addition to mentality change, the impact of structure and connections on leadership behavior should be addressed for leadership development.

Therefore, a holistic leadership development system, consisting of mindset, structure and connectivity, should be evolved to reinforce leadership behaviors in regard to readiness, responsiveness and adaptiveness required for I4.0 (Kelly, 2019). What is more, Schumacher, Erol & Sihn (2016) highlight the importance of items of the willingness of the leaders and central coordination as well as management competencies for assessing I4.0 maturity levels of companies. Overall, it is possible to consider that leaders play a strong role as a main driving force of successful digital transformation (Bouzidi, 2020).

Emerging Leadership Styles in I4.0

In the new digital age, it is expected that only agile organizations will flourish while organizations that rely more on backward-looking practices will be left behind. Leaders need to develop new strategic thinking to take advantage of business opportunities and respond to threats. They need to adapt to five environmental changes: competition, hierarchy, technology, hyper connectivity and transparency. First and above all, leaders need to react quickly to an intense competitive environment. Having a proactive and flexible approach is necessary for them to manage and lead change. Second, as the hierarchy is an obstacle to transformation, leaders need to distribute their management responsibilities throughout the network and release the decision-making process. Third, skilled leaders are needed to guide employees for applying new technological advances to the business. Fourth, leaders should know new languages and channels of communication to prepare to the constantly connected world. Fifth, leaders should have open and honest communication skills to address concerns about the uncertainty of the future. Given the long-term strategic change required by I4.0, unique leadership styles emerge (Lewin, 2017a, Lewin, 2017b). It is an obvious fact that the great importance of right leadership styles in the new digital landscape cannot be undervalued (Herold, 2016).

In such a fast-changing, interconnected and technology-driven world of work, companies should reconsider their existing leadership styles in accordance with new ways of working of 4IR (Marr, 2019; Phukan, 2020). Accordingly, leadership styles should be adopted in line with the new technological wave. Companies wishing to take advantage of I4.0 opportunities face a new leadership model instead of command and control practices (Hlupic, 2020). This leadership, derived from previous forms of leadership, is so-called Leadership 4.0. It is known as a kind of leadership that uses collaborative networks where main decisions are handled by using collective intelligence (Kelly, 2019). This leadership style aroused in I4.0 allows leaders to create the favorable working conditions to make organizations more humanistic and purposeful (Hlupic, 2020). This makes it imperative to engage in the task of a digital leader who fosters the required digital mindset and contributes to the development of digital culture in an organization (Bouzidi, 2020). Leaders who can draw an operational framework for the new digital business, offer an inspiring vision and mobilize the digital workforce are likely to be successful in I4.0 (Manpower Group, 2018). Leadership for I4.0 is a cross-hierarchical, fast, innovation-driven, team-centered and collaborative approach (Oberer & Erkollar, 2018).

The unpredictability of business developments in today's VUCA world often becomes difficult in strategic analysis and planning activities. That is why, some of the successful leadership approaches of the past have become obsolete today (Petry, 2018). Next generation leaders are accepted as an essential part of a self-organizing, wirearchical, responsive, agile and evolving business (Kelly, 2019). This integrative, complex and multi-layered leadership type requires scaling in new digital, virtual and flexible environments as well as continuous horizontal and vertical development (Roux, 2020). They map the resulting variety of dynamic trends, considering the threats and opportunities posed by disruptive technologies (Mack, 2015). They need to not only adopt disruptive changes, but also encourage their employees to do the same. Hence, entrepreneurial, agile and visionary thoughts are essential for new leaders (Giustiniano, 2018). That is to say, different characteristics of leadership come to the forefront in the context of I4.0 under these circumstances. These following-discussed leadership styles provide major support for successful shift to I4.0.

To begin with, a leadership mindset that is aware of the central importance of human capital is needed for the success of the companies in I4.0 (Sackmann, 2019). Obviously, the companies that are successful in transitioning to I4.0 will be those who know how to put human participation at the center of the transformation process (Cheppe & Roze, 2018). Within this context, Rolfes, Perry & Shunk (2019) recommend to companies' human-centered leadership which encourages knowledge development and participation of employees. In general, the focus of leadership behavior in this age is on employee management (Wagner, 2018). Diversity, which means embracing a wide range of views, perspectives and backgrounds, is critical for successful leadership in the digital age, as it enhances the leader's knowledge and understanding (Herold, 2016). Besides, the difficulty of centrally controlling complex systems in I4.0 leads leaders to use collective intelligence and implementing decentralized decision making (Petry, 2018). From this perspective, Agerwala (2020), who emphasizes the importance of inclusiveness in I4.0, notes that leaders should create a collaborative environment and develop a culture of continuous learning and continuous improvement within the organization. This requires participative leadership practices that present employees increased autonomy, creativity and participation (Tirabeni, Bernardi, Forliano & Franco, 2019).

More importantly, it is worth noting that the development of an increasing number of companies in the digitized world is linked to open leadership and soft management (Suszynski, 2020). I4.0 leaders need to have open communication with employees, provide feedback and be open to criticism (Corte,

Gaudio & Sepe, 2019). An open leadership style improves trust in leaders, retains talent and enables teams to grow (Yeo, 2020). Agile leadership characteristics is another facet of the new networked leadership. Agile leadership practices are required to adapt to new business strategies, meet changing workforce needs, respond quickly to business demands and embrace new digital reality trends (Herold, 2016). Agile leaders do this through creating different scenarios, capturing poor signals, experimenting with new ideas, and learning from both success and failure cases (Petry, 2018). Successful leaders stimulate an agile culture to improve their inspirational environment. Collaboration is impossible without an agile culture (Koning, 2019). On top of that, in order to cultivate new business strategies in a highly connected digital era, future leaders are expected to embrace a connected, responsive and collaborative leadership styles (Kelly, 2019).

Leadership Roles in I4.0

Business leaders continuously face increasing competition, globalization and a stream of revolutionary disruptions in industry (Bawany, 2019). Nowadays, they struggle with how I4.0 changes business dynamics, strategies and their roles (Herold, 2016). With these reasons, leadership development which has a pivotal role in building new core competences of leadership in view of radical transformation of the industry becomes not a choice but a necessity (Bouzidi, 2020). To respond to the digital transformation, leaders are expected to have varying roles, detailed below.

The first role is leader as an innovative captain. Developments such as new technologies, routine actions and weakening of company limits require the leader to be innovative. Modern companies can only survive with openness to this transformation. The second role is leader as a network administrator. The leader should increasingly act as a network owner to successfully deal with dynamic, non-linearity, and employee requests for participation. The third role is leader as a creativity and motivation pioneer. In the current situation, characterized by increased uncertainty, the leader should act to meet the motivation and meaningfulness requirements of the employees to achieve the goals. The fourth role is leader as a developer and companion. With a personalized approach, the leaders should accompany their development so that employees can work in an organized and innovative way on their own (Schönfelder, 2018). These leaders are also known as talent champions, as they prepare their teams for digital transformation (Renjen, 2019). The fifth role is leader as change champion. One of the key areas that help update the leadership talent strategy from traditional to I4.0 approach is to create change champions. Implementing the transformation in I4.0 begins with the development of change champions, who are willing to adopt new practices and gain the ability to influence people through interpersonal relationships. These champions, who are curious about digital issues, adapt their followers to transformation with deep empathy and effective communication skills (Erker, 2018). The sixth role is leader as data-driven director. These leaders can use data-driven approaches to strategic decision making for overcoming challenges. The seventh role is leader as disruption drivers. Leaders quickly adapt to change, as they are aware of that disruptive technologies will provide them with competitive advantage (Renjen, 2019).

Essential Leadership Skills for I4.0

The goals of sustainability and competitiveness of organizations in global business environment mainly depend on their ability of keeping pace with changing conditions (Karacay, 2018). Whereas traditional leadership skills such as inspiring and motivating others are accepted as minimum requirement for digi-

tal transformation, there is also a need for Leadership 4.0, as stated above (Herold, 2016). Leadership 4.0 deals with the question of what skills are required for adapting to changes. Certainly, leadership behavior must comply with the requirements of a digitized world. Business leaders must act knowing the technological changes and their consequences in all areas of the company to achieve this. They are not only the individuals who use digital media for communication and collaboration, but also the individuals who adapt their leadership behavior to their digital reality needs. To ensure a successful outcome, they should recognize the basics of organizational transformation and drive the required organizational change which underlines the development of people and organizing of cooperation (Moskaliuk, 2019). To stay informed of the latest trends, challenges and opportunities and to transform their businesses effectively, they must have digital skills and expertise, which are in greater demand than ever (Manpower Group, 2018; Bauer & Vocke, 2020).

One of the most common analytical leadership tools that emerged in the 21st century is big data. It offers the use of computer-aided skills for information gathering and analysis. The advantage of big data in the context of leadership is associated with the ability to obtain unique and valuable content. Apart from big data, the utilization of forecasting tools by leaders is crucial in terms of understanding how change occurs in systems (Mack, 2015). At this point, leaders who understand the world in its complexity rather than following the same patterns of behavior will succeed in their efforts (Murphy, 2015). Specifically, leaders need to be good at data analysis, judgment, learning, and strategy setting. They must know technological requirements, machine learning algorithms and new organizational models to achieve this (Heukamp, 2020). Furthermore, leaders should be familiar with the key elements of analytics tools to interpret data into meaningful and understandable information (Moskaliuk, 2019). Corroborating this, Deloitte (2019) reveals that leaders with attributes like data-driven decision making, long-term vision of technology, and aggressiveness about workforce development seem more prepared to survive and thrive in the digital world.

Not only digital skills, technical skills and industrial knowledge, but also the great significance of social skills, which are necessary for digital leaders is noticed in this era (Herold, 2016; Wagner, 2018). Modern leadership mindset requires balancing hard and soft skills. For instance, leaders need to understand both data, and how to use data to improve performance. Other than that, leaders need to understand both AI and its implications on their followers (Oesch, 2019). In the age of AI, it is extremely valuable to have critical thinking skills that enable objective analysis of problems (Moskaliuk, 2019). On the other hand, I4.0 businesses need leaders who are particularly humble, accessible, flexible, respectful to ethical values and adaptable to changing conditions (Heukamp, 2020). These leaders are enthusiastic and collaborative and have the spirit of achieving as a team and respecting others (Hlupic, 2020). They actively make decisions together, as all ideas are provided through open collaboration platforms and collaborative networks (Kelly, 2019). Some of the critical soft skills for leaders in I4.0 can be summarized as collaboration, communication, adaptation, critical thinking, creativity, negotiation, problem solving, decision making, talent management, coordination ability, emotional intelligence, service orientation and cognitive flexibility (Karacay, 2018; Tulasi et al., 2019).

Several authors have discussed essential leadership skills for I4.0. For instance, Al-Omary et al. (2019) mention in their study that leaders need new internal and external communication behaviors in this era where communication has become more dimensional, complex, informal and cross-hierarchical. They also emphasize that creative potential and personality have become more important than ever. They add that leaders, who build communication and creative skills, concentrate on the basic activities that the machine cannot do, make holistic decisions, get the right consultants and sharing partners, develop

new ideas and measures that go beyond the world of data, numbers and algorithms. Likewise, Ameer (2020) outlines five essential requirements of the leadership 4.0 framework: boldness, agility, sagacity, inclusiveness and communication. First, leaders in I4.0 must be bolder than ever to tackle disruptive and accelerating changes. They also must develop agility skills to adapt to uncertain, complex and rapidly changing business landscape. Moreover, they also need sagacity, a combination of wisdom and a keen sense of business, to avoid hasty decisions and unnecessary risks. Furthermore, they should focus on inclusive leadership rather than hierarchical leadership to achieve more innovation and collaborative results. Finally, the I4.0 leader must have the ability to communicate in complex environments to raise speed, efficiency, and smartness of implementations.

According to Harper (2019), leaders who are responsible for facilitating digital transformation in the workplace need some tools and skills including agile and flexible, emotional intelligence, responsibility, tech literacy, and teamwork and collaboration. Above all, the speed of change in 4IR requires leaders to be agile and flexible to embrace change. The widespread use of machines and smart systems also requires leaders to be more empathetic to maintain the well-being of their team members. In addition, emotional intelligence is an important skill, as leaders are expected to manage both their own emotions and employees' emotions in this process. Other than that, it is very important for leaders to take responsibility for the results of the processes. The fact that leaders take a responsible and accountable approach increases their respect.

Another factor to consider is tech literacy. I4.0 is shaped by high-tech trends. Leaders should have technological literacy to identify the right technology for their organization. More importantly, teamwork and collaboration emerge as the determining factor of strong leaders at I4.0. Strong leaders are needed to understand individual differences and benefit from them as a team. Another classification of common basic skills that could contribute times of digitalization is carried out by Guzman et al (2020). They classify these skills as cognitive skills (e.g. active learning, critical thinking), interpersonal skills (e.g. negotiation, coordination), business skills (operations analysis, resources management) and strategic skills (e.g. visioning, problem identification) (Guzman et al., 2020).

All things considered, future leaders are expected to be more inclusive, visionary and creative leaders with multicultural communication skills, who can foresee and evaluate opportunities. In this context, these leaders will tend to twenty-first century business skills such as self-growth, thinking outside the box, and a constant search for knowledge and creativity. These skills make it easy to keep up with new technologies and to make the best possible decisions (Mickahail & Aquino, 2019). To sum up, new skills of working, technical knowledge, digital literacy competencies and skills of creativity and empathy have increasingly gained importance in 4IR. Future-oriented leadership development practices should also address communication, innovation, collaboration and resilience (Bouzidi, 2020). Success will be inevitable for leaders who are connected, cooperating, learning, open to change, have a passionate team, and easily adapted to new culture (Tulasi et al., 2019).

CONCLUSION

In recent years, the enormous potential of digital technologies in I4.0 has enabled the moving from traditional to digital business models. Thus, a rapid evolution toward a digital future that creates new corporate structures, new employment relations and new managerial roles has taken place. In the new global economy, talent development activities beyond investment in advanced technology have become a

central issue for business competition and growth. Especially, the functions of leaders gain increasingly importance in times of digitalization. As previously mentioned, leadership talent is one of the factors at the core of successful I4.0 implementations. However, the present traditional leadership profiles are not suitable for dealing with the challenges of digital transformation in an organization. Today's complex business environments make it imperative to develop knowledge, skills and attitudes of leaders. Therefore, transition to I4.0 requires a wider leadership perspective for faster adoption of advanced technologies.

This chapter provides an overview of the required leadership styles, leadership roles, and leadership skills for I4.0. As a result, the survival of companies in a rapidly changing industrial landscape is closely associated with 4.0 leaders having the right leadership profile and multi-faceted leadership skills. Thereby, it is necessary to redefine leadership styles, roles, and skills for the new industrial age. According to the literature, an effective Leadership 4.0 mindset incorporates human-centered, participative, open, agile, connected, responsive and collaborative leadership styles. Dealing with transformation requires special skills for innovative, networked, creative, motivating, developer, companion, talent champion, data-driven and disruptive leadership roles. This essential skillset for the leadership in I4.0 consists of a broad range of hard and soft skills. Hard skills are the technical, computer-aided, and digital skills required to perform the tasks. Soft skills are non-technical skills such as creativity, agility, flexibility, adaptation, active learning, visioning, critical thinking, problem identification, problem solving, talent management, emotional intelligence, communication, coordination, collaboration, negotiation and inclusiveness, which are necessary to work and communicate with team members.

It is thought that this chapter will gain significant insights for scholars and practitioners interested in leadership and the future of work in the digital revolutionary world. Since both I4.0 and leadership mindset are in a continuous development process, there is still a great need for research in various fields. Within this respect, several limitations and several future research directions need to be considered for this chapter. The current study is limited to discussion of secondary data analysis. It only presents a theoretical framework of I4.0 leadership by examining leadership styles, roles and skills for I4.0. Future studies might focus on applied research in 4.0 leadership. As an illustration, additional research is needed to determine relative importance of leadership styles in I4.0. Moreover, it can be researched whether the skills required for leadership differ in terms of leadership styles and roles. The result of this chapter can constitute an important basis for such studies.

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KEY TERMS AND DEFINITIONS

Agility: An organization's ability to adapt quickly to changes in unpredictable environment.

Artificial Intelligence: Computer controlled systems acting as human like as possible.

Collaboration: A working method whereby multiple people work together to accomplish a task.

Critical Thinking: An ability to think rationally, logically, and objectively on facts.

Digital Transformation: A holistic transformation of business activities, processes and models by taking advantage of digital technology opportunities.

Industry 4.0: A global development that combines physical operations with digital technology, machine learning and big data.

Leadership Development: An effort to enhance the leadership abilities and attitudes.

Talent: Individuals who have special abilities in a particular field.

Chapter 5

Leadership/Followership Interface and the Workplace of the Future: Who Leads?

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ABSTRACT

Relationships have been documented to be the hub of employee social activities in the workplace. With the disruptions of Industry 4.0, much value and attention is given to machines and technology. Concepts of leadership and followership held by organizations may no longer hold water to determine the place of man and machines as relational tools in the workplace and to highlight the promotion of values in the man-human interface in the 4IR. The centrality of this chapter will be to determine whether the leadership and followership theories are relevant to organizations in the face of 4IR. In the 4IR, practitioner's attention should be on human development to lead despite technological advancements and the development of artificial intelligence.

INTRODUCTION

The global workforce is transforming the way organizations lead, manage and work, in the same tone changes have occurred in the way individuals follow. The leader in a relational context and for the purpose of the workplace is that employee who is the head of a group of people by virtue of having great strength and wisdom or may have inherited a position of power even if strength and wisdom were not part of the person's virtues (Northouse, 2017). Leadership can be viewed from an individual's person-

DOI: 10.4018/978-1-7998-3347-5.ch005

ality traits, behaviour type, autocracy, participation, situational, transactional or resource negotiation and transformational points. Leadership has been structured around situations, non-hierarchical and relational axioms (Western, 2019). The interest of this chapter is on the relational aspect of leadership. Followership has been viewed from the role perspective that individuals can have socially or between groups of people. Leaders and followers establish a relationship where their interests are mutually served. Previous study documented that it takes the leader and follower to co-create relationships (Abe, 2015). Commonality between the Followers in a relationship with their leaders is the constant desire to belong to a larger community and the expectation that the leader is honest or trustworthy. The outcome of the leader-follower relationship at work is effective organizational performance (Bashore, 2017).

The intervention of the fourth industrial revolution has changed the concept of leader-member exchange, not to only refer to the relationships between superior employee and his/her subordinates, but by widening the scope of interaction to extend to machines. The digital machines now perform the same tasks with human; and this has now become a resource to reckon with in workplace relationships. The association is now called the human-machine collaboration which is expected to shape the workplace of the future (Doppner, Derckx, & Schoder, 2019). Attempt is made to substitute the relationship between leader and followers with the human-machine relationship. The question this interface has posed is, who bears the responsibility of leadership, since both the man and the machines perform and complete tasks separately and simultaneously? The association that offers tremendous benefits has presented significant challenges also in the workplace of the future. The key features of the future workplace will be discussed. Prospects needed by employees in the adoption of technologies and skills re-allocation will be discussed to maximise the benefits of the relationship (Ibrahim, 2016).

BACKGROUND

The capacity development and the continued smartness of the machines has manifested a new form of partnership between humans and machines. The partnership is the augmentation of human expertise and the artificial intelligence to find and develop talent. Platforms are developed that align with the thinking of human to meet their needs social (Shuen, 2018). Alexa talks to you, Google finds answers to your quests, Amazon knows your preferences, Facebook knows your friends and can help you find one if need be. The world has accepted the digital smartness of Artificial intelligence (AI), data analytics, natural language processing, automation, and robots. The digital smartness is projected to affect the workplace and the global economy. It will add \$15.7 trillion to global Gross Domestic Product (GDP) by 2030. Increase productivity, wages, and require new skills by 65%. 10% of job [positions are unknown today. If this partnership can have economic and professional impact, what does the future hold for workplaces? Six distinct areas have been of interest to the global economic players, these are productivity and growth, natural resources, labour markets, global financial markets, economic impact of technology and innovation, and urbanization. The interest of this chapter is the automation of employment (Lent, 2018).

Automation is not a new phenomenon, and fears about its transformation of the workplace and effects on employment date back centuries, even before the Industrial Revolution in the 18th and 19th centuries. The US president in the 1960s Lyndon Johnson was of the view that "technology destroys jobs, but not work". * Fast forward and rapid recent advances in automation technologies, including artificial intelligence, autonomous systems, and robotics are now raising the fears anew—and with new urgency (Cook, 2019). In 2017, a report on automation, employment, and productivity documented the

potentials of the global economy, the timeliness over which phenomenon could play out and the capacity of automation to boost production if adopted. The report of a research program by McKinsey Global Institute is imperative as a guide to the future of work (Manyika 2017).

WORKPLACE TRANSITION 2030

While it is difficult to predict what will play out in the future workplace, this section will offer insight into the anticipated transition in the workplace. Some occupations will grow, others will decline, and unforeseen events or envisaged will lead to the creation of jobs. Associated with automation is the big shifts to the workforce as AIs and robotics change or replace some jobs, while others are created (Hoeschi, Bueno & Hoeschi, 2017).

Automation technologies including artificial intelligence and robotics will generate significant benefits for users, businesses, and economies, lifting productivity and economic growth. The extent to which these technologies displace workers will depend on the pace of their development and adoption, economic growth, and growth in demand for work. Even as it causes declines in some occupations, automation will change many more—60 percent of occupations have at least 30 percent of constituent work activities that could be automated. It will also create new occupations that do not exist today, much as technologies of the past have done (Calitz Poisat & Cullen, 2017).

Even if there is enough work to ensure full employment by 2030, major transitions lie ahead that could match or even exceed the scale of historical shifts out of agriculture and manufacturing. The scenarios suggest that by 2030, 75 million to 375 million workers (3 to 14 percent of the global workforce) will need to switch occupational categories. Moreover, all workers will need to adapt, as their occupations evolve alongside increasingly capable machines. Some of that adaptation will require higher educational attainment or spending more time on activities that require social and emotional skills, creativity, high-level cognitive capabilities and other skills relatively hard to automate (Pfeffer, 2020).

Income polarization could continue in the United States and other advanced economies, where demand for high-wage occupations may grow the most while middle-wage occupations decline—assuming current wage structures persist. Increased investment and productivity growth from automation could spur enough growth to ensure full employment, but only if most displaced workers find new work within one year. If reemployment is slow, frictional unemployment will likely rise in the short-term and wages could face downward pressure. These wage trends are not universal: in China and other emerging economies, middle-wage occupations such as service and construction jobs will likely see the most net job growth, boosting the emerging middle class (Brynjolfsson, Rock, & Syverson, 2017).

To achieve good outcomes, policy makers and business leaders will need to embrace automation's benefits and, at the same time, address the worker transitions brought about by these technologies. Ensuring robust demand growth and economic dynamism is a priority: history shows that economies that are not expanding do not generate job growth. Midcareer job training will be essential, as will enhancing labour market dynamism and enabling worker redeployment. These changes will challenge current educational and workforce training models, as well as business approaches to skill-building. Another priority is rethinking and strengthening transition and income support for workers caught in the cross-currents of automation (Willcocks, 2016).

RESPONSIBLE LEADERSHIP THEORY

Leadership is defined to be “a relational and ethical phenomenon that occurs in social processes of interaction with those who affect or are affected by leadership and have a stake in the purpose and vision of the leadership relationship” (Maak & Pless, 2006a). This definition widened the traditional leader-member relationship, Supervisor-subordinate relationship to leader-stakeholder relationships. Attention is shifted to the responsibility that the leaders have to the different stakeholders which makes relationships to be at the center of leadership. The definition above neglects the scope of responsibility that is most important to the leader and how the leader thinks about them. These responsibilities include accountability, appropriate decision making, task performance etc. Two premises have been identified for responsible leadership; one, it can be investigated empirically and conceptually what can be described as responsible leader mindsets and two, clarification about who should be included as relevant other in the relationship (Maak & Pless, 2006b).

Responsible leadership as a values-based and thorough ethical principles-driven relationship between leaders and stakeholders who are connected through a shared sense of meaning and purpose through which they raise one another to higher levels of motivation and commitment for achieving sustainable values creation and social change (Pless, 2007).

The perspective of the man-machine interface that has come to bear in this chapter fits the statement above as will be seen later. Three issues are paramount here the relationship is value based, two, common meaning and purpose, three, to achieve long term gain or change.

The emphasis of the theory as described, leadership determinant is not on the role of persons but promotion of values in any engagement and commitment to achieving purpose and the right mindsets (Pless, 2007).

The theory offered a gap that was missing from the established descriptors of leadership, like transformational, charismatic, authentic, participative, servant, shared, spiritual and ethical leadership (Waldman & Galvin, 2008). Responsible leadership is an element missing that is at the heart of effective leadership. The onus of responsible leadership is on the tool that perform and complete any given task whether human or machine.

CHALLENGES OF HUMAN -MACHINE RELATIONSHIPS

McKinney global report 2017 documented that “The technology-driven world in which we live is a world filled with promise but also challenges. Cars that drive themselves, machines that read X-rays, and algorithms that respond to customer service inquiries are all manifestations of powerful new forms of automation. Yet even as these technologies increase productivity and improve our lives, their use will substitute for some work activities humans currently perform—a development that has sparked much public concern” (Manyika, 2017).

Accenture report 2018, documented that 5.7 million jobs are currently at high risk in South Africa. South Africa has made significant headway in terms of adopting the digital revolution. The growing maturity of digital economy is yet to translate into significant growth especially for labour. 50% of its population under 30 years old are ready for the digitally driven economy. Population growth is in excess of the GDP growth, Labour and income growth are declining, while unemployment of youth are sitting at 28%, youth unemployment 36%, jobless youth make-up 75% of the unemployment (Arthur, 2018).

The following salient challenges have been noted other than those enumerated above.

- The job losses than gains impact negatively on the socio-economic wellbeing of employees and the economy.
- Tasks that were once thought to be the prerogative of human is now under constant battle between machines and humans.
- Automation and the developing digital technologies like AIs that poses as treat to jobs will add considerable stress on economies that are under pressure (Arthur, 2018).

As the development of AIs continues there were interesting projects carried out where the human and machine intelligence on tasks were put to test. On task accomplishment over time, the capacity of the AIs supersedes that of human many times over. For profit maximization, cost reduction and competitive edge, the use of AI is better for organizations of the future (Mikolov, Joulin, Baroni, 2016).

- In 1996, Gary Kasparov (the world champion in Chess contested against IBM (Deep Blue), Kasparov won the context.
- In 1997 there was a rematch, IBM (Deep Blue) won victoriously, it was documented that AIs are catching up to human intelligence, and Kasparov, alluded that the IBM team had cheated, however, in an interview in 2016, Kasparov said he had analyzed the match and retracted his previous conclusion and cheating accusation.
- In 2011, IBM Watson took on Ken Jennings and Brad Rutter, two of the most successful contestants of the game show Jeopardy who had collectively won \$5 million during their reigns as Jeopardy champions. Watson won! To prepare for the competition, Watson played 100 games against past winners.
- In 2013 whether AIs play Atari games better than humans. Deep Mind Technologies applied Deep learning model to play seven Atari 2600 games. This endeavour had to overcome the challenge of reinforcement learning to control agents directly from vision and speech inputs. The breakthroughs in computer vision and speech recognition allowed the innovators at DeepMind Technologies to develop a convolutional neural network for reinforcement learning to enable a machine to master several Atari games using only raw pixels as input and in a few games have better results than humans (Manyika, 2017).
- Alpha-Go was developed subsequently as a supercomputer. A machine that was able to detect and learn where knowledge is. The machine learnt 3000 years of human knowledge in 40 days. The machine is used to solve some of the world's most complex problems in health, energy and environmental issues.
- Bernard Marr documented that thought is underway about the possibility of developing machines that augment human's intelligence in meaningful ways (Marr, 2019).

The challenges that organizations are facing on the relationships between human and machines are emerging? Until now, digital technology adoption has overly been used by organisations to drive cost reduction automate and increase efficiencies, displacing human workers. The value of human-machine interface has become increasingly apparent, however, in order to realize the full potentials of digital

technologies and truly boosting economic growth it is imperative for humans and machines to work together to develop differentiated customer experiences, and create new products and services for new markets (Manyika, Lund, Chui, Bughin Woetzel, Batra & Sanghvi, 2017).

OPPORTUNITIES OF MAN-HUMAN RELATIONSHIPS

As more organizations implement automation and augmentation technologies to fast-track productivity and reduce costs, the AIs offer tremendous opportunities. According to Ranjit Rajan (2019) a researcher with IDC had noted that new working models are emerging that are developed around man-machine relationships which will allow a meaningful positive change in the age of automation (Accenture annual report, 2018). The following opportunities are worthy of note:

- The more organizations adopt and run workplaces that are robotics friendly, the AI agent are expected to work simultaneously with human agent. To the Human resource management, the collaboration is a challenge because they will be forced to assess key performance indicators and employee goals which are aligned to organizations strategy. But to the organization it is an opportunity to focus on the areas of performance productivity and cost reduction.
- “Humans are not being replaced by AI, we are being promoted. Machine-generated insights add to ours, extending our intelligence in the way a telescope extends our vision. Think of AI as ‘augmented intelligence.’ Our increasingly intelligent machines are making us smarter.”
- Online innovation platforms have emerged in the last decade to capitalize on “collective intelligence,” encouraging more people—enthusiastic volunteers—to become involved in solving problems. The platforms expand the scale of collaboration possible and the range of expertise tapped. The ideas and insights gained through increased cognitive diversity can spark new ideas.
- The impact of AI and robotics comes from connecting the physical and the virtual, the human and the digital, which can result in combinatorial and exponential change. Our disciplines and professions are no longer confined by physical or virtual boundaries—they can be both, simultaneously. This represents a new division of labour between “man and machine.
- Professionals will need many capabilities in the era of smart machines. One is cognitive capability—the ability to think, reason, solve problems, and reflect. Another is affective capability—the ability to feel and relate to others. Motor skills and manual capacity constitute a third capability. A more nebulous, yet critical, capability is moral—the ability to distinguish right from wrong, just from unjust, or to take responsibility for one’s choices. While our machines and systems are increasingly capable, they lack this last capability (Kelfat, & Peteraf, 2015).

ECONOMICS OF MAN-MACHINE RELATIONSHIP IN THE FUTURE WORKPLACE

On mastering the future of work economy in Asia-Pacific, the Centre for future work conducted a study was where it was documented that intelligent machines and human machine association would be the top two drivers of change for how they work in the next five years, impacting revenue growth, worker productivity and business agility (Lee Yun, Pyka, Won, Kodama, Schiuma, & Yan, 2018). Success with AI adoption will be based on how well companies blend and extend the strengths of humans (cognition,

judgment, empathy, versatility, etc.) with the capabilities of machines (accuracy, endurance, computation, speed, etc.) to create a joint team for common business goals. By turning machines and workers into collaborative “colleagues,” organizations can reach entirely new performance levels. The leaders of organizations in Singapore where study above was conducted hold the view that the key goal of using machines is to augment human intelligence and expand human capacity in their organizations. The following should be considered to unlock the economic values of the relationships: Organizations should take the risk to reinvent business and create new opportunities; • Identify areas for AI-driven revenue growth; View the back office as a machine sweet spot; • Engage in processes truly intelligent to supercharge profitability. If the collaboration between human and machine will mean anything, revenue boost was the primary reason for the relationship in the future workplace (Ehret, & Wirtz, 2017).

TRENDS IN MAN-MACHINE COLLABORATION IN THE WORKPLACE

The following have been identified as the features of the workplace digital economy one man and machine, two cooperative and collaborative, three knowledge and task-orientation and four flexible and fluid. These characteristics vary from organization to organization, but they are fundamental to the future workplace.

Workspaces, Places and Faces (Features)

Global study of one thousand companies on how human and machines will interact at work to drive productivity and plan to use AIs, identified three types of employment. These are explainers, sustainers and trainers. Explainers understand and interpret the output of AI Algorithms; sustainers optimize the effectiveness of AI systems; and trainers feed AI systems capacity for language, empathy and judgment. For example, Mercedes-Benz, a first mover in automating assembly lines, automated 90 percent of production in its E-Class factory. However, the robots couldn’t keep up with the demand for hyper personalisation of vehicles, which required rapid change and complex customisation. While skilled humans can change a production line in a couple of days, robots take weeks to realign. As a result, the company is giving people a greater role in industrialisation again, reducing automation from 90 percent to 50 percent, and introducing robots better able to collaborate with human workers. Human-machine collaboration gave the company the flexibility it needed to improve their response to consumer demand for hyper-personalisation while also halving the time taken to produce a car from 2005’s benchmark of 61 hours to 30 hours (Accenture, 2017).

Collaborative is the deeper communal effort toward a shared goal, cooperative is the act of working and interacting together with others for the mutual purpose. The digital technologies are changing the way employees are doing both at work. Organizations are using open source collaboration to solve complex problems and engage with customers (Brian, 2018).

Knowledge and task orientation, most business leaders are of the view that future workplace will be structured more by project than by job function. Organizations will be outsourcing projects and tasks to individuals or teams with special skills and knowledge relevant to a specific industry and timeframe. The pathways to work are changing at a rapid rate. Task platforms that connect people with special skills to a global workplace are emerging. The rise of the gig economy are expanding the marketplace. For example, Upwork and Thumbtack, call a Maid and Recruit My Mom. co.za, connect employers to skilled workers (eg domestic workers, web developers, electricians) to compete knowledge and task-based work.

Work used to be a place where employees look to, but it is fast changing to become a place to connect to. Flexible work arrangement has enabled individuals to increase their income, work part-time, re-join the workforce or assume new roles. By eliminating time and geographic constraints, flexible and fluid work permits new talent pools to enter the workforce. The demand and supply of talents around the globe can be met through a search for right skill (Noe, Hollenbeck Gerhart, & Wright, 2017).

Skills Attitude and Mindset

As the nature of work evolves and the characteristics of people in the workplace changes, individuals must adopt new skills and adapt to the same. The strategies that underpin new skills are: Learn to earn, Build Technological knowhow, Apply we Q, Create and solve, Cultivate a growth mindset and Specialize for work. Learning to earn, building a foundational skill to get work and be ready for the workforce. For example, literacy, numeracy, digital literacy, learning to maintain eye contact during interview. For example, Build Technology know-how, this is important to use, manipulate and create technologies and data; For example, ability to use digital devices to analyse, explore and share data and work effectively with machine intelligence. Apply We Q, interactive skill to build relationships and demonstrate self-awareness needed to work effectively with others in person and virtually. For example, teamwork, communication, Social and emotional intelligence and self-regulation. Create and solve problems, skills to approach problem solving creatively, using empathy, logic and novel thinking. For example, creative problem solving, critical thinking, reason and logic to assess and analyse problems and an entrepreneurial mindset. These skills also include cognitive functions like decision making, planning and executing goals. Cultivate a growth mindset: in the digital economy, work will not be restricted to one employer, job or team. Learning new skill will make individuals relevant in the workplace of the future, and a growth mindset will be essential to success. The skills needed to cultivate growth mindset are: cultivate curiosity, openness, capacity for continuous learning. The cognitive function is flexibility: these skills are building blocks for personal resilience and the ability to adapt and cope with change. Work specialization, timely and market relevant special skills are essential for works generally and entrepreneurial ventures. As jobs and opportunities shift in the digital economy specialized skills will be required to surmount and change continuously as the market demands Bechler, & Javidan, 2007).

RECOMMENDATION FOR LEADERS OF FUTURE WORKPLACE

Beyond the need to cooperate, collaborate, form team, knowledge of reorientation and flexibility at work; a sight is emerging on the strategic actions necessary to shape and prepare the workplace of tomorrow. Leaders need to speed-up reskilling of workers, Hinge the workplace on areas that create new value, strengthen the skilled workers value chain. By these, leaders will be response-able, responsible and responsive.

Organizations that need to speed-up its rate of reskilling people will need to position themselves to win in the new industrial revolution. Such organization will prioritise skills for development by selecting training along the machine intelligence and automation being used, and consequently the size of skills training. Reskill the top management for the leadership skills necessary to lead in an era of technology disruption. For example, Sasol's Board of Directors adapted by advising the Executive Management to turn the company into a digital organization. Experts were engaged to help build the Board's under-

standing of digitalization in oil and gas industry. Another vital point in reskilling is for organizations to continue to do what they have been doing as they become more agile, identifying and closing the skills gap through efficient reskilling. In reskilling the mindset is that of learning as a way of life. Alvin Toffler in his book *Future shock*, emphasised the need to “learn, unlearn and relearn”. The right attitude now is, there is no end to learning, age is no barrier (Bughin, Seong, Manyika, Chui & Joshi, 2018). The last action recommended here is to use the digital to learn the digital. In digital learning methods, virtual reality and augmented technologies are able to provide realistic simulations to help workers master new manual tasks for their smartness on machines. For example, according to Jacqui Canny of Walmart, in order to meet the needs of its customers constantly evolve in the use of technology to empower associates and provide new skills. The last thing to do in reskilling is to tap into current workers and recently retired executives to coach upcoming talents through the ranks. This will assist in creating a culture in the organization that respects and celebrates different contributions from different generations (Kane, Palmer, Nguyen-Philips, Kiron, & Buckley, 2017).

Hinge the workplace on areas that offer new forms of value. The man and machine interface is starting to gain ground with impacts on how organizations conduct business. The sight is towards transformation of what the business chooses to pursue. In order to achieve this, business organizations will use automation to catapult growth by reinvesting savings in the workplace. This will propel new business models. A Hotel which is a leader in the high-tech industry, has produced a human-AI hybrid workforce where algorithms predict which orders have issues, such as risk of cancellation or payment disputes. Employees can therefore spend more time paying attention to high-risk situations and be more proactive in mitigating negative outcomes. This approach has required training people to help them develop a range of expertise and capabilities— from industry sector knowledge to analytics and data interpretation, to the soft skills required to work with customers in new ways. Important also is the need to create a flexible workplace model. Traditional and rigid job structures may not support the speed and agility demands that digital innovation needs. Redefining and co-creating employment opportunities through more responsive role-based and gig-like work is a reality. These opportunities need to be available to both full-timers and freelancers (White, 2016).

Businesses are not responsible for the cause of the talent pipeline challenges, but they bear the brunt of its influence. Leaders need to start influencing change from the source. This is possible by fostering national or international programmes that will focus on skill development and training of unskilled workers looking to expand or venture into another skill. Leaders can also extend its influence to industry groups, by clustering together industry giants that wield greater influence (Bhatnagar & Budhwar, 2018). For example, NASSCOM, India’s engineering industry group is helping the public sector create new courses on data science and analytics, automation and internet of things (IoT) in academics. The last suggestion is the collaboration of business leaders with academia. Influence the academic agenda from the source, not just the programmes. For example, Nedbank Stellenbosch University Launch-Lab is a start-up incubator that aims to build a thriving ecosystem for entrepreneurs in Africa. Its focus is on the entrepreneurs themselves and helping them build a viable business through coaching and mentorship programmes (Lewis, 2019).

FUTURE RESEARCH

Leadership research in the recent has come under immense pressure due to the need to pivot organizations into the relevance that the future workplace demands. Just as new models are emerging to align organizations and their structures into the future workplace, more models will be required and older models that have been golden may go. New leadership theories will be sought by leaders who are hungry to run business digitally. Improvements are needed to sharpen the man-machine relationships as businesses assume new trends.

CONCLUSION

This chapter established the burden of leadership to be on the tool that completed tasks. As it is not possible to blame a tool that was not part of a task for any failure, so also is the responsibility of leadership. This is a digression from the descriptors of leadership. The full maturity of the interface between man and machine has not yet been experienced as there is room for improvement of the relationship. Trust level in the interface should come under serious scrutiny as there are possibilities of sabotage and unforeseen risks by parties in the relationship. The interface looks like the direction the workplace is taken, being slow to key in may be disastrous for the laggards who are slow to invest in digital technology.

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Chapter 6

Are Managers Still Necessary in the Era of the Fourth Industrial Revolution (I4.0)?

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ABSTRACT

As the Fourth Industrial Revolution (I4.0) technologies continue to evolve and converge, the role of the managers needs to urgently adjust and change accordingly. While some are delighted with the promises of increased flexibility in industries in tandem with productivity and better quality, others are concerned with mass unemployment. This is a chilling vision of how robots will completely reshape industries and disrupt jobs, thus creating societal change of an unforeseen magnitude and speed. But one thing remains the same: management is the hinge on which the fate of every organization swings. Managers remain the key driver to build long-term success in organizations. In this context, managers need to deal with emerging challenges, opportunities, management practices brought about by the 4IR technologies. In this context, they have to address the six crucial transformations namely in technology, the pattern of work, business, society, lifelong learning, and leadership, and provide countermeasures to thrive within this brave new tech-driven and globalized business world.

INTRODUCTION

Breakthrough technologies and innovation brought about by Industry 4.0 (I4.0) are widely recognized as disruptive forces for conventional businesses and industries, thus forcing organisations to embrace and adapt to change at exponential speed (Schwab, 2016). For example, recent advancements in internet technologies, automation and artificial intelligence (AI) are redefining the managerial roles of managers. Managers have to change and adapt to the changes and how to manage their work, workplace and workforce. It is because the deployment of AI and RI (remote intelligence) technologies that make it easier for

DOI: 10.4018/978-1-7998-3347-5.ch006

organisation to outsource services jobs. Talented foreigners can telecommute into local workplaces and compete directly for white-collar service and professional jobs. As a result, managers at all levels have to learn how to plan, organise, lead and control virtual cross-cultural team (Osborn, 2019) and will have to tackle global globotic upheavals in terms of inequality and job displacement and unemployment in organisations (Baldwin, 2019). Furthermore, the rise of smart collaborative machines has caused major concern which leads management scholars to paint an apocalyptic outlook for the traditional manual workforce that is being decimated by a highly-automated robot workforce (Ford, 2016). The emergence of advanced robotics with AI from supercomputers, drones and virtual assistants to 3D printing, smart thermostats, wearable sensors and microchips smaller than a grain of sand, has enabled robots to take over not only difficult and dangerous tasks, but also administrative and managerial tasks (Lehmacher, Betti, Beecher, & Grotemeier, 2017). More AI-trained computers and robots are programmed to mimic that human to perform tasks in call centres, accounting and law. At their most extreme, predictions foretell that the majority of those traditional “white-collar” jobs are to be wiped out by robots and smart software. Consequently, the demand for managers will be low as such technologies can free managers from a sort of white-collar drudgery. Managers just have to focus on more creativity and innovation beside managing and leading a smaller, but skilled workforce in tech-driven environment

Managers at all levels will have to adapt to the world of smart machines. The fact is, AI will soon be able to do cognitive tasks that consume much of managers’ time faster, better, and at a lower cost. Budding managers will need coaching skills, tech-savviness, nuanced communication, vulnerability and empowerment in order to manage the skilled workforce. Brynjolfsson and McAfee (2014) asserted that fewer people are working, and wages are falling even though productivity and profits soar. IN this regard, there will be a rise in a new social class - the precariat who are ‘working poor’, people who have several jobs, but still cannot make ends meet. Consequently, this will result in social inequality, the implosion of the consumer economy, and economic insecurity, rather than broad-based prosperity (Ford, 2016). In other words, there is a hollowing out of the job market, thus leaving a lot of workers out of work for a lengthy period and struggling to make a decent living.

It is all happening at a whirlwind pace as multinational companies (MNCs) and few small- and medium-sized enterprises (SMEs) have jumped onto the bandwagon to ride on the I4.0 promise of the high degree of competitiveness in terms of flexibility, productivity and quality (Ng, 2020; Telukdarie, Buhulaiga, Bag, Gupta, & Luo, 2018). Indeed, I4.0 disruptive technologies are transforming all end-to-end steps in production and business models in most sectors of the economy, thus revolutionising traditional ways of creating value and re-shaping management of global supply chains (Lehmacher et al., 2017). The majority of MNCs have deployed automation, AI, advanced robotics, autonomous systems and additive manufacturing in their operations to gain a competitive advantage to dominate their industries. Factories and offices are being transformed and re-structured to hire more robots rather than human workers, thus massively displacing workers. Under this new environment, managers have to think creatively on how to manage. They have to communicate and lead the technical workforce. It is true that I4.0 has brought tumultuous disruptions to traditional business models and hastening the need for change to align with digitalisation of managerial activities especially in digital procurement, supply chain and logistics capabilities (Lehmacher et al., 2017; Shamim, Cang, Yu, & Li, 2016).

In the era of I4.0, there will be fewer low-skilled workers for managers to motivate to secure participation, engagement for organisational performance. Managers have to handle more programmers and technicians to programme codes and maintain machines and robots. Under the AI centric organisations,

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it is anticipated there will be a small salaried elite, consisting of innovation and knowledge workers in the relatively lean agile workforce, instead of hundreds or thousands of white-collar and blue-collar workers for managers to plan, organise, lead and control (Thun, Kamsvåg, Kløve, Seim, & Torvatn, 2019).

Automation and computerisation of operations are changing the role of management from product production to decision-making. This represents a stunning shift in traditional management roles as managers have to adapt and change to survive the onslaught of disruptive technologies (Thun et al., 2019). Besides, managers themselves have to future-proof their jobs from robots by thinking strategically about how to use automation to achieve sustainable competitive advantage (Paster & Dupree, 2016). In the same context, managers especially middle and first-line managers need to equip themselves with future digital skillsets to keep up with all technical advances, stay relevant, avoid being left out and left behind in future, tech-driven organisations (CMI, 2020; Reagan, 2018).

Objectives

Although recent developments in I4.0 have become a new theme for researchers and attracted a number of contributions and publication on the impact of I4.0 on managerial roles, studies on the changing managerial roles in organisations with I4.0 setup remains unexplored or inadequately researched. The extant literature revealed a lack of systematic evaluation of managerial roles (Piccarozzi, Aquilani, & Gatti, 2018). Therefore, the objective of this chapter is to evaluate the impact of disruptive technologies on managerial roles and search for the new skillset of managers to lead their organisations in the era of IR 4.0. Previous literature review and empirical findings have been used as a methodology to achieve the aim of the paper.

History of Management

The role and responsibilities of managers in organisations had undergone radical changes over the last 100 years. Noticeably, there were three distinguished management gurus in the field of classical management theory, namely, Henry Fayol (1841 - 1925), Frederick Taylor (1856 - 1915), and Max Weber (1864 - 1920). Despite their criticism of being too formal to management and lack of attention to workers, their works had made an outstanding contribution to the development of management thought and fundamentally shaped the modern concepts of management (Ferdous, 2016). Their ground-breaking management principles and practices are still relevant and important in today's management practices and principles which affect organisational performance (Rahman, 2012). While Taylor (1919) was tinkering with scientific management and technology employed by individual workers to achieve 'one best way', Fayol (2013), widely recognised as the 'father of management', was theorising about general practices necessary to organize and manage a major corporation with his six primary functions of management, namely Forecasting, Planning, Organising, Commanding, Coordinating, and Controlling, and his 14 principles of management, namely, Division of Work, Authority, Discipline, Unity of Command, Unity of Direction, Subordination of Individual Interests to the General Interest, Remuneration, Centralization, Scalar Chain, Order, Equity, Stability of Tenure of Personnel, Initiative, and Esprit de Corps. Meanwhile, Weber (1947) asserted in this administrative theory, bureaucracy constitutes the most efficient and rational way in which human activity can be organized and organized hierarchies are necessary to maintain order, maximize efficiency, and eliminate favouritism. In brief, the three management gurus' have greatly influenced generations of management researchers and continue to provoke debate on their

relevancy, importance and practicality in modern management practices in the era of I4.0. Nevertheless, Minzberg (1975), a premier management thinker and believer of management being an art rather than science, challenged Fayol's school of thought on management functions as a 'folklore', arguing managers have not time to systematically perform functions but rather they are frequently interrupted by problems that demand them to perform the 10 roles namely, Interpersonal roles (figurehead, leader, and liaison); Informational roles (monitor, disseminator, and spokesman), and Decisional roles (entrepreneur, disturbance handler, resource allocator, and negotiator) in their daily functions (Mintzberg, 1973; Zaraket, 2014). In modern management research, Peter Drucker (1909-2005), as known as 'father of modern management', created a new discipline of modern management practices by asserting that management as a distinct function and being a manager as a distinct responsibility and indicated in his writing highlighted the challenges, difficulties and demands faced by managers in performing management functions and tasks (Drucker, 2006, 2008). In a relatively recent development, Hamel (2006), an American management consultant, asserted that typical managerial work may include a) Setting goals and laying out plans; b) Motivating and aligning effort; c) Coordinating and controlling activities; d) Accumulating and allocating resources; e) Acquiring and applying knowledge; f) Building and nurturing relationships; g) Identifying and developing talent; and h) Understanding and balancing the demands of outside constituencies (Punit, 2019). Hamel (2009) also argued that in today's bureaucracy-infused management practices, management needs to be re-invented by overcoming myriad management challenges to cope with the demand of the VUCA (volatile, uncertain, complex and ambiguous) -driven world (Schneider, 2018).

Industrial Revolutions 1.0 Through 4.0

The world has seen four industrial revolutions that have shaped the course of manufacturing and dynamics in the global economy. The First Industrial Revolution used mechanization, steam engines and water power to mechanise production. The Second used electricity and assembly lines to power mass production. The Third used electronics and information technology (IT) to automate processes. At present, I4.0 is using cyber-physical systems (CPS) to integrate digital and physical systems to perform advanced automation and control tasks with a high degree of efficiency, security, and dependability (Schwab, 2016). Indeed, I4.0 technologies are a fusion of advances in AI, advanced robotics, Internet of Things (IoTs), 3D printing, genetic engineering, quantum computing, and other technologies that are normally seen in science-fiction movies (Kurzweil, 2006; Satell, 2016).

This disruption is set to accelerate over the next two decades, transforming the workplace and disrupting the managerial roles. Managers have to keep abreast with the recent development and R & D efforts by major countries and MNCs in Big Data and Analytics, Autonomous Robots, Simulation, Horizontal and Vertical System Integration, Industrial IoTs, Cybersecurity, The Cloud, Additive Manufacturing, Augmented Reality and also 5G technologies to gain technical superiority and global domination (BCG Worldwide, 2019; Lehmacher et al., 2017). In particular, Manyika et al (2013) from McKinsey Institute predicted that there are 12 disruptive technologies that will have the potential to affect billions of consumers, hundreds of millions of workers, and trillions of dollars of economic activity across industries by 2025. Managers have to be concerned with the 12 disruptive technologies, namely Mobile Internet, Automation of Knowledge and Work, IoTs, Cloud technology, Advanced robotics, Autonomous and Near-Autonomous Vehicles, Next-Generation Genomics, Energy Storage, 3D Printing, Advanced Materials, Advanced Oil and Gas Exploration and Recovery, and Renewable Energy.

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At the organisational level, changes in work, workplace and workforce are transformative through this disruption. This disruption is set to accelerate over the next two decades, transforming the workplace and the AI world. This sweeping global trend fits with the theory of “disruptive innovation” as coined by Clayton Christensen, an innovation expert who asserted that even successful, outstanding companies with established products will get pushed aside in market leadership unless their managers know how and when to abandon traditional business practices (Christensen, 2013). It is because established companies are embarking on sustaining innovation only and are blindsided by small innovative, ‘Gazelle’ companies that are able to enter markets nimbly with disruptive products and services. With low cost, performance yet continuous improvement, such technologies will bump the older, once-better technology into oblivion, and finally, these entrant firms will grab large chunks of market share (Rifkin, 2020).

Management 4.0

Chartered Management Institute (CMI) (2020) defined Management 4.0 as management in the I4.0 where technology plays the most important role in shaping a new business landscape. CMI argued that in the era of I4.0, new managerial roles and skillsets are required to manage such high-tech organisations that are different from before in terms of deployment of machines than humans. It is clear to witness that human performance is being outrun by machine performance because the ability of computers to do things was previously possible to be done by humans before (Satell, 2016). CMI’s Management 4.0 campaign seeks to answer a fundamental question – what are the skills that managers and leaders will need in a workplace and world transformed by new technology. There are 6 rapid transformations in technology, pattern of work, business, society, lifelong learning and leadership which managers and leaders in the future will need to respond to.

Technology Transformed - Issues

Over the past two decades, digital technologies have become more available, affordable, and increasingly integral to most workplaces. Digital technologies, which include all types of electronic equipment and applications that use information in the form of numeric code have been rapidly introduced to achieve competitively superior performance. Such adoption is set to accelerate in the foreseeable future, thus transforming the meaning of work, workplace and workforce. The most noticeable technologies are AI, IoTs, machine learning, 3D printing, virtual and augmented reality, big data and mobile networks. Advanced robotics with AI and algorithms not only can redesign work with less human intervention but also vastly improve the productivity of existing jobs and lead to many new ones in the coming years (Lehmacher et al., 2017; Ungureanu, 2019).

Such disruptive technologies have posed several organisational and leadership challenges. The disruptions are different in scale, scope and complexity in terms of its profound ramifications on business models, management practices and styles. While manufacturing managers have to adapt to a new work environment where there are more automation and AI but fewer workers being employed to run their operations, logistics managers need to rapid changes in technologies in smart logistics and digital global operations and real-time delivery (Lehmacher et al., 2017; Telukdarie et al., 2018). In services sectors, managers in traditional banks and financial institutions adapt to challenges of Fintech companies. Fintech technologies are disrupting existing business models, and the way businesses are transacted and managed (Nair, 2019). For example, Ant Financial emerges as a dynamic force by integrating new game-changer

technologies like AI, blockchain and data science to offer e-payments, loans, credit scoring and stock trading through cloud computing. While traditional banking corporations may feel threatened with extinction and risk associated with new technology, other financial behemoths seize these technology-driven opportunities and up the ante to win the Fintech race (Sun, 2018).

Patterns of Work Transformed - Issues

Pattern of work has become a hot topic and relevant in the era of I4.0. Employee expectations are changing, with a desire for more flexible, self-directed forms of work, thus optimising work-life balance and harmony. New generations of millennial professionals need more challenging and meaningful work, are more loyal to their profession than to the organisation, less accommodating of traditional structures and authority, and prepared to take ownership of their career development (Cann, 2015). This poses great challenges to managers who need to capture both the “hearts” and “minds” of a new workforce to promote employee engagement and high performance (Kirchmer, 2018). Managers of the future are involved in an equally drastic change by leveraging technology to ensure workers are purposed-led and future-fit to help attain aspirations of organisations. In a fast-changing world, managers can no longer rely on go-to solutions but leverage on I4.0 technologies like ubiquitous computing with AI and IoTs to overcome the unprecedented levels of disruption in communication, coordination and management.

Business Transformed - Issues

The business world is being transformed by emerging digital technologies especially AI, IoTs, and advanced robotics. With the advent of new technologies, new business models are being created through innovation and business process management to attain high performance in the digital age (Kirchmer, 2018). Businesses in every industry and sector are pivoting online businesses against traditional ‘bricks and mortars’ shops, to capture new opportunities arising from changing consumer preferences and Covid-19 pandemic (Donthu & Gustafsson, 2020). Through the power of Internet technology and digitalisation, e-commerce giants like Alibaba and Amazon use AI and smart systems to offer an enormous diversity of products, allow their systems to automatically conduct online business transactions at 24/7, make decisions without the involvement of human beings. Meanwhile, smartphone technologies and AI-driven processes allow online businesses to scale up at an exponential rate. For example, Uber and Airbnb which rely on the ride-hailing app and mobile apps, have replaced traditional taxi and hotel operators with freelance contractors by offering new features and lower costs (Schütze, Helwig, & Schneider, 2018).

As the online business growth, managers have to learn new digital skills and develop new management practices to manage and control such new businesses with the help of ‘live’ digital dashboards that are capable of linking data in the AI-driven computer systems. They have to re-examine their value creation methodologies and offer unique value propositions in light of new consumer behaviour and expectations (Thun et al., 2019). In terms of managing gig workers, managers have to use a different way of dealing with freelancers who only work on a project basis and prefer to work in a manner that encapsulates their freedom, autonomy and flexibility. Managers have to be aware of the thriving gig economy which is a new way of organising economic activity that may supplant the traditional corporate-centred business model (Petriglieri, Ashford, & Wrzesniewski, 2018; Ungureanu, 2019). Undeniably, traditional businesses are currently experiencing fundamental disruption, in part driven by technologies like robotics, AI, machine learning, virtual reality, augmented reality and cloud computing. Consequently, existing

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business models have been radically transformed to adopt new business models and enterprise architecture to thrive within this brave new business world (Agostini & Filippini, 2019). Under these circumstances, corporate values are created and lost in breathtakingly short periods, and the rise of ‘unicorns’ against the demise of once-venerated organisations has shown that how firms compete has changed drastically behind massive tech-driven operations. This transformation resonates with Schumpeter’s theory of innovation in which “creative destruction” is the vehicle of growth to replace existing industries, jobs and human capital by new ones with a new cycle of innovation and economic development (Schumpeter, 1934; Ungureanu, 2019).

In the age of the I4.0, new governance and management are required to move beyond the traditional sphere of corporate governance and management (Telukdarie et al., 2018). It is necessary to address the inter-linked dynamics of the pace and synergistic nature of emerging technologies in a borderless world with political implications. For example, tech giants have to provide internet that protect data protection and cybersecurity without being left to the ingenuity of private governance.

Society Transformed - Issues

Ideally, a stable society should not only have equality in incomes and gender but also in digital literacy and in gaining to digital technology. As such, it makes sense to measure digital inequality and the digital divide between those who have access to the digital world and those who have not especially from urban poor and those in rural areas. It is equally important to monitor the skilled gap among millennial workers who are considered digital natives, and older workers who are considered digital migrants (Irwansyah & Nurbayani, 2018).

With regard to technology, society has to change and undergo transformation triggered by AI, distributed ledger systems, cryptocurrencies, advanced materials and biotechnologies. As the population ages and becomes more diverse, top C-level managers will have to deal with new challenges of evolving workforce demographics (Sony & Naik, 2019). Wellins, Smith, Erker, and Board (2006) asserted that as workforce demographics are changing and evolving, more organisations have waged a new “war for talent”. Der Heydt (2015) opined that organisations need to build an exceptional talent management strategy by taking firm objectives and culture of the company and employed-focused into consideration in talent management. It is because more than half of those aged 60-64 are working and the number is expected to reach 60 percent by 2026 (Zobrist, Grampp, & Rohr, 2019). As many of those have hold top positions, younger workers are looking for opportunities with other organisations for career advancement. Long gone are the days of young workers spending the whole of their careers at one company. Today, workers change jobs more frequently, on average every 4.2 years (Bortz, 2020). As low unemployment and digital technology are shifting the balance of power to employees, who want more flexibility and better values from their employers. In other words, for now, the complex and ambiguous future of work appears to be in the hands of the workers. With the ability to work from anywhere and little incentive to show company loyalty, many workers are discovering they have a unique kind of leverage and are using it to demand a new kind of work experience and work cultures (Mohelska & Sokolova, 2018). Hence, managers and leaders to develop a leadership pipeline of the next generation of talented leaders and managers who have different career expectations and to achieve a sustainable competitive advantage in this digital age.

Lifelong Learning Transformed - Issues

Lifelong learning is the ongoing, voluntary, and self-motivated pursuit of knowledge for either personal or professional reasons. Such training should be supported by dynamic learning organisations which have continuous capacity and resources for workers to attend and develop skills through training and external collaboration with industries and academics. It is true that while managers seek to exercise controls and cut down operational costs through the process of simultaneous upskilling and Braverman's deskilling thesis, lifelong learning is important for lifelong employability and personal development (Buchanan & Huczynski, 2019; Noon, Blyton, & Morrell, 2013).

With the advent of disruptive technologies, change in job skillsets is fast in today's workplace. In the same vein, those skillsets can become easily obsolete in today's smart, interconnected, pervasive environment. Therefore, workers have to tackle the issues of lifelong employability to ensure they remained gainfully employed in new, different jobs. It is predicted that in the next two years, by 2022, 42% of core skills required to perform existing jobs are expected to change (Zahidi, 2020). Thus managers have to think of getting suitable skillset for workers to efficiently perform new jobs in the process of "upskilling" and "reskilling" revolution (Zahidi, 2020). For existing workers, they face learning capabilities to fast catch up with the transformational pace of technological change and finally adapt to new disrupted workplaces which may be dominated by human and machine collaboration (Lehmacher et al., 2017; Zahidi, 2020). Indeed, managers especially from the human resource department have to go back to the drawing board to rethink their strategies, policies and practices of addressing the issues of mismatches of job and skill gaps. Undeniably, when workers do not fit their jobs, work productivity gain will drop drastically, thus forcing them to lay off workers (Kalleberg, 2008; Parekh, 2020). Although the greatest disruption is coming from people, and not machine learning algorithms, workers may not have sufficient time to attend training on digital skills. Hence, managers may be forced to allow train 'on the job' and learn how to work seamlessly alongside robots and AI systems. If workers are well-trained to work alongside with machine, it will make a big, moon-shot difference in efficiency and productivity gain. In terms of learning, the greatest challenge is not those who cannot read and write to transform their career, but also those who cannot learn, unlearn and relearn in the 21st century (Toffler, 2006). As the upskilling and re-skilling of workers will become even more important, managers have to take training and development initiatives systematically for new, existing and displaced workers for long-term firm competitiveness and survival.

Leadership Transformed - Issues

The importance of leadership is stressed by management guru, Peter Drucker (1909–2005) who asserted that only three things happen naturally in organisations: friction, confusion and underperformance and everything else requires leadership (Story, 2016). With command-and-control styles of management possibly becoming extinct, managers should ideally embrace technologies to manage organisation, without sacrificing the human touch which is the hallmark of great leadership. However, management styles with traditional top-down hierarchies are still pervasive in the era of the I4.0. In capitalist systems of profit maximisation, managers still treat employees like cogs in the machine and are hesitant to move away from relational leadership and hierarchical power, to more networked, virtual organisations (Osborn, 2019). They still face the challenge of overcoming conflict and inspiring virtual members, complete with amorphous, matrix organisation structures, and transitory working arrangements. Managers have

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to tackle the fear and risk of losing corporate control and investment when they walk on the tightrope of balancing the act of favouring a profit-oriented business and maintaining the benefits welfare of workers.

Management Solutions

Nowadays, businesses are operating in strange and unprecedented times of geopolitical competition, ongoing trade wars and the Covid-19 pandemic in its scale and impact on the global economy (Donthu & Gustafsson, 2020; Kaeser, 2020). While digitization initiatives are fully integrated into the central corporate strategy of larger companies, SMEs face problems of planning for the long term. They are hesitant of adopting advanced technology and smart factories into practice as they possess neither the human nor financial resources. While some prefer to avoid risks of failure in building smart factories in manufacturing concepts, logistics solutions and managerial models. Many SMEs prefer to take a wait-and-see approach to transformation, become followers and adopted a simple version of MNCs proved state-of-the-art models to save operating costs (Moeuf, Pellerin, Lamouri, Tamayo-giraldo, & Barbaray, 2018). Llinas and Abad, (2019) stressed high-performance people management practices are found to be strongly correlated with both productivity and innovation and hence, the normally-forgotten people management practices should be a high priority for any firm seriously thinking about I4.0 implementation. In the same context, as organisation move through I4.0 implementation, managers are becoming more concerned about the potential benefits and risks of adopting digital technology. Top managers are particularly worried about the effect of ongoing digital transformation that underpins I4.0 technologies. Hence, managers need to take heed of the lessons of I4.0 implementation and take action to prevent unnecessary pitfalls (Sony & Naik, 2019). They have to take action to overcome the challenges of the six transformations under Management 4.0 (CMI, 2020).

Technology Transformed - Solutions

With the growth and advancement of new technologies and AI, there is a growing need to re-orient and re-align strategies to cope with the undue I4.0 disruptions. As more technologies are deployed, the management of MNCs has to urgently evolve and adjust by reformulating and remodelling their business models to cater to a broader range of stakeholders. Leadership needs to rethink holistically their purpose, strategy, organisational design and decision-making rules and harness creative and innovative capacity to steer breakthroughs in the evolution of technology (Telukdarie et al., 2018). The role of the managers needs to urgently evolve and adjust. Next generations of managers need to be cultivated to become more responsive leaders through sense-making and swarm intelligence that reflects the coming cybernetic revolution (Shamim et al., 2016).

Revisiting skillsets for the future, managers have to become tech-savvy digital and earlier adopters who are innovative, creative, and collaborative. Typically, digital leaders are forward-thinking, industry-leading, and most importantly, have the ability to remain relevant in a fast-changing business landscape. Hence, MNCs organisations have invested in management training besides building core competencies in data and connectivity, analytics and intelligence, conversion from the physical world to the digital world, and human-machine interaction (Oberer & Erkollar, 2018). Managers should become champions of change and develop key performance indicators to monitor progress and risk of adopting innovation besides facilitating workers to excel through smart technologies. In this context, organisations need to create innovative rather than bureaucratic ecosystems to support technology adoption in international

organisations (Barnett & Finnemore, 1999). Agostini and Filippini (2019) found that there is a statistically significant relationship between the level of organisational hierarchy and level of adoption of I4.0 technologies. Besides, technology adoption requires a strong organisational culture that is characterized by discipline, dedication, sacrifice and passion. This will ensure that any culture-shaping initiatives, together with change programmes, will have significant impacts on the choice of management practices but will foster employee engagement, rather than mere sloganeering (Mohelska & Sokolova, 2018).

Patterns of Work Transformed - Solutions

It is interesting to note that World Economic Forum, Organisation for Economic Co-operation and Development and United Nations all have agreed that humanity remains on the cusp of the Fourth Industrial Revolution (Skilton & Hovsepian, 2017). This means at the heart of I4.0, humans, not robots, remain a key player. Therefore, managers have to focus more on the development of a smart, flexible workforce. Nevertheless, as robots rise to take over more jobs, workers have to get used to living with tireless machines and expect a new pattern of work in an automated future (Ford, 2016). In this context, there should be a change in human resource policy and ensure workers, not machines, are purpose-led and future-fit to help attain both organisational goals and their career aspirations. In this context, leaders and managers at every level and across all sectors need to create a harmonious pattern of work to attract talents to join their organisation. Young professionals especially millennials will be impressed with a creative pattern of work that is more flexible and independent and without sticking to rigid 9-5, 40 hours a week working models in symphonic human-machine operations (Cann, 2015). Moreover, it is necessary for managers to promote good work-life balance and wellness among employees with a view to achieving both career advancement and organisational goals (Ras, Wild, Stahl, & Baudet, 2017).

Business Transformed - Solutions

To adapt to transformational changes, businesses need to build business models that allow the development of new managers. Managers should be able to manage through networking and collaboration in virtual environments (Osborn, 2019). This means managers should transcend isolated silos and boundaries to tackle the high-stakes problems and challenges facing their businesses and industries. They have to rethink customer expectations in terms of better, faster and more personalised services. While some managers can handle untenable situations and customer complaints, stronger managers are on top of the problem and embraced change even when it came at great professional risk and move beyond organisations to win the market competition. In change management, managers review changes in management practices and organisation structure in tandem with emerging I4.0 technologies (Paster & Dupree, 2016). Admittedly, while riding the wave of innovation and disruption, managers have to not only acquire previously unheard of technical management skills, understand recent advances but also predict future trajectories in technologies.

Society Transformed - Solutions

In today's all-pervasive, ever-connected internet age, more managers should have confidence in handling the digital transformation. They should be equipped with knowledge and skills to manage workers from different backgrounds and ages. They can build networking and promote collaboration to share work

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experience. They have to integrate relevant technologies to better support a broad spectrum of roles and responsibilities. With the universal presence of computers and smartphones supported by Internet giants like Baidu and Google, Alibaba and Amazon, WeChat and Facebook, information and knowledge can be acquired at people's fingertips (Cusumano, Yoffie, & Gawer, 2020). In a similar context, managers should work with the best digital talent to succeed in four areas: society, strategy, technology and talent in today's hyper-competitive and the increasingly complex global economy (Punit, 2019). Leading MNCs should champion creativity and innovation, and deeply committed to talent development among upper-level graduates and workers to thrive in the I4.0 world (Parekh, 2020).

Lifelong Learning Transformed - Solutions

As humans play a bigger role in I4.0, it is more worthy to make a substantial investment in human capital development. Therefore, organisations have to provide quality training and development for both managers and workers so that can perform their jobs more efficiently. To achieve lifelong career development, managers and all workers need to constantly upskill, reskill in advanced robotics and automation as their jobs change and evolve. Managers have to lead in the lifelong learning transformation and create a climate of learning, unlearning and relearning. In this regard, organisations have to ensure learning taking place at three separate levels: a) What we know we know, b) What we know we don't know, and c) What we don't know we don't know, aka 'Rumsfeld paradox' (Gordon, 2010). The learning strategies can include reflective design-based learning, designing negotiated learning, storytelling digital approaches and information processing learning models (Irwansyah & Nurbayani, 2018).

They should be incentives and financial supports to encourage self-directed lifelong learning. The focus areas should be the management of technology advancement and innovation development for managers, and for workers, data skills in data analytics, data science and cybersecurity for workers, with training pathways to professional qualifications. Other equally important capabilities are creativity and teamwork, which machines and robots find it harder to replicate and perform (Ford, 2016). Meanwhile, the government must revamp the education systems and its syllabi that suit the digital economy, allow new collaborations with industries that pair brute processing power with human ingenuity (Brynjolfsson & McAfee, 2014). Indeed, the government needs a skills revolution to avoid large swathes of graduates becoming technologically unemployed as AI makes many jobs obsolete. To be more aligned with I4.0, graduates should be trained in the literacy of STEM (Science, Technology, Engineering and Mathematics) or TVET (Technical and Vocational Education Training) through apprenticeship and internship, to ease the school-to-work transition (World Economic Forum, 2017).

Leadership Transformed - Solutions

Managers and leaders need to lead with grit and determination to adopt technologies and AI to gain sustainable competitive advantages and dominate those industries. They should harness the power of I4.0 technologies that promise the superior performance of automation and benefits beyond labour-cost substitution (Chui, Manyika, & Miremadi, 2016). Managers should become digital leaders, also known as Leadership 4.0, who demonstrate strong leadership competencies by adopting a cross-hierarchical, cooperative, and team-oriented approach. In the leadership matrix, managers should ideally aim to become digital leaders who are concerned for innovation and technology and concern for people (Oberer & Erkollar, 2018). Managers have to be concerned with people besides focusing on discovering new

products and services through human creativity, collaboration, inclusivity and new role models of leadership (KPMG, 2018). In this regard, managers should be highly competent in both intelligence quotient (IQ) and Emotional Quotient (EQ) to reimage their future and afford every employee of the opportunity to excel in their works. According to Hamel (2009), it is necessary to redefine the work of leadership where natural hierarchies require natural leaders who can mobilize others despite a lack of formal authority. Leaders of tomorrow need to become social architects without abdicating their responsibility during a crisis. Managers should think differently, plan big and act to size up changing situations and take decisive action to do the right things, rather than do things right. In winning the trust of followers, managers may have to evolve from strong-armed bosses to become servant leaders besides adopting bottom-up strategy development (Moore, 2019). Leaders should train and develop followers to become new leaders to assume managerial roles as organisations grow and evolve in the era of I4.0 (Guzmán, Muschard, Gerolamo, Kohl, & Rozenfeld, 2020).

In this context, managers are responsible to make a balanced trade-off between the benefits of adopting the technology and the need to safeguard the well-being of employees, customers, and society. This requires managers to consider ethical principles when assessing the trade-off between the displacement effect of automation and the productivity improvement that is going to lead to greater employment or high wages. It is important for managers who should have the courage to state clearly their missions and values, their true north of ethical AI in a today's accelerated business world that is constantly spinning and at times is based on myth, wishful thinking, outdated science, or is just plain wrong (Lohr & Gusher, 2019). Schwab (2017) stressed that innovators should respect moral and ethical boundaries rather than cross them to make sure the technologically-enriched future is safe, ethical, inclusive and sustainable. In terms of corporate social responsibility, tomorrow's management practices must strike a good balance between doing good and making a profit (Hamel, 2009; Punit, 2019).

CONCLUSION

As disruptive technologies and innovation continue to accelerate and machines continue to take over jobs, fewer workers will be deployed in AI-centred organisation, thus creating a new way of managing in a less labour-intensive environment. Hence, managers have to find suitable management practices and play a new role. Automation and interconnectedness of devices, processes, and machines are changing the role of management involvement. Although disruptive technologies drive manufacturers and service providers forward on their I4.0 journey, managers continue to be relevant and necessary. However, managers need to be well-equipped with relevant digital skillset to lead in I4.0 transformation. While unskilled workforce was replaced, displaced, laid off, semi-skilled workforce will be re-skilled to take up new jobs. Indeed, I4.0 is redefining the nature of managerial work as organisations are organized in the CPS system. The transition to I4.0 has set the stage for a fundamental change in managerial work, workplace and workforce. Managers have to be better prepared to manage humans-machine interaction. Such advances in technology will transform the way managers, work and interact with subordinates in this Digital Age. Managers have to build and lead talented teams to brave the unknown and step confidently forward or risk of being left far behind by their industries. Indeed, management, not just technology, is at the heart of I4.0 implementation (Moktadir, Ali, Kusi-Sarpong, & Shaikh, 2018). Technologies

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are not driving the change of digital transformation, structural changes, and new business model, but the change engine itself is fuelled by managers and their high-performance teams. Management can drive innovation and focus long-term strategy, change management and create new models of dynamic leadership. It is reasonable to state that managers are not dead but highly essential part and parcel of the organisation for sustained successes. Good management and leadership are entirely necessary to this new sphere of digital and physical worlds. Furthermore, managers should be trained and developed with three core skills, namely, high cognitive skills, social and emotional social skills, and technological skills to solve complex problems and overcome challenges (Jezard, 2018). Managers should not be worried about robots and AI but rather more concerned about value creation that continues to change for years to come. Managers have to be open-minded to chart the way forward with I4.0 roadmap. Digital transformation offers opportunities for dynamic organisations to leap-frog their organisation development and make sure every member of organisation can move forward and upward in unison. In this regard, organisations need to develop the next generation of managers and leaders with strong leadership skills to future-proof their organisations.

Against the backdrop of tense geopolitical competition and pandemic COVID-19, the future of the economy, business and job opportunities are highly VUCA. Hence, managers together with the policy-makers, captains of the industries, and researchers at every level and across all sectors, need to tackle the messy transition from the current economy to a digital economy. Managers have to gear up to manage the six diverse transformations with confidence. They have to show their leadership mettle in navigating the unknown and seizing opportunities in every element of the value chains in a VUCA world of disruption, scale their successes up and finally build a shared future for humanity.

RECOMMENDATIONS FOR PRACTITIONERS

Based on the research, some of the following recommendations and improvements should be considered to enhance the relevancy of managerial roles in the era of I4.0. Firstly, as the world of work is changing fast and technology is changing even faster, therefore, managers have to evaluate the impact of the identified challenges before venturing into implementing new I4.0 initiatives. This means managers have to work out new guidelines for the implementation of I4.0 (Sony & Naik, 2019). It is important to note that despite decentralisation and autonomy, managers remain on top of the decision loop with a final say in strategic decisions. Secondly, as organisations collaborate with relevant parties, and disruptive innovation is evolving, new skills and managerial roles are gaining prominence. Therefore, managers have to be prepared for this pace of change. They have to adapt to new work, workplace and workforce in today's tech-driven business world. While managing deskilling, managers have to upskill and reskill their digital skills to communicate with their highly skilled workers to motivate and lead them to achieve organisational goals and secure their future of work (Noon et al., 2013). Last but not least, it is worthy for managers to design new organisational structure with new strategic managerial policies to improve the current conditions of IT infrastructure in I4.0, to reconfigure production pattern and adopting suitable smart technologies to achieve optimal productivity (Moktadir et al., 2018).

FURTHER RESEARCH

Future research should make in-depth studies on the effect of technology adoption on managerial hierarchy under different types of industries. Another aspect is the study on the effect of decentralization and autonomous, data-driven decision making based on machine-generated insights which may render managerial decisional roles less significant and redundant (Lehmacher et al., 2017; Schneider, 2018). It is possible, I4.0 may lead to a hypothetical state of singularity where robots may outsmart humans, and the fusion of humans and computers may unlock unpredictable capabilities, thus resulting in unforeseeable changes to management and humanity (Kurzweil, 2006; Satell, 2016).

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Chapter 7

The Dynamics of Workplace Relationships, Employee Well-Being, and the Fourth Industrial Revolution: Perspectives of Workplace Relationships and Industry 4.0

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ABSTRACT

Employees globally are expected to flourish amidst the uncertainty, volatility, and complexities of the muddy waters of Industry 4.0. To identify changes in the perceived workplace relationships and consider initiatives that will improve interpersonal relationships at work in the 4IR. A review of literature will be conducted on the following key variables: 4IR. In the 4IR, provision of interpersonal other than digital means of communicating with employees, effectiveness in intra-organizational information sharing among employees, constant training on new and improved technological tools of working will be useful. Human resource practitioners should focus on designing strategies to improve IR at work, in order to minimize interpersonal conflicts, provide social support and improve organisational performance.

INTRODUCTION

Workplace relationship is the compound word for all interpersonal relationships in which employees engage themselves with in the process of doing their jobs including customer relationships, workplace friendships, supervisor-subordinate relationships, Professor-student relationships, client professional relationships, romantic relationships (Abe & Mason, 2016). Scholars have considered workplace relationships from different perspectives. For example, workplace relationship quality, (Sias, 2015); tradi-

DOI: 10.4018/978-1-7998-3347-5.ch007

tional and emerging perspectives (Sias, 2008); Bullying in the workplace (Johnson, 2009); Millennial's organizational relationships and performance (Myers, & Sadaghiani, 2010); Innovative behaviour and workplace relationships (Xerri, 2013); Workplace culture (De-Lara, Ting-Ding, 2016). Each perspective is unique in concepts of organization, communication, and relationships, as they draw the attention of practitioners to various essentials in an organization situation (Sias 2008). The perspective that is relevant to this chapter is the communication aspects of workplace interaction in the era of industry 4.0. Bearing in mind that communication and relationships are like two sides of a coin.

Employee wellbeing is not a bad concept, but making the objective benefits of wellbeing a priority, and implementing its promotional policies in an organization is intense resource wise. Previous studies on employee wellbeing has been well documented. For example, employee wellbeing scholars wrote extensively on the circumplex model of affect (Russell, 1980); the components of employee wellbeing (Van-Horn, Taris, Scaufeli & Schreurs, 2004); Mental health, (Keyes, 2005), Subjective wellbeing at work (Warr, 2007); Core of wellbeing (Diener, Lucas & Oishi, 2005); affective employee wellbeing, (Bakker & Oerlemans, 2011); Positive and negative concepts of employee wellbeing (Makikangas, Kinnunen, Feldt & Schaufeli, 2016) and human sustainability and employee wellbeing, (Kobayashi, Eweje, Tappin, 2018).

The Chartered Institute of Personnel and Development (CIPD) defined employee wellbeing as, "Creating an environment to promote a state of contentment which allows an employee to flourish and achieve their full potential for the benefit of themselves and their organization." Employee wellbeing initiative at work is the balancing of the needs of the employee and that of the organization. The CIPD survey of 2018 suggested that the mental health awareness of workers has increased, and stress remain the dominant cause of employee ill health. "Although technology is viewed as a positive step forward, a whopping 87% of HR professionals reported that the most common negative effect is the inability of employees to switch off outside of work ". (Jimoh, 2016).

A new face of development has evolved in the fields of the digital technology, physical technology, and the biological technology. These three technological areas are the drivers of the Fourth industrial revolution. These technologies are impacting the global industrial, economic, and social development (Li, Hou & Wu, 2017).

Globally the labour markets are undergoing transformation as the consequence of globalisation, technological and demographic changes. The transformation is evident in the new forms of employment, different approach to workplace contracts and engagements, facilitated by online platforms which is because of the 4th industrial revolution (Brooks, 2016). Technology has accelerated the level of communication in workplace relationships. Employees are assessable through different forms of technological tools at any point in time. What effect does this have on the employee in a short and long run? Communication has widened the scope of interpersonal relationships among employees at work by the introduction of technology, scholars must search for new theories and concepts for workplace relationships. In this chapter, the initiative positioned to assist the wellbeing of employees in the face of the new industrial revolution is social support. The assessment of the growth in the characteristics of perceived support and the propensity of employee's behavioural interpretation as supportive. The assumption is that social support represents the positive interpersonal relationships among employees (Gibbs, 2017).

Historical Background

Literature on interpersonal relationship have grown over the years. Earlier researchers viewed interpersonal relationships from the role of relations or intimacy (Marwell & Hage, 1970), Socio-emotional and informal relationships, (Wish, 1974). In 1976, the four dimensions of interpersonal relationship was documented (Wish, 1976). The dimensions include, one, perceived equality versus inequality in relationships (Forgas, 1992; Fiske, 1992): Two, Valence of the relationships between positive and negative relationships (Fiske, 1992): Three, the strength or interdependence of relationships, (Forgas, 1991): Four, to determine the fundamentality of the social context of relationship and/or whether relationship relates to work, Haslam & Fiske, 1992). Studies on interpersonal relationship graduated to determine the presence of relationship between leaders and members of an organization (Graen & Uhl-bien 1995). The interdependence in relationship was reasserted in terms of viewing the compatibility between cooperation and competition (Johnson & Johnson, 2011), Power distribution (equal versus unequal power), (Loi, Lam & Chan, 2012), Task-oriented versus social-emotional relations (Rosh, Offermann, & Van Diest, 2012); Formal and informal intensity of activities in relationship (Chen & Krauskopt, 2013). The focus of these scholars was to establish the perceptions of interpersonal relationships and to determine the context in which relationship occurs.

The scholars that digressed from the earlier view are of the opinion that there are conditions that affect interpersonal relationships which should be considered also. These scholars asserted that individuals spend considerable time at work, and the interaction of employees in the workplace should be given due attention. The suggestion of Song and Olshfski, (2008) was that family ties, class, ethnic background, race, gender, age, experience, interests, and geography influence interactions among people. Many theories support the suggestion that employee's characteristics and condition of living affects the social relationship between individuals (Sacco & Schmitt, 2005). Social categorization Turner, 1982), social identity theories (Tajfel & Turner, 1986; Turner, 1982), they suggested that people should categorize themselves into in-groups and out-groups according to significant characteristics including sex and race. The assumption was that individuals tend to reduce their differences within groups and enlarge their differences between the group members.

From the foregoing, workplace relationships are all interpersonal relationships in which employees engage themselves with in the process of performing their jobs including customer relationships, workplace friendships, supervisor-subordinate relationships, client-professional relationships, romantic relationships. The following conditions have been proven to affect interpersonal relationships at work: One, loneliness which is a situation experienced by the individual where there is an unpleasant or inadmissible lack of (quality of) relationships (Peplau, 1982). Two, exclusion or social isolation is the state or process of being excluded, not allowed take part in a workplace interaction (Baumeister & Leary, 1995). When employees lack positive relationships, they usually experience loneliness, guilt, jealousy, depression, and anxiety (Leary, 1990). Three, organizational justice: which deals with employee's perception of fairness in the workplace. The concept is divided into three dimensions, namely distributive, procedural, and interactional justice. The distributive dimension is the just allocation of resources or rewards. The procedural dimension concerns how decisions are made, reasonably or otherwise. The interactional dimension is the relationship between superiors and employees, essentially, how employees are treated (Colquitt, Conlon, Wesson, Porter, and Yee, 2001). Four, relational justice is defined as "the justice produced through co-operative behaviour, agreement, negotiation, or dialogue among actors in a post conflict situation" (Casanovas & Poblet, 2008). Five, psychosocial working conditions is the psychosocial aspects of the

working conditions which are mental load or psychological stress. These constitutes not only mental demands in quantitative ways, for example, production rates and time pressure, but also relationships to customers or demand persons (Kristensen, Bjorner, Christensen & Borg, 2004).

Six, individual differences which refers to the degree of variations and similarities among people on intelligence, personality, interest and aptitude or *intelligence quotient* (IQ). Physical factors such as body, age, and sex (Maltby, Day, & Macaskill, 2007). Seven, cultural differences are different individual orientations with social norms that are prevailing which are probably linked with cultural differences in the way people relate to and communicate with one another in interpersonal relationships (Fiske, 1998).

Workplace relationship metamorphosized into Leader-Member Exchange (LMX), (Dansereau, Graen & Haga, 1975; Graen & Uhl-Bien, 1995). The theory contended that leaders develop different relationships with their subordinates. The supervisor-subordinate relationship was developed on the premise that the supervisor directs and determines the flow of relationship from introduction to maturity (Sias, 2008). In 2014, a followership theory was developed that highlighted the role of subordinates as important factors in workplace relationships. The theory emphasised two frameworks, one was the role-based approach where subordinates are viewed as moderators of leaders and two, constructionist approach where subordinates are co-creators of relationships (Abe, Mason 2016). All discuss thus far has awaken a salient question. In the phase of recent economic, social, and technological changes, will the workplace relationship still hold water, or should scholars begin to look towards new relationship for employees in the workplace, especially now that industry 4.0 is with us?

Workplace wellness started with the Italian Physician Bernardino Ramazzini (1633-1714). He was among the first writers on the influence of work exposure on employees (occupational diseases). He took interest in the possibilities of applying preventive measures to help improve employee well-being. Ten-hour workday was proposed by welsh in 1810, to protect the wellbeing of the workforces. An aggressive measure of eight hours was later proposed (Lamphier & Welch, 2017). The account of the health problems of industrial worker was first documented in 1832 by Charles Turner. At that same time, Thackrah highlighted that employers often neglect the wellbeing of their employees in the bid to run their organizations Thackrah, in 1932 (Murray 1985). Organizations have been moderating employee wellbeing through constant trainings and improvements on working conditions. In 1950s the concept of Employee Assistance Programs (EAPs) was introduced. Organizations began to offer wellness interventions with primary focus on alcoholism and mental health problems (Owens 2006). It was later confirmed that true workplace wellness programs began to have positive effect in the mid-70s (Realdon, 1998). During this time, a shift was perceived in the financial responsibility for health care from government to employers of labour. After which the development of worksite wellness was motivated to consider occupational safety and worksite health of employees. The reasons given for the worksite wellness are as follows:

- A general culture shift that promoted fitness
- Emerging research findings that showed the cost of employees' unhealthy habits
- Newly formed workplace health promotion groups such as the Washington Business Group on Health and the Wellness Councils of America.

Over the last fifteen years workplace wellness programs adopted have moved from providing health information, counselling, and physical fitness to rewarding employees with monetary incentives (Wieczner, 2013). While employers are debating over the high cost of maintaining employee wellness, other organizations with foresight are looking ahead towards meeting the demand of human progress at work

in the fourth industrial revolution. Therefore, the question here is, whether a safe, healthy, and productive work environment for humans is an aspiration or a pot of gold at the end of a rainbow that can never be reached? Organizations that have developed employee wellbeing tagged themselves as “the best place to work” will the same hold in the fourth industrial revolution, where almost everything is assuming a new learning?

The advent of the 4th industrial revolution suggested that there have been three major technological advancements. The First industrial revolution started in Great Britain with the introduction of hydraulic and steam machine system. The second was the separation of components and the assembly of products by the division of labour. The third was characterised by wide use of the electronic, automation of manufacturing and information technology. The fourth is the integration of intelligence and networking system (Li, Hou, & Wu, 2017), widespread application of cyber-physical systems in the manufacturing industry (Liu & Xu, 2017). The Cyber Physical Systems (CPSs) represents the understanding of the Fourth industrial revolution (Zander, & Mosterman, 2017). The Industrial Internet, which was promoted by General Electric in the USA, is viewed with the same idea as CPSs. The common features of both are that they are enabling technologies which create the integration of the virtual and real (Al-Fuqaha, Guizani, Mohammadi, Aledhari & Ayyash, 2015). This is a network that permits intelligent objects to communicate with each other. The fourth industrial revolution is manifested in almost all aspects of the society, technology (Shwab, 2017), production (Webster, 2015), consumption and business (Gentner, 2016), human genetics (Sackey & Bester, & Adams, 2017).

The term industry 4.0 originated in 2011, at the Hannover Fair in Germany. The name was a strategy to mitigate the increase in competition from overseas and to differentiate European and German industries from other international markets (Wang, 2016). The intention of the German Government was to use intelligent monitoring in production processes to support decision making and machine maintenance, thereby reducing costs and increasing competition of German industries. For a clearer understanding of the term industry 4.0, a framework was proposed that was adopted by different governments (Price Waterhouse Cooper, 2017).

The concept of industry 4.0 began in Germany and has been recognized by other leading industrial nations. In United State of America, it is called “connected enterprise” and referred to as the “Fourth Industrial Revolution in the United Kingdom. The expectation of those at the forefront of the industry 4.0 is that it will be more profound, irreversible, and more rapid in development and acceptance than all the other three generational moves.

The beauty of this chapter is captured from the lens that view industry 4.0 and employee wellbeing from the concept of social support. The changes that industry 4.0 drives in the workplace demand that employees be supported through the transformation. The believe is that employees can count on their employers to offer needed support. That employees will be assisted through period of crisis. That information will be made available to employees to cope with the changes in work operations and interactions.

Challenges of Employees

International Labour Organization’s (ILO) forecast that 2.3 million workers globally will accede to a work-related disease or accident every year. 6000 deaths are predicted every day. In 2017, 1.3 million work-related illnesses were reported in United States alone. These illnesses are work-related stresses, mental health, and musculo-skeletal cases (HSE, 2018).

Low rates of unemployment and unending demand for productive work has posed a serious challenge. The responsibilities of managing the wellbeing of employees in a multi-generational workforce where almost everything is changing at an unprecedented rate is imperative. Under reporting of interpersonal conflicts at work is not impossible among employees who are trying to find their feet in the technological workplace (Abe, 2015).

An empirical study carried out among 310 employees of four retail companies in South Africa, 2016 further buttress the facts above. 80% of the respondents agree that they have no relationship with their supervisors or co-worker because they work with machines most of the time. Low level of communication, disrespect, low (EAP) Training, low support, lack of friendship was responsible for low interpersonal relationships among employees (Abe, Mason, 2016). Audi motor company stated clearly that no matter how educated an employee is, the future of any employee in the company depends on their level of interpersonal relations at work. The question is, under the present circumstances where organizations have acceded to job cut, what will happen to employees with low interpersonal skills or relations?

Jeffrey Pfeffer, (2018) documented that the number of employees who say they have no close friends at work has increased in the last ten years (Methot, Lepine, Podsakoff, & Christian, 2016). Previous studies on social support about associations and connections in the workplace that an employee can count on during crises, have effect on that individual's psychosocial stresses. Employees with low social support have been linked with high mortality rates (Uchino, Cronan, Scott, Landvatter, & Papadakis, 2020). The difficulties of interpersonal relationships consequently social support have been the workplace characteristics. For example, encouraging unhealthy competition at work, ranking of employees are vices that has reduced collaboration and teamwork among employees. Unconsciously, the fourth industrial revolution and the use of technology has encouraged transactional workplace approaches, whereby employees are seen as tools, factors of production, emphasis are now on trading money for work; this has left many without any emotional attachment to people and workplaces. The assumption is that as easy as it is to hire you, it is easier to fire you. Again, what if the organizational outcome is better performance and productivity, what effect will all these have on the outcome for the organizations?

By the Fourth industrial revolution and emerging use of technologies, the focus of workplace relationship can no longer be on two people as traditionally dictated, but by many simultaneously. This is a complete departure from the status quo. At best relationship at work must assume a new form of learning because of its complexities.

Concept of Workplace Revolution

The concept describes the interactive changes in the engagement of employees globally and in different sectors. Organizations are rapidly evolving their workplace strategies because of the need to become disparate and respond timeously to rapid growth. These establishments are looking forward to innovation and technology as tools that drive competition and productivity. Global employee performance index must assume a new paradigm between value and culture; reduce employee dissatisfaction and disfunction; embrace exponential volume of change in the organization. The factors that underpin the workplace revolution are:

1. Opportunities that the new technology presents drive innovation and collaboration. Globalization and digitization are major challenges for many organizations who need to focus on finding new ways to create value and increase productivity.

2. Generational change that creates expectations that are either high or unmet. It has been confirmed that five generations of groups interact simultaneously at work. The leadership of these different generations of employees need to find solutions to their long- and short-term challenges to maintain its position as the best place to work.
3. Creation of organizational agility. The need to be ready for any form of change whether economic, technological, or social, and the readiness must be swift and quick.

Trends in the Workplace

Five reasons have been purported to be the purpose behind industry 4.0 and why it is imperative to be revolutionary in the era of open market operations and information Technology. First, Industry 4.0 reduces the burden of challenges in the manufacturing industry that is in search of flexibility and responsiveness to business trends. The challenges include increase in market volatility, short product lifecycles, higher product complexity, and global supply chains. Second, industry 4.0 facilitates the transformation of modern economies to become more innovative and increase productivity. Modern Technologies like digital chains, smart systems and industrial internet should speed up innovations and business models are implemented at faster. Third, Consumers are regarded as co-producer, and this brings them to the centre of all activities. Product customization is valued as well as product value chain, digitization will ease crowdsourcing and it will result in faster design process. Fourth, Industry 4.0 puts human (worker/employee) in the centre of production. Workers will be assigned where assistance is needed, there will be high demand for skills in managing complex projects, flexible work arrangement will be available. Five, Sustainable prosperity using technology to find solutions to energy, resources, environment, social and economic challenges.

A body of evidence is growing on the connection between measures of happiness, wellbeing, engagement, and productivity among employees in the workplace. Emphasis are on the need to close in on the measures that will serve a universal purpose as the work environment changes (Shwab, 2017).

Scholars are calling for strategies to provide good work for all, that is fair and decent with a realistic scope for growth and fulfilment. The shift from employer responsibility to government responsibility and accountability should be enhanced.

As progress is recorded technologically, clarification will be needed in several areas that relate to employees. The need to be clear about who a worker is? The need to inform all on new platforms, such as Uber, obligations and accountabilities between platforms and service deliveries to clients. Concerning the worker again, the law should be clear about his/her rights, what the minimum wage should be where the number of hours in engagement are not specified. Increased protection is necessary about the dependent contractor, their description and how organizations pledge to support them.

In addressing work control, job autonomy is required which is built on trust between the employer of labour and the employee at different level. There is the need to clarify what is expected from the employee. Trust between the employer and the employee is important, trust is also imperative between employees at different levels of the organization. It has been reported that the most likely reason why employees leave their work is failed relationship. Therefore, positive relationships across the cadres of employment should be emphasised, without which the organization may not survive despite the efficiency of technology (George, 2015).

In the technological age words that are familiar are assuming changes also. For example, the word relationship has changed to interface. The interpersonal relationships between humans are now being extended to machines. Therefore, machine to machine interface at different levels of process have been developed with the aim of performing human functions at work. Organizations that are at the fore front of change in automation and technology have engaged in the automation of links between different processes. For example, in the manufacturing industry, pre-machining and part measurement automation Has been developed. Exchange of information is faster through automation between planning systems, production machines and measuring instruments without human interference or control. Irrespective of the machines involved, consistent data formats and standardized interface has been achieved to ensure continuous networking throughout the processes. For example, OPC Unified Architecture. In accordance with industrial standards, fully integrated communication solutions are developed with feature robust operational friendly control solutions to implement higher levels of automation. Process steps, range of manufacturing, replication and metrological systems are all interconnected into a network and relates to the corresponding planning systems. Therefore, the scope of interaction of communication activities in the technological age is widened with minimal influence by humans (Shwab, 2017).

RECOMMENDATIONS

Having considered events that are unfolding some of which were anticipated and others incidental, it is important to view relational strategies that the workplace leaders need to put in place as organization evolves. It is obvious that the employees are at the receiving end of the hammer of the 4th industrial revolution, because of the constant threat on their jobs and workplace relationships built over the years which have consequent effect on their wellbeing. The line of recommendations will dough-tail on the factors that affect employee interpersonal relationships at work vis-a-vis the fourth industrial revolution. These factors are communications, teamwork, respect, training, friendliness, listening, sharing information and problem solving (Abe, Mason,2016). Focus here is on the positive contribution of workplace relationships as tools of transformation.

To improve employee workplace relationships in the face of technological changes of industrie 4.0, it was suggested that team accomplishment is imperative (Abe, 2015). However, Iwao Kobayashi, (2018) has documented the following strategies to assist organizations that are developing their teams at work. Practical program for corporate revolution, the quest to clean and organize workplace, rationalization of the system or management of objectives, improvement of team activities, accelerations of changes in technology, minimal supervision in manufacturing, building relationships and corporation between neighbouring processes and empowering workers to improve on their carriers.

Institution of best place to work strategy. This strategy is premised on the policies of long- term engagements and relationships with customers and employees. Organizations need to earn the trust of their employees as caring for their wellbeing. For example, the organization should be able to go the extra mile for employees who dies in active duty; by means of assistance to the relations of the deceased employee.

Organizations that are at the top of their economic and social activities have put in place a culture that is characterized by open communication, high performance, an engaged work environment. Forster the culture of caring both for employees and clients/customers through the following improvements: Learning culture which creates room for both old and new employees to attend classes to be acquainted

with the culture of the organization. Employee inclusion is important through engaged interactions in the organization, looking at the goals, mission, and objectives set for achievement (Tian, Deng, Zhang & Salmador, 2018).

Contributing to the assistance of employees through positive interpersonal relationship (social support). When employee needs another employee to count on out of crisis, the organization should fill in the gap for their employee's assistance. For example, the organization may request an employee to apply for financial assistance when such need arises. Commitment to employee's wellbeing can be strengthened when the organization demonstrates its investment in the health of the employees. For example, the health officer of an organization must ensure that employees can always access its health programs and facilities.

Organization should be viewed as assisting employees with contributions outside the payroll. For example, in the event of national or state disaster, a well-meaning organization can demonstrate social responsibility to its environment by contributing to relieve funds to help people suffering from disaster.

Employees are likely to help others with whom they perceived to share unit of relationship that make them similar and unique. The language that can create division among employees should be avoided as best as possible. Especially those languages that can cause noise between the leaders and employees and erode the idea of community and identity.

The need to strengthen common identity and social bond must be encouraged among employees. For example, the organization should encourage programs that celebrate employees' tenure, shared successes, throw end of the parties for employees. The sense of belonging should be promoted now than ever as against the sense of transaction promoted by the industrial revolution.

Heightened the personality coherence of employees through assessing the availability of assistance provided to employees by the organization, each of the components of assistance are generally referred to as sense of social support. Where it is the belief of employee that there are certain others that accept them for their personality, including their best and worst dispositions, such persons are energized when they observe that others are willing to support them. This is called sense of acceptance (Sarason, 2013). The sense of acceptance is also an aspect of coherent personality, that is, constellation that promotes effective coping with demands and challenges, and enhances the ability to receive social opportunities (Hayes, Levin, Plumb-Villardaga & Villate, 2013).

FUTURE RESEARCH FOCUS

The traditional interpersonal relationships among employees was developed on the premise that it takes two to tangible people of different status to create, maintain and end relationships at work. Through widened communication, the scope of interpersonal relationships has broadened due to the assistance of technology and creation of networks from where interested persons relate and interact with others around the world that they have not seen before. Areas of research interest in the future are, exercise of choice in workplace relationships, exploring the power of reciprocation in relationships developed, maintaining networks and reliance on the information received from interactions with unknown persons.

Many functions of employees at work will be taken over by machines. Modern leadership at work now sees employees as resource tools just as machines. Furthermore, the role of interpersonal relationships has been extended to machines that converse one with another to solve complex problems through system programming. The question that comes to mind is, in the future workplace, who will lead who? Will the man lead the machine or machines will lead the man since they are both resource tools?

CONCLUSION

The progressive knowledge of workplace relationships that was predictable through different theories in the past has assumed a new meaning because of the intervention of the 4IR that is accompanied with unprecedented changes. The tools of technology have affected the way employees interact and relate at work. The scope of interpersonal relationships has widened, what use to be private and confidential information may no longer be classified. The challenges of relating in the workplace takes different turn as changes takes place in the operations of organizations. However, a higher level of support is needed for many employees who may lose their jobs. The need to unlearn, learn, relearn is inevitable under the circumstances that employees find themselves. Some employees may probably be too old to cope with the changes in the workplace. Many employees confess they have lost confidence in their governments for job retention but trust their employers as the last resort.

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Chapter 8

Future of Work and Its Implication on Employee Well-Being in the 4IR Era

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ABSTRACT

Capitalist corporations seek ever-new opportunities for trade and gain. As competition intensifies within markets, profit-seeking corporations innovate and diversify their products in an unceasing pursuit of new market niches. The incessant changes and unpredictable nature of capitalism often leads to insecurity regarding job loss. Job insecurity has been empirically proven to have negative effects on individuals and organisations. It associates to reduced job satisfaction and decreased mental health. A longitudinal Swedish study showed an indirect effect of trust on job satisfaction and mental health of employees. The advent of AIs, humanoids, robotics, and digitization present reason for employees to worry about the future of their work. A recent study conducted by the McKinsey Global Institute reports that by 2030, a least 14% of employees globally could need changing their careers as a result of the rapid rate of digitization, robotics, and advancement in artificial intelligence disruptions in the world of work.

INTRODUCTION

Presently, the world of work is experiencing major outcomes from the change process. The speed of change processes and the size of such changes are drawing attention to the need to transform the world of work. Organisations are working hard to understand and react efficiently to the emerging challenges.

DOI: 10.4018/978-1-7998-3347-5.ch008

For instance, the “Future of Work Initiative” (FWI) by the International Labour Organisation (ILO) is one of such efforts. The FWI is designed to assist the ILO to enhance her social justice mandate. Management of proactive organisations need to engage extensive process of deliberations on the future of work as the core of human resource consideration. Discussions and actions on the concept should be broadly based on making the future of work visible and promoting practical political willingness to engage; as well as giving attention and structure to strategies that immediately tackle the diverse and complicated challenges (ILO-DG, 2015). Where these concepts underpin discussions on the future of work, success is expected to be the resultant factor.

In considering the future of work, some pertinent questions to be asked should include but not limited to matters associated with; capacity to create or destroy jobs annually, implications of job creation/ or destruction on existing policies, priorities and controls, repositioning work in societies, income distribution, managing the effect of technological advancement on workforce, with the emergence of humanoids, robotics and artificial intelligence (AIs) – are we expecting jobs disaster or jobs prospect? (Ryder, 2015), and the implications of all these on employee health and wellness.

It is becoming predominantly clear that the advancement of technology and improvement in ways of doing things continue to provide technological reasons why routinised jobs that do not need mental inputs should be automated. In this context, Ryder (2015) asks; *So how do we deal with technologies? How do we deal with the dissolution of the employment relationship?* The answers to these questions could be unsettling; technologies will deal with man in the workplace in both positive and negative ways. It will dictate skills, new skills and need to acquire new skills. Many people will lose their permanent employment and will need to get new skills (reskill) or additional (upskill) skills to be able to engage in part-time employment in the new world of work. Employment relationships will change.

It does not make sense to examine the 4IR and the future of work without looking at the earlier industrial revolutions. The need to improve the way in which work is done efficiently paved way for the revolutions.

Background of the Industrial Revolutions

Over time, men mastered industry by not only depending on mechanical evolution but through the reinvention of the machines as novel resources and using them as tools. By this, industry is promoted through qualitative developments whose outcomes impact mankind overwhelmingly and they named the occasional entrenchment in any given period “revolutions”.

The first industrial revolution (era of the emergence of steam engine), denotes the period in the late 18th century (1765) that witnessed the transformation of mainly rural, agricultural cultures in Europe and America into urban, developed and industrialised societies. Handmade commodities totally produced by human effort began to be produced in large quantities by machines in plants as a result of the introduction of mechanised techniques in the textile, ironmaking and other trades. This revolution began in Britain in the early 1800’s.

The second industrial revolution (age of science and mass technology) began in the late 19th century (1870) and continued to early 20th century and is reputed to have introduced the most changes into the world. It brought growing cities, sprawling factories and ended the regulation of people’s lives by the sun (Freeman, 2018). It birthed fast advancement in the manufacture of steel, use of chemical compounds and electricity to power manufacturing processes including arms and consumer goods produced massive proportions. It created ease in transportation (using train, cars and bicycles); information was spread

faster through newspapers, radio and telegram. All these made life and living faster. It was the period when a class of rich businessmen and well-off middle class was created. Migration to the urban areas by workers from all over the world and rural dwellers of America's farming communities and villages was prominent. Work was at the centre of all this and according to Freeman (2018), individuals who had control of their lives and whose work revolved around times and seasons had to work in factories that were fixed, and clock regulated. The second industrial revolution midwifed mass production in industrial and consumer products.

The way information is transmitted, business is done, and people interact was changed by the third industrial revolution (rise of digital technology) via the digital communications technology and internet. This commenced in the 20th century (1969) and witnessed the rise of electronics (microchip and transistor, processors and telecommunications). The 3rd industrial revolution orchestrated high-level automation in industrial production processes through programmes and robotics.

Summarily, the first industrial revolution utilised water and steam to industrialize production, the second made use of electrical energy in creating bulk production while the third revolution utilised microchip and information technology to power production.

The matter of a fourth industrial revolution is a topical issue today. While some people argue that we are now entering it, others question its existence. However, it is a revolution that builds on the 3rd industrial revolution and the digital revolution ongoing since the middle of last century. Expansion in this revolution is exponential featuring an unprecedented integration of technology that distorts physical, digital and biological domains to totally displace industries globally (Um, 2019; Galli, 2018; Bertola, & Teunissen, 2018). This is expected to generally impact production, management and governmental processes. Robots, humanoids, Artificial Intelligence, Biotechnology, Big Data, Cloud Computing and Autonomous vehicles among many others are altering human concepts of life and perception (Tiddi, Bastianelli, Daga, d'Aquin, & Motta, 2019; Vermesan, Bröring, Tragos, Serrano, Bacciu, Chessa, & Simoens, 2017).

Below is a presentation of the four industrial revolutions

Table 1. Industrial revolutions one to four: the level of complexity

Industrial Revolutions	Level of Complexity	Time Period
First Industrial Revolution	The mechanical production facilities using water and steam power	End of 19th century
Second Industrial Revolution	diversified mass production using electric energy	Beginning of 20th century
Third Industrial Revolution	further automation of production through use of electronics and IT	Beginning of 1970s
Fourth Industrial Revolution	cyber-physical systems	Present days

Source: *Spath, 2013*

These revolutions impacted transportation and communication, triggered mass migration from the rural to the urban centres, brought banks and financial institutions to prominence, dramatically accelerated industrialisation, creation of labour unions, attendant pollution, violence, labour dissatisfaction amidst so many other things and is today changing the way we relate, work, do things and live generally.

SECTION ONE

The Fourth Industrial Revolution and Future of Work

The 4th Industrial Revolution (4IR) was first announced in 2011 in Germany. It denotes the era when the production of industrial goods is automated. It guides the concept of a smart plant featuring an absolute network of the production processes: actual time control using information technology and the amplified usage of artificial intelligence, humanoids and robots that control themselves; for better productivity and effectiveness (Kotynkova, 2017). The 4IR concept is fundamentally shaping digital conversations globally and debates posing more questions rather than offering answers are on-going. This chapter seeks to explore the implications of the 4IR for the future of work. In the case that the forecasts that automating production processes would result in the loss of millions of jobs are right, what would become of those whose jobs are extinct? What would happen to traditional workplace relationships? Although revolutions could seem magnificent, they also can be damaging, causing professional obsolescence.

The concept is based on the digitisation, cybernation and information exchange in manufacturing processes. The functionality of the 4IR is grounded on the use of IoTs, Big Data and Services for the creation of a “smart factory”. Inside the interlinked smart factories, *cyber-physical systems* (CPS) scrutinise physical procedures, produce a cybernetic copy of the real world and reach decentralised decisions (Ghobakhloo, 2019). CPS interconnect and collaborate with one another and with mankind in real time through the IoT. Value chain participants access offered services through the Internet of Service (iOS) (Lu, 2017; Verdouw, Wolfert, Beulens, & Rialland, 2016).

Many policymakers are clueless about what the 4IR is about because there is a notable paucity of data available to answer fundamental questions, for example: what is the extent and level of change of the main technologies, particularly artificial intelligence (AI)? Which technologies are currently eradicating, supplementing or transforming which types of careers? What novel job opportunities are developing, and which policy alternatives could generate jobs in this context? This scarcity of information will result in missed prospects and the worst-case scenario could be terrible. Hence, if the unpredictable outcomes of the 4IR and its automation agenda would be understood, there is an urgent need for observation and tracking of its changes and indicators, preparation, reinvention and guidance of the workforce and workplace in readiness to guide the effects (The National Academies of Sciences, Engineering, and Medicine, 2017).

The discussion on 4IR so far is along two divides, namely; pessimism and optimism. Pessimists argue that the transformation leading to the use of IoTs, AIs, and robots among many others, will result in the end of human labour, while the optimists who are mainly economists, claim that since past technological advancements ultimately increased the demand for labour and earnings, the 4IR will not be different, hence, there should be no room for fear and anxiety. Between the two divides, few or not much individuals, scholars, or practitioners are discussing about employee health in the 4IR.

Scholars and industry experts are regularly engaging in discussions on the emerging organisations and ways of guiding the whole value chain which is progressively syncing with customer demands. The value chain encompasses the overall product lifecycle, beginning with the conception of its idea through the development and production processes unto delivery to the customer and possibly, the recycling phase of the product (Stark, 2015). According to Brynjolfsson (2014), increasing automation brings humanity to the “second machine age”. However, in the 4IR, data forms the heartbeat (material) operations and processes. Little surprise that the entire universe of work is jittery about the implications of the 4IR on work, future of work, relationships, leadership, strategies and employee well-being among many others.

The results and consequences of the consistent daily activities of transformational changes in the 4IR on the workers and workplaces are difficult to accurately predict or addressed in the short run. For instance, the use of robots and humanoids to perform routinised functions that are otherwise performed by humans will not only cause individual employees to lose their jobs but will also entail that they either upskill to acquire further skill in doing similar jobs or reskill to function in another job area. This will come with its attendant stress on the individual's health and/or his interpersonal relationship at work/ domestic relationships. On the workplace itself, the requisite actions requiring instant policy responses could be challenging, especially where such actions are necessary but demand short-term and precise attention.

What is the future of work in the era of automation? To meaningfully explore the future of work, there is a need to draw have a baseline knowledge by examining the present-day outlook of work. What is the present situation of the world's over three billion labour force? In what areas do we have the most prominent shortages in decent work?

According to the report of the Director-General, International Labour Conference, the 104th Session (2015), the world was enjoying a period of unprecedented prosperity before the global financial glitches of 2008, and the current level of economic development has remained notably lower than the times before since then. Unemployment rate worldwide is recorded at above 200 million, about 30 million in excess of 2008's number. The number of unemployed youths is much more in comparison to that of the total population, and in most cases the rate is doubly higher. Additionally, the inequality in the number of men and women in employment persist by 26% with more men than women, but the participation of women in workforce rose sharply in the last century. However, the latest information show that the salary gap between the genders is still above 20%, showing no sign of reduction soon. Rather, informal types of work and unsalaried domestic work at home are the typical jobs that women are the most participants in.

It is no longer news that the world needs to create approximately 600 million jobs by year 2030 since over 40 million individuals are launched into the labour market annually. The most visible job created these days are in the services sector that already employs about 49 percent of the total employment when compared to agricultural and industrial sectors' 29 and 22 percent respectively. Demographic structure of the present day workforce shows that most of the people at work are young people who will need provide for a rising number of aged people, as the global population shows an increase in the percentage of individuals above the age of 65 from 8 percent to almost 14 percent by the year 2040. According to the ILO (2013) report, inequities are on the rise in numerous nations as the contribution of labour to gross domestic product fell notably from 75 percent in '70's to 65% in the middle of the 2000s in industrialised nations.

With foregoing in mind, one is pressed to ask about the implications of a transformation of the production processes on a workforce that is under the burden of rising unemployment rate, inequalities at work, aging population with the need to be supported, escalating poverty and social injustice? In trying to address the incongruity among the necessary skills needed for the new machineries (including robotics, IoTs, Humanoids, and others), and the extreme rate of automation, will the workforce and workplace relations be able to fit? What will the impact of all these be on employee well-being as they struggle to adapt, upskill, reskill and lead in an unpredictable work environment? Is there sustainable protection, strategies, initiatives to support employees who may lose their jobs (deskill) or need to acquire additional skill (upskill) or learn new skills altogether?

There is no concrete answer to this question in the present. However, unclear and different guesses abound with majority of the scenarios spinning around the complicated associations among humans and machines (Proctor & Van Zandt, 2018; Roblek, Meško, & Krapež, 2016). Using robots to perform jobs erstwhile done by humans will have a displacing effect on labour and the demand for human labour will decrease; conversely, the cost of labour (wages) will decrease too. However, the cost savings derived from decrease in labour and wages will counter these effects through its effect on productivity and result in an increase in the demand for labour in the tasks not carried out by robots. Additionally, the productivity effect will lead to more capital accumulation and deeper automation and conversely rise in the demand for labour (Acemoglu & Restrepo, 2018).

Although there are benefits associated with the automation of manufacturing processes in the 4IR as seen above, the prediction of its effect on employee wellness has not been made. From the period of transiting from area of traditional skill (de-skilling) to learn a new skill or acquire additional skill (up-skilling), the influence on employee health and wellness through strain, stress and fatigue could be imagined.

SECTION TWO

Digital Technologies and Employee Well-Being

Organisations in the 4IR seek to exploit new and developing technologies to attain higher stages of competence of production and consumption, grow into new markets, and contest globally with new products for customer base that progressively includes digital natives. Nevertheless, management and leadership of organisations in every sector will be required to design holistic human resource strategy to address the challenges of the transformation of the 4IR age.

Although innovative disruptions are essential to organisational development; however, there is a dearth of empirical studies that have systematically investigated the effects of the phenomenon on employees mental and physiological wellbeing. According to Mitchell and Brynjolfsson, (2017) immense difficulties for jobs accompany technological advancements. They report that although the level of productivity in the United States is at an all-time high, earnings of those at the 50% bottom level wage mark has been at a standstill since 1999. This, they say is as a result of technological advancement and the allocation of profits to those at the top of organisational hierarchies.

The National Academies of Sciences, Engineering, and Medicine (NASEM) (2017) marshalled the effects of information technology on employees. It reports that in the next 10–20 years, digitisation will impact almost every career. The introduction of self-driving automobiles for instance, will reduce the jobs of taxi drivers and long-haul truckers, while online training could be of immense value-add as a retraining option to retrenched employees. However, most of the information required to identify, understand and adjust to employee challenges are not collected systematically, or may not be in existence. Ironically, we live in an age of abundant information, but policymakers often do not always have timeously relevant information necessary to tackle the effect of digitization on the workforce.

Organisations that would positively embrace the 4IR in a socially supportable manner, will need to complement their digitization process with training and development line-ups for their employees, in new equipment and technologies that skilled worker uses and by which the operatives are straight-forwardly and indirectly affected. Additionally, new working settings such as the '*cyber-physical factory*' will un-

swervingly impact the operatives and the nature of work, making new exchanges not only among humans and machineries, but also among digital and material ecospheres. Hence, socio-technical transformation towards the 4IR that integrates innovative strategy and manufacturing philosophies for two prong 'human-centric' and 'cyber- physical' production processes where robotics, artificial intelligence (AI), humanoids, and other innovative manufacturing technologies present possibilities to further enhance and augment human employee's physiological, psychological and cognitive capabilities instead of unmanned, automated factories (Romero, Bernus, Noran, Stahre, & Fast-Berglund, 2016) are required. Romero et al (2016a) suggest that approaching the 4IR this new way will need basic rethinking of job-design such as those utilised in the design of environments where aeroplane pilots, manufacturing operatives and military personnel work. Naturally, this setting would need the supervision and control of situations by humans.

According to the World Economic Forum (WEF) (2018) report, there are signs of rising skills instability resulting from the upsurge in new technologies and disruptive business models, alterations of work outlook arising from job sharing between machine and humans. Furthermore, it reports that employers of labour expect that the requisite skills for the performance of some work tasks will change considerably by year 2022.

Additionally, it is reported that at least 54% of the workforce will need notable re-skilling (obtaining new skills) and upskilling (obtaining additional skills). The skilling programmes needed to attain re-and upskilling are expected to last from six to twelve months or more. The skills that would be highly prominent by 2022 are forecasted as those requiring critical thinking, creativity and innovation, and dynamic learning and learning tactics. Others are thoughtful consideration of details, hardiness, ability to solve complicated problems and flexibility. There will also be incredible demand for leadership, interpersonal skills, emotional intelligence, and networking capabilities (social influence) (WEF, 2018). Hence, when an organisation automates its production processes, the human workforce are likely to face challenges resulting from the need to re-and upskill to perform their jobs, and this will place a demand on their time, energy and mental and physical wellbeing.

In line with Day, Scott, and Kevin Kelloway, (2010), automation is viewed here as both a demand and a resource using the *job demands-resources* model (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001) and Lazarus and Folkman's (1984) transactional model of stress to provide a theoretical framework. Aspects of digitization will be reviewed as promoters or reducers of workers' stress and wellness respectively. The degree to which digitization improves employee productivity, the extent to which it increases an individual's job control and self-development and the extent to which it requires that an employee de-skill, up-skill, or re-skill, all have significant impact on the employee's wellbeing. In this context, this section explores the interface among the employee (individual characteristics) and the institutional/work characteristics in the 4IR.

SOME PREDICTED IMPACTS OF DIGITAL TECHNOLOGY ON THE WORKFORCE OVER TIME

As the rate of technological advancement continues to rise, so does the impact of the transformations that come with it. Evidently, the cost of digital technologies conversely reduces as they develop in capacity. If these transformations are well managed, they could result in a new era of decent work, decent jobs and enhanced quality of life for everyone, but if on the other hand, they are managed poorly, they will create the risk of broadening skills gaps, more inequity and wider polarization. The likelihood of

more of these technologies being acquired by organisations to perform diverse functions is high. These advancements have enabled global development of peer-to-peer (P2P) platforms like Uber, CurrencyFair, Kiva, and Gobi, which cut off the exploiting middlemen and has the potential to basically alter employment designs and arrangements to a 'gig economy' where temporary job-based employment is rampant (Horton, Cameron, Devaraj, Hanson, & Hajkowicz, 2018).

The implications of these on employees across various sectors are enormous. Workforces are contending with numerous major changes for example, prolonged use of digital technology at work and home leading to longer screen-time, end of traditional work arrangements and relationships, fear of job loss, stress arising from new learnings, and boundary blurring between work and family domains. Given the unfolding changes, the main question for employers, management, and human resources practitioners should be the extent to which the present legislation, organisational policies and systems are able to address future workplace and workforce challenges. There is a need to start thinking about plausible futures before they come to pass and plan and strategize wisely.

Some of the trends and effect of digital technology on employees are as follows;

1. **The Spread of Automated Systems and Robotics:** The probability of the costs of advanced automated technologies falling is high while their capacities and broad use will possibly be on the rise. The implication of this is that more jobs will be created and/or lost and the need to re-, up- and de-skill will respond consecutively. To de-skill, will task the psychological, social and economical factors in an employee's life. The employee in this situation will need relevant information and time to process the situation and where this is not properly handled, stress leading to ill-health could set in.
2. **Rising Issue of Workplace Stress and Mental Health Issues:** Workforce globally is recording increasing levels of stress and mental health issues. There is a possibility of workplace stress and mental health issues to be exacerbated by new and increasing use of digital technologies in the workplaces even though technology itself could also provide prospects of addressing these issues. For instance, Shigemi, Mino, Tsuda, Babazono, and Aoyama, (1997) found that male workers who could not keep up with the rate of technological advancement and those working in automated factories faced the danger of having of mental ill-health. Potential relations were found between high use of digital technology and signs of informed mental health issues among young adult tertiary institution students, although the causal paths were unclear (Thomée, Dellve, Härenstam, & Hagberg, 2010).

Mental health difficulties include anxiety, depression, and sleeping disorders and mood-swings. These have increased among the overall global population over the past few decades, but it is more prevalent among adolescents and young adults (Patel, Flisher, Hetrick, McGorry, 2007). Though the causes of mental ill-health are linked to many factors, use of digital technology has been figured as a main variable in the exposure of young people to the disorder (Thomée et al., 2010).

3. **Growing Screen Time, Inactive Behaviour and Chronic Illness:** Technological advancement and performing routine tasks on computers have increased the level of sedentary behaviours leading to physiological ill-health among both the old and young. Diseases resulting from longer time spent on the screen are on the rise and they include obesity, heart-related diseases (hypertension and heart attack), type 2 diabetes and other chronic ailments.

4. **Distorted Boundary Between Work and Family:** A large population of the global workforce, especially those from developed countries like America, United Kingdom and Australia are engaging with employment arrangements that grant them flexibility at work. Flexible work policies allow employees to work from any location outside the traditional workplace. Blurring of work-family boundary has been indicated as a predictor of work-family conflict (WFC) (Schieman, & Glavin, 2016; Allen, Johnson, Kiburz, & Shockley, 2013). Work-family conflict is a stressor that has been proven to associate significantly with wellbeing ((Kalliath, Kalliath, & Chan, 2017; Nohe, Meier, Sonntag, & Michel, 2015)

SECTION THREE

Future of Work - Deskilling, Reskilling and Upskilling

Introduction

This section examines the unclear impact of technological digitisation and automation of work processes on the cultivation of new skills by the workforce and the future of work in various sectors. Since the 20th century advancement in technology and machine automation which it brought with it, a reduction in the economic value of applied knowledge and skillsets previously acquired by machine operators, artisans, and various highly skilled workers (Braverman, 1974), while also compelling the acquisition of new skills in various engineering and professional careers. Advancement in technology has also been documented as potentially responsible for complicated patterns of *deskilling*, *reskilling*, and *upskilling*. In this section, the scholars in line with the theoretical contraption of sociological discussions over economic deskilling, highlight a dissimilar potential for technological deskilling/upskilling/reskilling, namely the ability of technological advancement and the automation of the workplace of the future to contribute to the *wellness deskilling* of human workforce, a possibility that exists together with rich but presently underrealized potentials for wellness reskilling and/or upskilling. We explore this general premise by reviewing the extant literature involving automated workplaces, new media practices, and robotics. In conclusion, we posit that since employee wellbeing is a vital requirement for employee optimal productivity and satisfaction, and since technological advancement and uncertainty about the future of work may not be currently synchronised to achieve this in the future, there is a need to pay close attention—and perhaps formulate active intervention.

The Future of Work Across Some Sectors

The future of work is not singular. It will vary along sector and industrial axis and impacted by initial situations surrounding the distribution of roles, various financial outlay for adopting new technology, access to skills and the adaptability of the employees. In this context, dissimilar experiences will accompany the structure of new functions and the characteristics of the functions that will no longer be in high demand. WEF (2018) reports that within the period 2018-2022, development in internet as accessed by smartphones and other mobile gadgets will possibly influence the Financial Services and Investment Sector, Aviation, Consumer Commerce, and Travel and Tourism sector. Consumer speedy adoption of recent technologies and the developments in cloud computing will propel fast growth in

the ICT sector, while big data availability will widely influence the Financial Services and Investors, Energy Use and Technological sectors respectively. Also, the range of need and type of sector will push the adoption of specific technologies. As reported in WEF (2018), businesses in every sector will possibly implement the use of immobile robots, as opposed to humanoid, floating or subaquatic robots. But, leading organisations in the Oil and Gas sector relatively demand similar level of immobile, floating and subaquatic robots, the Financial Services and Investment sector will most likely adopt humanoid AIs. Spreadsheet technologies will significantly influence the Financial Services sector and the Global Health and Healthcare sector, with the earlier looking very likely to be an early leader in the adoption of the technology. Risk prediction could be easily done by machine learning, thus making it a major disrupter in risk prediction and positioning this technology as an attractive tool to the banking and insurance subsectors, and consumer sector. Machine learning could lead to predictive maintenance and demand modelling in the consumer sector.

Furthermore, many industries will face disruption and changing demand structures from non-technological issues, like the consequences of ageing in the Global Health & Healthcare sector. Competences in healthcare technologies could therefore become essential innovations to address the demographic changes occurring, releasing the time usually spent in management and administrative duties for care-giving occupations (Bughin et al., 2018).

Skills gaps between the local job market are among the vastly given hinderances to suitable technology adoption for some sectors., especially among corporate leaders in the Aviation Travel & Tourism, ICT, Financial Services and Investment, and Mining and Metals sectors. Global Health & Healthcare as well as Infrastructural businesses often quote leadership skills gaps as their most notable barriers, while the Chemical, Advanced Materials and Biotechnology, and ICT sectors report extensive worldwide labour market skills deficiencies. Every sector expects substantial skills gap and reskilling of some duration. In the fore front of this is the *Aviation, Travel and Tourism; Financial Services and Investors; Chemistry, Advanced Materials and Biotechnology; and Global Health and Healthcare* industries will require some reskilling. Organisations in these sectors propose that their employees will need reskilling for periods lasting for at least one year. Most organisations believe that they will equally increase and reduce some portion of their present staff, with the increase possibly counterbalancing the reduction (WEF, 2018). However, this position seems dissimilar across diverse sectors. Mining and Metals, Consumer, and ICT industries, assume that the reduction in their workforce will rise automation, while Professional Services sector employers assume that the ongoing changes will probably lead to an increase in the number of their employees.

Deskilling

The developing technologies deeply reshaped workplace and human practices around the world; the economic, socio-cultural, environmental, political and physiological consequences of which the workforce still struggles to comprehend. Scholars and practitioners in the area of psychology, sociology, philosophy, and economics, in a bid to understand the emerging changes, conceptualised the term “deskilling” to describe the way in which the 20th century technological advancement resulted in the reduction of the value placed on hands-on knowledge and skillsets traditionally required of machine operators, technicians, and professional employees (Braverman, 1974).

Based on a Marxist consideration of skilled labour as a tool for reducing costs and improving performance and managerial hegemony (Marx, 1990), Braverman's seminal deskilling theory has been criticised considerably (Friedman, 1978). Nevertheless, technological advancement continues to generate fresh causes for worry about deskilling as the value for the core aspects of skillsets of lawyers, teachers, doctors, nurses, pharmacists, machinists, and even librarians are reduced to redundancy status (Roberts, 2010; Davis, 2008; Carey, 2007; Rinard, 1996).

The mental, socio-cultural, and economic effects of deskilling on the workforce, their dependants and communities could be overwhelming. Also, the effect on their mind and body could be arduous on their wellbeing. Still, industrial deskilling is a very disputed and severely *unclear* phenomenon (Spencer, 2000; Wood, 1987), when considering the freedom that the computer transformation offered employees charged with monotonous duties like filing, copying, and collating chances of reskilling and/or upskilling to gain employment in careers in the services and information sectors erstwhile assumed to be the prerogative of skilled and knowledgeable individuals (OECD, 2001; Gallie, 1991; Addler, 1990).

The 4IR faces its peculiar challenges with respect to technological deskilling; just like the previous (1st, 2nd, and 3rd) industrial revolutions. Developments in neurotechnology, biotechnology, nanotechnology, artificial intelligence and robotics are exerting new pressures on established professions and the skillsets that are linked with them. For example, the duties of human surgeons are likely to be further changed by their robotic counterparts. The question is, how will this impact the skills of human surgeons – make them redundant or free them to acquire new and advanced capabilities to give better care to patients? Also, will the advancement in software algorithms lead to the redundancy of skilled humans in the areas of forecasting, actuarial science, and market trading? Or will it simultaneously assist humans to both predict and better comprehend upcoming events as well as their intricate causes? Teaching is also at risk as a result of the efforts to develop automated methods for delivering instructional content, marking essays, and regulating dialogues in the classroom. If robots or humanoids are created to perform these duties, what would be the future role of a human teacher in a classroom? Will teaching become an extra role consigned to supporting robots and AIs; or would they be afforded additional time to inspire and create curricula, or give more care to the mental, growth and emotional needs of individual learners? Scholars in relevant fields are doing their best to trace and ponder on these issues and the vague potentials they create (Heisig, 2009; Ritzer, 2008).

However, this section focuses on an important facet of deskilling that has yet to be voiced in extant literature of the physiological impacts of technological advancement in the 4IR, namely, the potential in various professional and technological contexts for an automation driven deskilling to impact employees positively and/or negatively. It is negative where the human being is extracted from the workforce and not allowed to upskill or reskill and positive where the reverse is the case.

Hypothetically, the potential for deskilling in an era of massive automation is significant, and irrespective of the optimism surrounding this, deskilling is likely to present serious wellness problems in many areas of human living if the present trends persist. Where technological tools completely replace the human beings in the performance of traditional functions that humans used to do, the human employee could be said to have been deskilled. This act is costly in financial terms expressed by loss of earning expectations, cost of reskilling (where the organisation does not bear it); time and energy expended in acquiring new skills, and physiologically, stress and strain on the body.

Summarily, the idea of deskilling has declined in scholarly circles, for some reasons. Primarily, the communication (ICT) revolution has created a problem to efforts to find the simple causal connection among mechanisation of human tasks and the loss or devaluation of human skill. Advanced technology

especially computerisation have liberated most employees from comparatively low-skilled employment (OECD, 2001). In this way, upskilling and reskilling address the ambiguity in deskilling by additionally developing human skills needed for the future workplace. The secondary reason for the decline in the use of deskilling by academics is its strong association with past debates about employment, commerce, and socio-economic justice, connoting the concept as politically and ethically biased. Because of this, present day sociologists shy away from using the concept, not willing to stain their work with extreme or normative nuances; deskilling therefore lost some acceptance as an unbiased tool of scientific analysis.

In conclusion, since reskilling is required for effective performance and earning of wages, and the various costs of deskilling on an employee's finances, time, energy and health may not be in sync with the future shape of technological developments, a concerted effort by practitioners and scholars to systematically appraise these developments and possibly design active and plausible interventions in support of deskilled employees is called for.

Reskilling

There are complicated response rings among new technology, careers and skills. Technological advancement can push growth in businesses, drive job creation and increase demand for expert skills yet depose entire functions when some duties become outdated or automated. Skills gaps—between employees and amongst the management of organizations—could both hasten the trends towards automation in some cases and create hinderances to the adoption of new technologies thereby hampering business growth (WEF, 2018).

The vital reskilling of employees will displace some staff and simultaneously make available for some others, new opportunities. But exploiting the gains and diminishing the losses demands the thoughtfulness of not only the policymakers (organisational leadership), but also the rational reactions from organisations to discover the winning strategies for employees and organisational bottom line.

Employees need to develop a mindset that is alert to learning in their shifting from their traditional roles that were limited to the emerging, erstwhile unthinkable future. Lastly, organisational leadership, government and the academia need to collaborate to find ways of assisting disengaged employees to refocus their skill or reskill to acquire new capabilities, and finance sizable investment in the creation of new learners who are alert in future human resources by addressing enhancements to learning and training structures, modernising employment policies to align to the actualities of the 4IR. Extant literature presents the different effects of technological advancements leading to the automation of work processes, showcasing how jobs are designed and employees ownership (or absence thereof) of skills harmonise with recently launched technologies to influence the organisational and individual performance (Autor, David, Frank Levy & Richard Murnane, 2000).

Reskilling will avail employees with highly in-demand skills capable of being improved upon, the opportunity to earn more and work in more excellent jobs. On the other hand, employees who do not possess the requisite skills to adjust to new technologies and be promoted to more value adding roles could have their salaries and work quality repressed by technology consistently devaluing their work, as it intrudes into their roles (WEF, 2018). These categories of employees need to be augmented to be motivated, alert and armed with compact skills to exploit new opportunities in the future via constant reskilling and upskilling (Shook, & Knickrehm, 2017).

The WEF (2018) identified a major downward trend in the demand for physical skills and manual capabilities as well as a decline in the need for skills associated with managing financial resources and fundamental *installation* and *maintenance skills*. Conversely, logical thinking, creativity and innovation, dynamic learning and training strategies, technology design and programming are gaining rising prominence. Competency in emerging technologies is one side of the skills coin, while person-related skills such as social influence, hardiness, ability to solve complicated problems, and flexibility, mindfulness and attention to specifics will remain or grow in value. Leadership, networking and emotional intelligence (EI), and service inclination is experiencing enormous rise in demand compared to their present importance. Hence, organisations will have to follow various corporate strategies to remain competitive in the face of fast changing human resource skills needs. To achieve this, top management and human resource practitioners will need to transform their skills in order to successfully be in the fore front of the workplace revolution.

It is important that organisations having employees confronted with unstable skills consider the need for reskilling and upskilling, their cost on bottom line and the opportunities that could be harnessed through this approach. The time required, costs to organisation and individuals, delivery mode and success/failure cases may not be the same for categories of employee, and job functions of various organisations undertaking reskilling and upskilling. For instance, some organisations may experience awesome increase in their employee performance, retaining of talented experts, empowerment of frontline employees to maximise the use of recent technologies in performing their duties and improved worker satisfaction through reskilling and upskilling programmes.

Notably smaller sizes of businesses could see reskilling as a way of reducing hiring costs, posting workers in disrupted work functions or as a means of increasing the skills source of their middle- and lower-skilled staff. Summarily, employers have perceived reskilling as a slim approach targeted at specific subcategories of workers, not as an all-inclusive approach to propel staff transformation. Lastly, while it is incumbent on businesses to be in the fore front of creating capability within their organizations necessary to sustain their conversion to the workforce of the future, the challenges arising from the financial and societal nature of these disruptions demand that they progressively become strategic in partnering with other stakeholders to organise the massive reskilling and upskilling needs of the future. Viable partnership opportunities exist in creating alliances with academics to reform learning curricula, collaboration within and among industry players on developing skill pipelines, partnering with organised labour to stimulate cross-industry skill movement. Governmental partnership could be harnessed through the creation of incentives for lifelong education, guaranteeing of standards sharing for reskilling and consolidation of protection (security) for mobile employees (Bughin, Hazan, Lund, Dahlström, Wiesinger, & Subramaniam, 2018). Nevertheless, there is still need for additional guide and good training opportunities.

In order to avoid a situation of overwhelming and undesirable loss occasioned by technological advancement attended by skills shortage, mass job loss and escalating inequality; it is vital that organisations participate actively in assisting their current employees through reskilling, that employees personally take a pragmatically practical route towards their lifelong education, while governments quickly and innovatively provide supportive environment to help all these endeavours.

Reskilling though generally necessary, should be prioritised among employees presently executing high-value functions in order to strengthen organisation's strategic capabilities. Additionally, employees performing major and frontline duties who will be utilising new technologies in their work should be reskilled. Also, highly productive employees, employees performing duties that are mostly going to be affected by new technologies and are at risk of losing their jobs should be prioritised for reskilling.

WEF (2018) suggest that there is a need to comprehensively augment employee potentials in the face of transformation by using automation of certain roles to balance and boost human employees' relative strengths in order to empower them to exploit their full potentials on the long run. Instead of the narrow focus on cost savings through cutting labour cost, the augmentation tactic considers the bigger picture of value-creating events that could be undertaken by human employees usually in harmony to AIs, robotics and possibly humanoids, when they utilise the freedom created for them from performing routinised and monotonous duties for human-centric activities. To derive these benefits, employees need to acquire the relevant skills to enable them to succeed in the future workplace as well as the capability to reskill for as long as they are in the workforce.

The key business imperatives of vibrant organisations are to design in-house permanent training system, finance human resource development and collaborate with all stakeholders in crafting human resource essential to organisation's medium to long term development and contribute meaningfully to humanity and social stability.

Upskilling

The level of skill needed to perform work is becoming higher among industries and within distinct professions. Upskilling, both in relations to the average level of employees' education and the kinds of work that they do is required. Gallie (1991) reports that work with developed technology had connections with higher skill levels when examined with the experience employees had with changes needed in the skill to perform their jobs. Additionally, the skill changes are in the area of those needed to perform the job, instead of changes in the expertise and experience that individuals brought to the same job.

The rapid advancement in technology, among other factors including globalisation and emergence of knowledge economy has brought wide ranging argument about the need for advanced levels of skills. Although there is a growing consensus about the importance of skills as vital to economic development (OECD, 2000a) and the extension of the knowledge economy, there is a far less consensus on which capabilities and skills make the difference. Inside and outside the academia, discussions centre on the attainment of higher academic qualification in general, concentrated on the attainment of broad-based capabilities supportive of lifelong learning. From the job market opinions, a heightened attention is being given to skills such as the capacity to use *information* and *communication technology* (ICT) to address challenges, participate in teamwork, oversee and lead, and engage in continuous learning. Presently, workplace skills in the public discourse is differentiated from the regular or traditional courses given and received in schools and universities.

In the foundation of the perception that knowledge and information are the core of advancement and progress is the idea of "knowledge economy" and "knowledge worker". Hence the capability to effectively create and use information in the digital era has become the important source of skills for potential employees (OECD, 2000b). Change and advancement push the growth of the knowledge-based economy as a result of their impacts on manufacturing processes, spending patterns, and economic structures. This implies that certain transformations in the processes of advancement may not have happened without ICTs and similarly, some of the effect of ICTs may not have been perceived outside the systemic transformations (OECD, 2000c). These transformations have impacted the establishments - economy interface, making networking, synergising and the liquid flow of knowledge in and around national borders to come to prominence.

Knowledge-based organisations comprising the superior-ranking technology product manufacturers, high-and-medium-high technology factories, and those service organisations that mainly use technology such as banks and other finance institutions, insurance companies, corporations, communication, social and individual services greatly contribute to national GDP and are developing speedily (OECD, 2000d).

Indicators of Upskilling

In order to adjust and sustain effectiveness while responding to rapidly changing consumer consumption patterns and preferences in an era of technological transformation, corporations require relevant systems, skilled employees, and competent management. With the changes is a need to restructure the workforce and modify the kind of labour needed. This has highlighted the increasing human capital levels shown by the academic accomplishment and as inferred from the rising demand for more vastly educated and expertly skilled employees. The sign that upskilling is going on is indicated by a preference of more educated people in the job market, evidenced by the proportion of people with university degrees in the workforce and the variations in the distribution of their share in the overall working-age population.

The accounting profession has experienced tremendous upskilling. Empirical data shows that in the past two decades, development in the expert, technical, managerial and executive professions known as “white-collar, high-skilled jobs” has risen higher than employment in other working groups. Comprehensive analyses of hiring trends within businesses corroborate a true upskilling process (Steedman, 1998; Berman, Bound, & Machin, 1997; Machin, Ryan, & Van Reenan, 1996). Those scholars propose that work-engagement moves within organisations, rather than between organisations, and represents an actual shift towards higher skills. This is a generalised reflection of the occurrence of upskilling procedure in individual organisations in opposition to a mere shift from sectors typified by low skilled work to sectors typified by high skilled work. The evolution of ‘white-collar’, expert skilled jobs in the services and manufacturing sectors respectively showcases upskilling, rather than a mere rise in the activities of the service sector. Really, the decline in manufacturing activities in various countries has in fact raised the need for white collar, high skilled professionals in the manufacturing sector. From a different perspective, there seems to be upskilling within professions

In fact, although total manufacturing employment has decreased in most countries, it has increased for white-collar, high-skilled occupations within the sector. From another angle, there appears to be upskilling within occupations Green, Ashton, Burchell, Davies, & Felstead, 1997).

According to Osterman ((1995), jobs within careers now require higher skill levels in the United States’ workplace than they did before especially in the technological and professional careers. In addition to upskilling of the workforce in the academic and professional qualification, new and clear need for set of “workplace competencies” and “interpersonal skills” commonly identified with the emergence of ICT and recent work practices (OECD, 2001). Some of these proficiencies and skills include, basic computing skills, problem solving, critical thinking, team-working and communication (Smith, 2016; Fong, Sidhu, & Fook, 2014; Green et al., 2000). Hence, upskilling and a rising demand for various proficiencies are the main characteristics of the future workplaces ingrained in knowledge economy.

RECOMMENDATIONS

This chapter recommends that lifelong strategy to proactively identify and prepare employees whose skills will not be relevant in the future workplace be urgently crafted and adopted by organisations in every sector. There is no way to downplay the psychological effect of deskilling on affected employees. But appropriate preparation and care in displacing them should palliate the physiological and mental employees suffering. Some of the strategies include post-career counselling, financial management counselling, stress and time management trainings and mindset reorientation.

Additionally, those to be reskilled and/or upskilled should be afforded relevant timing to acquire and test the new skills through patient guidance and support. Time should be given to assist employees in planning their self, family and work relationships while they undergo the required reskilling and/or upskilling processes.

Furthermore, as it has become glaringly clear that the advent of the 4IR came with the need for lifelong reskilling and upskilling in the future workplace, organisations need to become responsive to the need to fund these. The skilling needs are expected to be costly both to the organisation (in productivity terms) and the individual employee (in terms of money, energy and time). A new scheme where individual accounts are opened for employees could be funded by an obligatory three-tier contributions being made in small amounts regularly by individual employees, employers and the state. This is because, the skill needs of the future may not be met through public funding alone, because, when the national purse faces recession and funds are no longer spent on skills development, individuals and organisations may not be willing to invest their monies on it. Creating a scheme would afford all individual employees the opportunity to access fund to meet their reskilling and/or upskilling when necessary.

Employee health and wellness programmes usually adopted to address employee health and wellness issues in the classical workplace may not be efficient in addressing these issues in the workplace of the future. Emerging stressors and ailments such as disorders associated with addiction to social media platforms, stress from reskilling and upskilling and mental health, to mention a few, need novel interventions. Human resource strategists need to collaborate with the academia, organised private sector and policy regulators to tactically design initiatives/interventions to tackle emerging stressors and ailments.

GUIDE FOR FURTHER RESEARCH

The future of work, deskilling, reskilling and upskilling in the 4IR are topical issues widely discussed among experts, professionals and policy regulators in the present times. However, there is a need to research on the extent to which the future of work is impacted by the skill needs and the levels of stress generated among employees by the need to reskill and /or upskill. Additionally, scholars should explore the effect of these new skills modification needs and how they impact on employee wellbeing and design strategies to address the emerging health issues resulting from automation and new technologies.

Reskilling and upskilling are necessary in the workplace of the future but very costly undertakings. Empirical studies to determine the ways of reducing and /or subsidising the cost of these ventures in order to exploit the benefits that accrue from the process is recommended.

CONCLUSION

The 4IR comes with it bright prospects, changes to the way things are done, changes to the way relationships forged and sustained, changes to the way goods are produced and services rendered. It comes with vision of good things. Nevertheless, to tap into this positive vision, the workforce needs to possess the suitable skills that should empower them to both work and thrive in the future workplace. They need to be enabled to continue to reskill and upskill throughout their lives. Proactive organisations should be able to craft vibrant in-house lifelong knowledge system, invest in human capital development, and massively partner with other stakeholders on human resource strategy as an important business prerogative, vital to organisations' mid- to- long-term development, for meaningful and significant contribution to people and social cohesion. Employees need an alert attitude towards learning as they transit from the monotonous traditional work practices to emerging and awe=inspiring futures. Lastly, governments, top management of organisations and the academia need to basically find ways of assisting displaced employees to refocus their skills or reskill to acquire new ones; and to devote huge financial sums for the development of a new alert mindset for learning among the employees through undertakings to improve learning and training systems, revising workforce policies to align to the actual events of the 4IR.

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Chapter 9

Appraising the Future of Employee Health and Wellness Programmes in the Fourth Industrial Revolution: Wellness Programmes

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ABSTRACT

Employee wellness is an important aspect of human resource management system that has to be considered in the various phases of industrial revolution. It should be noted that during the industrial revolutions work has been transformed from handmade methods to machines. Work productivity improved, yet at the same time the number for those required for manual labour slightly reduced. In each of the revolutions the need to maintain employees remained significant. Therefore, it becomes imperative in the 4th industrial revolution even though managed heavily by machinery and technology to continue with employee wellness for effective productivity within organisations going forward. This chapter will deal with the employee wellness as a strategy that deals with enabling employee welfare. A healthy workforce enhances employee wellness.

INTRODUCTION

In the era of rapid transformation whereby human resource is challenged by substantial changes particularly in the matters concerning jobs and workforce (Rasca, 2017), employees experience difficulties in balancing work and personal day-to-day life. Employees' inability to succeed in balancing their work

DOI: 10.4018/978-1-7998-3347-5.ch009

and family duties has resulted in an increased number of stress-related ill-health in organisations (Ethel, Ziska & Sulaiman, 2016). Globally, the well-being of workers is important for the survival and advancement of any organisation (Zheng, Zhu, Zhao & Zhang, 2015). Hence, the wellness of employees is of immense concern to all stakeholders in the workplace.

Most of the issues impacting employee health and wellness stem from the stress of balancing work and family stressors to achieve meaningful work-life balance (WLB). Though scholars have argued that WLB is a personal matter (Kim, 2014), the challenges arising from its imbalance have both personal and organisational implications. On the personal level, where there is work-life imbalance, employees manifest stress, depression, anxiety, and panic attacks, among many other physiological and psychological challenges. While on the organisational level, absenteeism, poor performance, frequent sick leave and cost of managing it, as well as other attendant costs take their own tolls on organisational outcomes. Because of these, employers have been providing employees with benefits that should help them to meet their needs.

For instance, some companies provide cover for maternity expenses incurred by their employees who have just given birth, while government organisations are compelled by law in some countries, for example South Africa (Abe, Fields & Abe, 2016), to adopt employee health and wellness programmes (EHWP) which provide strategies to address domain-related stressors. Employees tend to perform their duties and tasks well within a workplace when their needs and expectations are met. On the other hand, conflicts tend to arise when employees' needs and expectations are not met within a workplace. Research shows that conflict between family duties and work demands arises because some facets of work and family demands are irreconcilable (Adame, Caplliure & Miquel, 2016).

In the context of the foregoing, this chapter focuses on the future of work and employee health and well-being to understand whether the traditional wellness programmes adopted by organisations will still be relevant in addressing employee wellness issues in the fourth industrial revolution where the workplace is facing unprecedented and rapid transformations in new technologies.

The previous industrial revolutions came with a lot of benefits as well as challenges to the socio-economic status of the people who experienced the transformations (Rabeh-Morrar & Saeed, 2017). For example, in the first industrial revolution, Great Britain led the revolution by discovering the steam engine which transformed the communication and transportation sector, led to the creation of many jobs and facilitated the movements of people and goods from one place to another (White, 2009)

The second industrial revolution witnessed the introduction of mass production in the form of division of labour and it was powered by the discovery of electrical energy. In the early seventies, the third industrial revolution emerged with the introduction of electronics and information technology which witnessed the discovery of types of machinery that would allow production to take place with little or even without human work (Taalbi, 2019).

The fourth industrial revolution currently being experienced is built on cyber-physical production systems {Forum, 2015 #24}{Forum, 2015 #24}(Hirschi, 2018). In the fourth industrial revolution, systems are being transformed rather than specific products or services. Cyber-physical systems means combined communications, information technology, internet of things (IOT), sensor networks, and internet communication infrastructure (IP). It has also brought with it intelligent real-time processing and event management (CPUs), implanted software for logic, 3D/4D printing, artificial intelligence or advanced robotics (AI) which can perform any jobs like humans, automated operations, and management of system activities.

Thus, all these discoveries from the fourth industrial revolution put jobs at risk, because industry 4.0 will limit the demand for labour and urges new essentials for education (Prisecaru, 2016). Research shows that in the next few years some jobs will be lost to robots {2016, 2015 #24}(Forum, 2016).

EMPLOYEE HEALTH AND WELLNESS PROGRAMMES

There are a number of definitions of employee wellness. In this section wellness as opposed to well-being is deliberated upon. Wellness has at times been confused with well-being, yet well-being refers to a state of happiness of people, but wellness is interlinked to prevention and management of employee health (Global Wellness Institute, 2016). Kroll (2017) however considers wellness to be related to an employee's physical well-being which is directly linked to employee health. However, a rather broader definition of employee wellness was provided by the International Labour Organisation as "all aspects of working life, from the quality and safety of the physical environment, to how workers feel about their work, their working environment, the climate at work and work organisation" (ILO, 2018: 6). The definition by ILO is supported by Nielson, Nielson, Obonnaya, Kansala and Isaksson (2017: 104), who postulate that employee wellness relates to "the state of individuals' mental, physical, and general health, as well as their experiences of satisfaction both at work and outside of work." Employee health and wellness programmes are interventions tailored to encourage employee awareness of their individual wellness needs in order to make personal mental and bodily adjustments towards stimulating own health in a supportive work environment (Abe et al., 2016).

Healthcare and its impact on performance is expected to impact global operations everywhere in the fourth industrial revolution. The technological progress spanning the digitalisation of healthcare to social media, sensors, wearables, IoT, AI, augmented reality (AR), robotics and 3D printing as well as nanotechnology will break the healthcare systems, increase interconnectivity and transform society radically. This is well exemplified with genetic engineering, in particular the genome editing, tissue engineering, precision medicine, regenerative biology and medicine, cancer genomics and immunotherapy, optical imaging, microbiome, as well as optogenetics and brain machine interface technology. The digital technologies and AI are expected to have a transformatory impact on medicine and healthcare. Cure other than disease prevention will be offered by these technologies. This is further exemplified by the technologies of gene editing, with the potential of curing genetic diseases such as cystic fibrosis and sickle cell anaemia. Along this line is the germline editing which has the ability to help create inter-generational changes, while at the same time the ability to cure as well as control diseases with genome editing (WEF, 2019). Genome editing is one of the interesting developments that has been associated with genetic engineering, which has been noted as working wonderfully in medical applications. This in particular has been known to be able to introduce a functional gene that replaces a defective one (Clarke, Harley, Hubber, Manea, Manuelli, Read & Watt, 2018). In the process, the healthcare which enterprises are supposed to independently take care of at high prices may become more affordable and cheap for organisations or enterprises to undertake. Nonetheless, some healthcare programmes may continue being part and parcel of the enterprise healthcare and welfare programme.

One of the components of employee wellness and health programmes is that they go hand in hand with technological trends. As technology takes people to searching information on the internet, employees are equally allowed to access health information at all times. Technology also allows wellness data to be collected.

The wellness programme is also adapted to the corporate culture of the organisation. It is something different in different contexts. It is advisable to integrate the organisation's corporate with evidence-based health information. This therefore permits the understanding of a collectiveness by the entire organisation towards workplace wellness.

Examples of workplace wellness programmes include on-site fitness centres. The centres may not be of the same size; some of the organisations offer a large swimming pool, access to personal trainers as well a rock climbing wall. At times cash incentives are offered to the team and much support is given in reaching their goals.

The smoking cessation programme is one of the components of a good health and wellness programme. Smoking cigarettes does cost employers due to health-related problems associated with the habit. It has also been noted that health provision in the form of a smoking cessation programme to members of the team can be helpful. Organisations like Union Pacific offer a cessation programme on smoking, it conducts lifestyle coaching, and also offers pharmacological assistance to members. Union Pacific managed to reduce smokers from 40% in the 1990s to only 17% in 2007.

Good wellness programmes have been known to offer transit options in terms of transportation to employees. The sharing of a bike or giving public transport incentives can prove to be beneficial to the environmentalists and employees. Current employees who value this programme can easily be appealed to by this programme.

Sometimes some of the components of a wellness programme can include a paramedical service as is the case offered by Google to team members. A massage programme manager is employed by Google in the US. It is often understood that a relaxed member is calm and also feels encouraged at the workplace. One of the activities offered is yoga classes and the space for practising this is given. This is known to relieve stress as members deal with deadlines.

Healthy snacks and lunch instead of eating fast foods in 30 minutes is given by the organisations. Organisations like Bandwidth offer a fitness lunch where members can go home and have lunch or go about playing sport or going to gym for 90 minutes. Organisations like Google offer cafeterias with ready-made lunches and snacks for employees. These have even extended office delivery. The lunch offer does appeal to the team since most people eat. Communal eating encourages interaction between people, thus creating one spot for the intermingling of a diverse and large workforce.

Employee assistance programmes should be offered to all employees and this should include the 'mind component' as well. Organisations like Accenture help employees deal with issues like stress, anxiety, substance abuse and depression.. Work-related stress is therefore addressed outside the workplace with the help of guided support. It is through this kind of programme that financial support can be gained for all workers. Incentives are offered to employees for goals of wellness that they have accomplished. It's through programmes like this that organisations offer empathy in supporting their workers, resulting in employee satisfaction.

Some organisations offer after lunch naps to workers to refresh workers. Organisations like Zappos, Facebook and Assana provide nap rooms to workers to catch an afternoon rest. The flexible work schedules allow employees to refresh themselves with a nap thus renewing their energy. Productivity has been improved as a result, which has been clinically proven. This could involve a walk, extra time or even having quiet time to read. It is true that each person gets energised in different ways, so the need to vary the types of refreshment becomes necessary.

Sometimes wellness challenges are provided to the team. Progress is tracked and the employees can win a health-related prize at the end of the month. The drinking of water is encouraged and physical exercise is promoted. Wellness habits are thus encouraged.

Wellness adventures can be offered by the organisation. So far organisations like Zappos do offer subsidies for fitness, wellness reimbursements and health benefits. Wellness programmes are made optional as a way of getting people away from their desks at work. Wellness adventures are done in a fun way and therefore most people enjoy these. It is at this point that people start focusing on the fun rather than the exercise (Staff, 2019). Wellness programmes as exemplified above point out how the well-being of employees are dealt with in organisations, and in the fourth industrial revolution the modification of such programmes will depend on the informed understanding of the organisation towards needs that may impact on employee well-being in the process. It is in the process of using machines and technology that further understanding of how this impacts on employee well-being shall be unveiled, and the policy makers shall amend the present well-being programmes according to the needs. For example, if the use of machines and technology causes workers to develop certain kinds of cancers or tumours, the organisation may develop a medical policy as well as a preventative exercise for the safety of employees. So far well-being programmes can be considered as acceptable, however, additional modifications to the programmes will need to be implemented depending on the need. Therefore the health of an employee may impact the wellness they may realise. Health and wellness are thus interconnected and interrelated.(Upadhyay, 2017).

FUTURE OF WORK

There is a hushed transformation taking place in work places, whether in the factory, at the airport, at the restaurant, or even if the work involves simple things like washing clothes, taking a shower, or brushing our teeth. New opportunities are being created in different fields of work such as mental, physical and mechanical work.

The rapid transformation of technology is changing the ways we interact, work and communicate, connecting society and workers in more advanced ways and creating new opportunities. Thus, it has become common to hear individuals articulate their need to upskill themselves if they are to stay relevant for a certain job position in the modern workplace (Forum, 2017).

Additionally, research shows that there is a huge mismatch between job seekers' skills and employers' needs, and this mismatch will become even wider since the fourth industrial revolution transforms businesses and jobs at a speed faster than workers can adapt. Studies conducted by Deloitte (2018) suggest that in exactly 15 years, more than two-thirds of today's children who are less than five years old will work in entirely new jobs that didn't exist before, and the jobs that currently exist will not be based where the job seekers stay. Therefore, the future of work is uncertain and there is a need for employees to upskill or re-skill themselves. Rainie and Anderson (2017) stated that some of the skills needed in the future workplace include soft skills, technical skills, entrepreneurial skills, work readiness skills, critical thinking skills, problem-solving and decision-making skills. Klaus Schwab, the founder and executive chairman of the World Economic Forum (WEF), once said there is an uneven distribution of the working population in the world. According to WEF (2017), there is a 1.8 billion working population that is between the ages of 15 and 29, but the population and its future growth are not well distributed among countries in the world. Also, areas with huge population increases are far behind in education, which in the future will have impacts on employment readiness.

Furthermore, research predicts that by the year 2030 more than one billion youth in the world will not have the qualifications or skills demanded by the emerging global workforce, therefore it is crucial organisations start preparing tomorrow's workforce today for the fourth industrial revolution (Deloitte, 2018). Butler-Adam (2018) predicts that by the year 2020 global businesses will witness a shortage of more than 40 million workers who have a tertiary education, another 45 million workers who possess a secondary education, and surprisingly there will be a surplus of almost 95 million less-skilled workers. These shortages and surplus of workers are yet again not evenly distributed worldwide, therefore, this indicates that there is a huge mismatch of supply and demand in the world. Science skills as well as engineering skills are in short supply. Among the lacking skills are creative thinking and data analysis which are essential in most contexts, and the equipping of employees with these skills becomes something significant within the fourth industrial revolution (Bhuiya, 2020).

The following table shows the predicted demand for employees in 2020.

Table 1. Anticipated demand for employees by year 2020 compared to the anticipated demand for employees in 2030 in some countries

YEAR	2020	2030
BRAZIL	8.5 Million	40.9 Million
CANADA	700,000 – 1.1 Million	2.3 Million
CHINA	55.2 Million – 75.3 Million	24.5 Million
ITALY	2 Million	0.9 Million
SOUTH AFRICA	6.5 Million – 7.8 Million	6.2 Million – 9.2 Million

Data source: (WEF 2016)

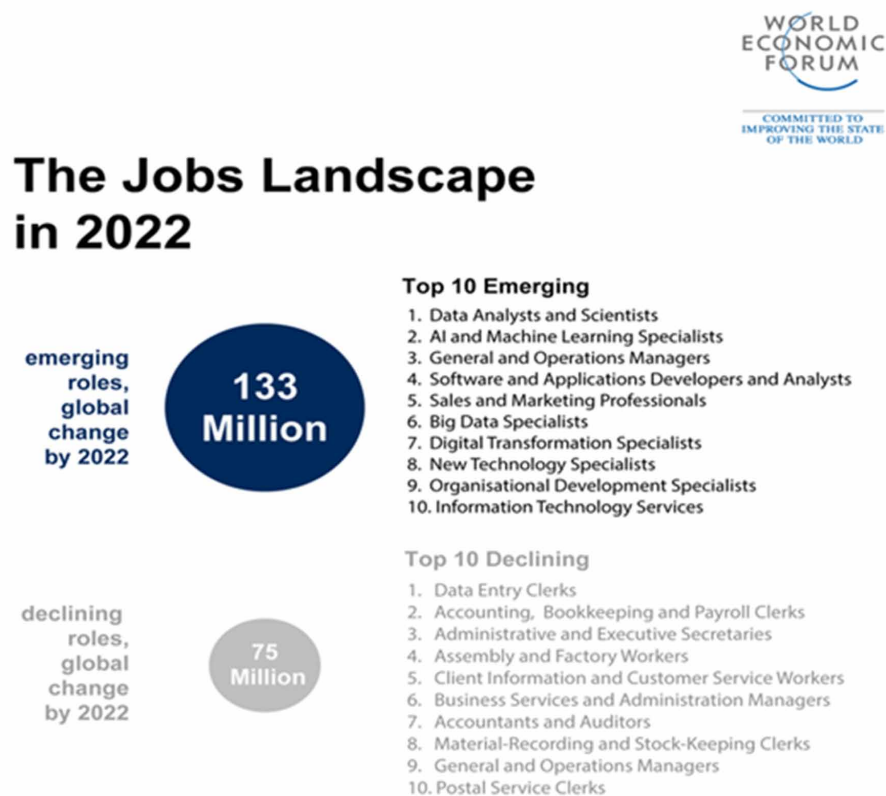
The table above points out that some countries are likely to have more jobs than others, for example Brazil is expected to have more jobs than Canada, China, Italy and South Africa in 2030 as opposed to 2020. However it can also be noted that whereas jobs shall be increasing for some countries like Brazil, Canada, and South Africa, countries like China and Italy shall be experiencing decreasing jobs in 2030 as opposed to 2020. As jobs increase in a particular context, so shall the responsibility of enterprises as they deal with employee wellness, whereas countries that shall have decreasing employee numbers may have less burden of employee wellness programmes. It is also important to denote that it is possible for countries that have less employees to have a higher burden of employee wellness depending on how they budget on the wellness programmes for their employees. Nonetheless, employee wellness as indicated may improve productivity and profitability of enterprises and this then does not only become a benefit for employees but enterprises, organisations, as well as departments, whether public or private in nature.

The fourth industrial revolution brings challenges to the supply and demand of skills in global business, even as Figure 1 points out, the nature of jobs that require different skills. It is also obvious that there will be a massive use of robots, automation, as well as sophisticated data which will make supply chain easier and smarter, and lastly, AI for decision making. Due to the changes taking place in terms of the nature of jobs and the skills demanded, traditional employment will be reshaped by these innovations and a gig-based economy gets created (Rabeh-Morrar & Saeed, 2017).

Table 1 shows countries are expected to create jobs, however in Figure 1 the kind of jobs created are specifically pointed out. The nature of wellness related to new jobs may differ and policy makers may be expected to address this for enterprise success as well as for the comfort of employees. It is also possible that as new roles get created, new health-related issues become apparent and therefore the wellness of employees will have to address these scenarios. Another predicted skills pattern by the WEF is depicted in the figure below. As to whether this skills pattern requires additional consideration regarding how the well-being of employees shall be catered for is cause for consideration. It is important to note that some skills like creativity have been useful in the past centuries and will continue to be in the future. It is true that the well-being of an employee lends credence to their ability to be creative. Wellness programmes are not the same and have different purposes as they address different issues such as stress management, massages, campaigns, portals, incentives, or corporate nutrition programmes, whereas some offer just wellness management services, as pointed out by Aldana (2020). Further study may need to be conducted to realise the level of value of each of these programmes to the enterprise or department as well as the employee in context. Since the nature of risk may well be related to the nature of jobs, as Figure 1 presents, the employee wellness programmes that address such contexts may be developed by organisations or departments. Some however tend to offer a comprehensive wellness programme.

Figure 1. The jobs landscape in 2022

Source: Haanaes (2020)



Source: Future of Jobs Report 2018, World Economic Forum

WORK/FAMILY SATISFACTION AND EMPLOYEES' WELL-BEING

Boxall and Macky (2014) defined employee well-being as a state of being happy, healthy and having all elements of a relationship-oriented person. Some studies show that there are two perspectives when attempting to define employee well-being. The first one is called *hedonism*, whereby it regards employee well-being as happiness-oriented, and the second one is called *eudemonism*, whereby it regards employee well-being as an outcome of personal achievements and the realisation of employees' potentialities and talents (Deci & Ryan, 2006). Diener, Lucas and Oishi (2002) state that individuals' realisation of their life and personal attributes is called subjective well-being (SWB) and it consists of two elements which are life satisfaction and emotional experience. In some cultures, well-being is not examined based on personal attributes, rather it is based on the society in general. For instance, in China, people take into consideration the well-being of the whole society, not just individual well-being (Zheng, Zhu, Zhao & Zhang, 2015).

In the foregoing context, Schultz, Ryan, Niemiec, Legate and Williams (2014) suggested that a healthy workforce enhances employees' well-being and increases organisational performance. Having a job and being able to work is essential for people's health and wellness, nevertheless, a healthy workforce is also advantageous to employers. Employers contribute to the wellness of the employee by creating a good, comfortable and healthy environment for employees in crafting their wellness programmes. In so doing, employees are motivated to perform well in their duties and tasks with increased morale in the workplace. Responsible employers advocate and provide initiatives to encourage their employees' achievement of work-life balance in order for them to achieve positive outcomes in the organisation (Parakandi & Behery, 2016).

Studies show that healthier employees are frequently less absent and are more encouraged to stay at work, they do not easily get sick, and if they do, they recover quicker from their sickness.

Some of the benefits of promoting employees' wellness in the workplace are as follows:

- It will improve productivity at work
- It will improve business performance
- It will boost employee morale
- It will increase employees' engagement in duties and tasks within an organisation
- It will also reduce accidents and work-related sicknesses
- It will reduce costs for the business, such as costs of sickness (medical bills, time loss, recruiting temporary staff, among many others).

Shimazu, Schaufeli, Kamiyama and Kawakami (2015) suggested that an organisation that looks after its employees is more likely to succeed. An organisation must prioritise health over work by promoting various wellness programmes in the workplace. These wellness programmes assist employees to maintain requisite physical and mental health to perform well in their duties.

BENEFITS OF WELLNESS PROGRAMMES TO EMPLOYEES

An employer can offer numerous health benefits to employees such as the provision of vaccinations to prevent some airborne diseases like colds and flu.

SOME ELEMENTS OF WELLNESS PROGRAMMES

A study conducted among professional level employees at a metropolitan municipality in South Africa categorised wellness programmes into: a) work strategies - those designed to address work-related challenges faced by employees, and b) family strategies - those that address employee family-related issues. The study found that the wellness programme adopted by the municipality was suited to address family-related issues and not work-related challenges. The study reported as follows: 1) life strategies: domestic relationship counselling, stress management, substance/alcohol abuse counselling, HIV/AIDS counselling, financial/debt counselling, and 2) work strategies: work from home on an ad hoc basis, job share, compressed workweek, telecommuting and career break (Abe, 2015: 432).

However, the following are other examples of initiatives provided through wellness programmes: flexible work arrangements, telecommuting, job share, dependant-relative care and assistance programmes, maternity and paternity leave, straight-forward financial assistance, provision of crèche services in the work environment, counselling and referral services (Bardoel, Tharenou & Moss, 1999; Kramar, 1998; Kossek, Baltes & Matthews, 2011). A number of the wellness initiatives are important but because the fourth industrial revolution shall involve the use of robots and AI, there will be need for humans to develop trust to work with machines and to relate to machines as well (Lewis, Sycara & Walker, 2018). During the fourth industrial revolution, the abovementioned needs are likely to be part and parcel of the system since they address human employees' needs. In a situation where the processes have been automated, then these needs won't be feasible as such, however, the context shall differ as such. Bardoel et al. (1999) recognised 100 kinds of work-family initiatives, showing that several different strategies have been applied within organisations as a means of addressing wellness issues.

The fourth industrial revolution may impact on employee health, and it is reported that America's factory workers' health declined by two thirds yet productivity increased dramatically from 1960 to 2014 (Min, Kim, Lee, WonJang, Kim, & Song, 2019). The use of some of the exercises for workers' health, as pointed out below, may improve a workers' health and organisational productivity as less absenteeism due to sickness is realised.

Fitness Programmes

Employers can build a private gym at the workplace or if not, companies may pay for gym expenses. Also, companies can emphasise group exercises after work such as jogging, walking, and rope jumping. Companies may also do this by establishing sports competitions within an organisation at the end of every month and reward those who win the competitions. For instance, a soccer competition, basketball tournament, swimming competition, a volleyball tournament, etc.

Mental Health Programmes

Mental health is very important to both employers and employees, as stress can trigger various health problems that are serious like heart diseases and diabetes. Companies should establish mental health programmes to reduce depression and anxiety which is common with employees. Mental health programmes like yoga classes and full-body massages will help to reduce stress among employees. Also, companies may encourage employees to leave at a reasonable closing time and not stay behind trying to

finish their work. This will improve their mental health and increase productivity. The main cause for withdrawal at work, early retirement, and resignation has been associated to poor mental health (McDaid & Park, 2011).

Social Programmes

Companies should consider offering employees programmes that will help them to get to know each other. These programmes may be conducted far from office environments, for instance, companies may establish a movie night for all employees on the last Friday of each month. Also, a company may organise a night party for all employees to attend. In the process employees get the benefit of first becoming part of a community activity as well as getting to relate with those they would not have related with in the first place.

Community Service Programmes

Some people feel good when they do something great for the community. A company may encourage employees to give back to the community by organising a volunteer day for employees to participate in helping out in the community. For instance, participating in general cleanliness, planting trees or organising a fundraising event that will help to generate funds to solve a certain problem within a community.

GLOBAL TRENDS WHICH WILL ENHANCE AND CREATE WORK/ FAMILY SATISFACTION AND EMPLOYEE WELL-BEING

Various studies have shown that job satisfaction has several benefits. A satisfied employee is more productive, more efficient in his/her work, and performs well, and therefore, improves the firm's profitability (Andrade, Westover & Kupka, 2019) and vice versa. The rapid change of technologies has brought about dramatic shifts like work, quality of work, and job satisfaction.

Job satisfaction has different definitions; various authors define job satisfaction in different ways. According to Azeem and Akhtar (2014), job satisfaction is a situation whereby people describe what and how they feel about their job in various aspects; it's about how people like or dislike the job they are in. Another definition is by Fiksenbaum (2013) who defined job satisfaction as a combination of good and bad feelings an employee has regarding his/her work. Job satisfaction is whereby employees' expectations match with their job rewards. It's where employees feel a sense of achievement in their work.

Findings have shown that the traditional schedule of working from 9am to 5pm creates family conflicts and leads to most employees feeling unsatisfied in their jobs. This compressed work schedule is associated with a decrease in morale and productivity (Honigman, 2017). The traditional working schedule is characterised by strict boundaries that limit employees; it doesn't give employees freedom and flexibility. In this schedule, employees are expected to engage in matters in their own time, therefore, it will lead to work-family conflict and less productivity at work.

WORK-LIFE BALANCE

Work-family balance is a situation whereby an individual is satisfied in his/her area of work and at home with a minimum level of conflicts (Parakandi & Behery, 2016). It is an equilibrium between the amount of time an employee spends at work and time devoted to the family and other personal responsibilities (Greenhaus, Karen & Jason, 2003). Work-life balance enables one to gain freedom on a personal level and also experience liberty from their input at work (Byrne, 2005). Work-life balance is necessary in reducing stress and burn out. It is also noted that chronic stress is one of the issues that workplaces tend to have (Kholi, 2018). Therefore the need for work-life balance is an initiative that management needs to ensure exists in the workplace. It is also important to note that as time passes by the demands that need to be considered will definitely differ according to each organisation's context. The organisations definitely will acknowledge the value of enabling their employees to gain a work-life balance as a result. Fredrick (2019) points out 12 examples of work-life balance initiatives that may be valuable for an individual:

- One such example is in the area where policy makers give flexible leave policies in organisations. So instead of limiting particular time off as leave days, they rather consider it as 'paid time off'. This may be an incentive in the fourth industrial revolution as people get more refreshed by getting time away from work. This then could lead to creative abilities that are more heightened as a result.
- Another exemplary initiative that organisations have undertaken is the art of creating an opportunity where employees engage with the community. This has been known to strengthen the team. Indeed one of the things that is necessary in the fourth industrial revolution is corporate social responsibility, since there will be connectivity developed between various sectors and the enterprise.
- The other exemplary activity that some organisations have adapted is the creation of a healthy work environment. It is in the process that organisations not only offer snacks in the workplace but also give employees freedom to choose how they want to arrange the way they sit at work. This freedom is likely to be more prevalent in the fourth industrial revolution as organisations give liberty to workers to even choose a place where they will work.
- Some organisations have also trained their managers to help without necessarily being called. For example they may notice signs of burn out and so they will reach out and help employees. This aspect may not be easy to understand, and whether in the fourth industrial revolution it shall be handled fully given that some of the tasks shall be delegated to machines in the process. This may then mean that humans may receive little attention and could easily feel neglected as a result. This could also cause situations where stress builds up in the process for human workers.
- Another example of a work-life balance practice is when flexible scheduling is arranged. This may be slightly different from the routine 8am to 4pm job. However, this is where organisations, departments and entities will give freedom to the employee to finish the task according to the time they can finish it after considering any limitation when it is due.
- One of the examples of a work-life balance is when the organisation is a family friendly environment for employees. In the achievement of this some organisations offer sponsored child care or after school programmes.
- In achieving a work-life balance some organisations end up applying change management techniques. In this case leaders at work are trained how to support their workers during change.

- Another example of work-life balance is when organisations end up offering creative incentives to employees. Offering tangible benefits to the team can boost the morale of employees in the process.
- Another work-life balance example is when employees are given time to nurture their own creativity.
- Providing educational support is one of the ways a work-life balance can be created or enabled to exist. As learning is encouraged, so might productivity be encouraged in the process. In the fourth industrial revolution productivity levels will be heightened and therefore this could be an initiative necessary for the achievement of the goal.
- Creating a fun committee is also necessary for a work-life balance to be achieved. It provides a moment of relaxation in the process.
- Finally it is important to involve the employees in team building exercises. Teamwork strengthens teams and fosters creativity which is a necessary element in the fourth industrial revolution and can boost the company's image in the process.

An individual can meet work and family duties as well as personal responsibilities. Work-life balance involves issues like flexible working time, maternity leave, sickness leave, and parental leave, and time off for dependents. These definitions imply there is a need to establish a good combination between these two issues.

Work-life balance plays an important role in realising employees' performance as well as organisational performance.

The advantages of work-life balance are:

- Reduced turnover in the company
- Improved employee performance
- Bringing about job satisfaction
- Encouraging employees to have an effective commitment to their company, hence creating a sense of loyalty to the company.

THEORETICAL FRAMEWORK

One of the theories used in the area of well-being of employees is the Person-Environment Fit Theory (Caplan, 1987). The theory relates to the employee's well-being, behaviour and how these match the working environment. It is therefore about an individual and how the environmental characteristics match. A person's characteristics would include the psychological and biological needs. It is therefore important to note that goals, abilities, personality, value, and needs form the characteristics being pointed out here. While the environmental characteristics do include the extrinsic and intrinsic rewards, the role of the job and the rewards of the job, characteristics of other individuals, collectives in a person's social environment, as well as value and culture help form the integration of the environment. As organisations and enterprises enter the fourth industrial revolution alongside public departments the environment created around the fourth industrial revolution it is likely to dictate the nature of well-being of employees as employees are likely to have lots of work to produce. This work shall be done with technological assistance yet the pressure and need to relax is yet to be revealed as the fourth industrial environment is yet to

be studied and understood in its context. Nonetheless, the understanding that organisations, enterprises or public entities may want to accomplish a lot may indicate that pressure to accomplish these tasks, as much as they may be automated this may either positively or negatively impact on the well-being of the employees. It is perhaps too early to give a picture of the environment that shall be available within the fourth industrial revolution. This theory fits in as it deals with environment as well as the individual that is working. In this case the individual can be the employee or worker and the environment can be the work environment involving the use of technology and machinery in enabling productivity to become efficient and productive. The Person-Environment Fit Theory points out the rewards of the job as being part of the environment and therefore in considering the new environment organisations may motivate employees by paying closer attention to their well-being.

Another theory that is useful to deliberate in this chapter is the Conservation of Resources (COR) Theory (Hobfoll, 2001; Hobfoll & Lilly, 1993). The COR Theory is another important theory that places greater emphasis on resources that need to be preserved in the process. These resources can include income. It is true that as technology tends to replace workforce through modifications, thus developed, human employees will have to attain new skills in the process, however in the meantime there can be stress experienced. The loss of income in the case that jobs are lost becomes a crucial concern for those that are affected and as such stress is likely to be encountered. The fourth industrial revolution has untold benefits as well as untold impact that will require detailed study as the revolution unfolds. Nonetheless, the understanding of the fact that stress is one of the issues to be dealt with in the workforce remains to be dealt with, and whether it will be eliminated with the fourth industrial revolution. The two theories pointed out above are related to the well-being of employees or workers as such.

CONCLUSIONS AND RECOMMENDATIONS

Investigating the future of work, work-life balance, and employee wellness is an important task which attracts further investigation of the topic. Promoting wellness programmes in the workplace, encouraging flexibility in work in terms of time flexibility and place flexibility will help in improving work-life balance, achieving job satisfaction, and increasing performance, which will result in the lowering of company's turnover hence increase the company's profitability. In this discussion, the researchers have explained the importance of all these aspects for employees' well-being and the company's future performance. Therefore, a conclusion can be made that work-life balance and job satisfaction are important for the company to generate commitment among its employees. It is concluded that a healthy workforce enhances employee wellness (Haar, Russo, Suñe & Ollier-Malaterre, 2014). Therefore, management support is very crucial within an organisation regarding work-family balance initiatives. Also, globalisation and the fourth industrial revolution alerts for immediate measures to be taken to promote workplace flexibility. These call for companies to change the traditional working schedule and adhere to the demands of this era of rapid transformation of technology. This chapter recommends companies to modify their physical and organisational structure and they should target all employees and not only high ranking individuals or executives. It is important for any organisation such as government, NGOs, small-medium enterprises, and big companies to understand the importance of work-life balance and job satisfaction for the future development of these organisations. Research needs to be conducted in investigating not only employees' well-being but also the sustainability of the amount of working experienced by individuals.

Therefore, this study provides a road map for further researches and for organisations to consider the importance of job and life satisfaction of their employees for better organisational and personal results.

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Chapter 10

Fourth Industrial Revolution, Accounting Profession Well- Being, and Environmental Well-Being in South Africa

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ABSTRACT

Industry 4.0 centers on the connection of physical and cyber networks to allow actionable insights and real-time information flow such that the well-being of the creatures, workplace, and the environment is guaranteed. Plastic pollution has been a major menace in South Africa and the proposed ban has not been implemented by the government. With the current measures of reducing the pollution, it was evident that the use of fourth industrial revolution has not been effective. Thus, it was recommended that government should enforce labelling of very single-use plastic and an associated fine should be attached to every single-use plastic found polluting the environment. It should be made mandatory for all management accountants to include cost for plastic pollution as one of the operating costs of each organisation. Also, it is recommended that robots can be erected around the cities, towns and workplace picking plastic waste. This will show the seriousness of the government to combat the single use plastic pollution and automatically curb the littering of the environment with plastics.

INTRODUCTION

The Fourth Industrial Revolution (4IR) brought to the accounting profession the Internet of Things (IoTs), automation, and artificial intelligence (AI), all of which must be greatly embraced in order to be persistently relevant as change is inevitable (Sutherland, 2020). Professional accountants play a critical role in providing professional judgement. For this judgement to be sound to stakeholders and clients, confidence in the implementation and reporting of principle-based standards are important. Accountants must be ready to serve their client by restoring and upholding the public's trust through their competen-

DOI: 10.4018/978-1-7998-3347-5.ch010

cies, hence the need to adjust accordingly. The 4IR has brought inevitable changes and expectedly, for the next one-decade, massive changes will be felt in finance and business landscapes. There is therefore the need for incessant professional development programmes and competence frameworks to ensure accountants fit in. As the main goal of accountants is to serve business, clients and societies with accuracy and integrity, hence there is the need to advance skills and update competencies in order to stay ahead.

The role of accounting cannot be overemphasised, and there is a call for the need to integrate with the digital world to keep significant (Jackson & Meek, 2020). It is pertinent to say accounting information revolves around most of the enterprises' information systems, and it is utilised by the specialists of the administrative apparatus for economic analyses, planning, the compilation of various forms of reporting and auditing. It is worthy to note that accounting controls the target performance during the reporting period and provides information required to plan and forecast economic development. In fact, economic analysis is built on accounting data and reveals the need for managers to examine the reasons for any deviations from their plans. The reserves required for the improvement of efficiency in business activities and the check for legislative regulations that will enhance business relationships are identified and emphasised using accounting data (Turner, Weickgenannt, & Copeland, 2020). Further to this, overseeing economic development, environmental stability and statistical generalisations in a country require accounting data to be able to make reasonable decisions.

Based on all these roles, it is important to stress that the majority of companies have information systems that entail accounting information which centres on the receipt and utilisation of material and financial resources in accordance with the requests of users, both external and internal. These users have unique interests which accountants must endeavour to satisfy notwithstanding the changes in the digital world. Nevertheless, the immense development in information technology and the impact of 4IR have not displaced accountants (environmental management accountants inclusive). Despite the proposed ways of combating plastic pollution, it was discovered that the 4IR was not really taken into consideration and there are other measures that can be put in place. With the perpetual menace of plastic, it is high time the 4IR is taken into consideration to complement and fortify the present measures that are put in place. Hence, this book chapter will elucidate further on the impact of the 4IR on the environment of accounting in terms of plastic pollution control in South Africa and the well-being of accountants generally in this regard. This is the core area of attention now as the world is tending towards going green.

ACCOUNTING PROFESSION WELL-BEING IN THE ERA OF INDUSTRY 4.0

Presently in the accounting sector, software and human-beings work together. The accounting profession is advancing using AI, machine learning and robotics. To be able to cope extensively, it is required of accountants to be more adaptive and advance their skills to retain stride with the mechanism. AI, machine learning and robotics are known to be free from human error and have advanced processing power, which has overridden the traditional accounting job. Notwithstanding, the demand for skilled and high-quality accountants are on the rise even though technological stands are swapping accounting jobs. It is worthy to note that AI generally aids professionals to learn, reflect and perform better. Despite the job insecurity risks posed by technological revolution, its numerous effects in accounting and in the finance sector cannot be overemphasised. According to a report by The Boston Consulting Group (BCG) in 2015, a prediction was made of a one-third job elimination by 2025 as a result of the evolution of smart

technologies (Sirkin, Zinser & Rose, 2015). Also, in 2018 a report from PricewaterhouseCoopers (PWC) analysed tasks involved in over 20,000 current jobs across twenty-nine (29) countries to evaluate the probable risk of computerisation over the next twenty (20) years (Hawksworth, Berriman & Goel, 2018).

In the same manner, in a report made in 2017 by Marc Staut of Boomer Consulting Inc, it was affirmed that machine learning and AI will absorb many of the accounting profession's duties. It was succinctly mentioned that bookkeepers, tax accountants and auditors are among the top professionals whose work will be computerised (Dominic, 2017). In fact, this automation has started affecting the hiring practice of some firms such as Ernst & Young, UK. Their chairman and managing partner for the UK and Ireland, Steve Varley, mentioned how the increased computerisation has prompted the Big Four firm to restructure their hiring practice (Harriet, 2016). Consequently, computerisation will lead to job losses for reiterating activities in the accounting profession such as transaction calculation, reconciliation and verification. Service renders such as bookkeepers, tax preparers and other accounting professionals are therefore at the risk of extinction, but digitisation and training are ongoing to keep accountants up to date.

WAYS THE FOURTH INDUSTRIAL REVOLUTION IS IMPACTING THE ACCOUNTING PROFESSION

Recently, the role of the accountant is varying. The industrial revolution has come to remove the slow and manual processes of the past which greatly impacts on the ability of the accountant to create more values for their organisations and businesses. The effect of cloud technology has been beneficial to organisations' performance by lowering the infrastructure support costs which is the higher proportion of organisations' operating costs. In terms of efficiency, Industry 4.0 creates room for greater analysis of business drivers which has granted businesses higher competitive advantage. Industry 4.0 has prompted accountants to venture into strategic business partners from being mere bookkeepers and stewardship account providers. Creative thinking has increased while monotonous and dogmatic process-driven roles have decreased significantly. Generally, accountants have accepted the inevitable wave of technology. Even though many people find the daily routines so chaotic, most accountants who know that this change is the key driver of growth and uniqueness have embraced the change, while some customers still require sensitisation that technological know-how is the way forward.

It is pertinent to say that opportunities always accompany change. Among many other opportunities Industry 4.0 has brought to the accounting profession, it is worthy to note that via technological advancement, accountants now create value, reveal how the value is created and expose how value is preserved compared to the sole focus on cost which was the main duty of the past. Nowadays, accountants can individually use software-as-a-service (SAAS) technology because it is hosted on the cloud. In terms of the operational efficiency, the operating cost has been greatly minimised because Industry 4.0 comes with lower infrastructure costs and set-up costs. Also, there is a great improvement in the speed of implementation with limited continuous updates. However, technology is challenging the accounting sector. As accountants can work faster, the volume of the work to be done has increased because nothing can be left undone. Hence, there is the need for accountants to invest more in technology. There is a deep tie between technology and growth of business. The value technology brings applies to staff and clients of the organisation. Technology balances the mix of cost, resources and time because its effect will be felt when optimum output is generated from employing it.

According to Appelbaum and Nehmer (2020), cloud technology has become a game-changer for accountants because of the possibility of mobile and remote working. With the current pandemic, COVID-19, accountants can work efficiently from anywhere in real time and without any delay or obstacles because of the advent of cloud technology. This has greatly changed business atmosphere and has saved businesses from interrupted profit generation. Cloud technology does however have its own challenges to overcome, for instance, security, training and trust, and there is the need for proper protection of accounting data, software and hardware. Also, human effort and input is also required in technology. These people must be well trained on how to make the best use of technology. The assimilation skill of people differs, and time is crucial. Adequate support must be given to staff to try it out without any fear of failure. In terms of trust, users of technology build trust as they use it. The staff must be cognisant of the User Acceptance Testing (UAT).

In all, the future of accounting is varied, wide-ranging and optimistic. AI and machine learning constitute part of the future for accountancy. Because of the technological involvement in the accounting process, there are no challenges for accuracy. Qualified and well-trained accountants are still needed to vet any figures produced by automation. Since this revolution cannot be overlooked or avoided, accountants should stand back and think very cautiously about their aims around technology so they can catch up with this transformation, get qualified and well-trained to be ever relevant.

The three most relevant skills required by professional accountants to succeed in the era of Industry 4.0 are critical thinking, intricate problem-solving and creativity. As a result of 4IR, there is no distress that machines will substitute the role of the professional accountant because accountants will use technology. Nowadays, accountants are strategic and future planners and no longer problem solvers (Kruskopf et al., 2019). Thus, to keep up with this unavoidable evolution to a digital world, the road map is based on three focus areas: Transformation, Optimisation and Diversification.

ENVIRONMENTAL WELL-BEING, ENVIRONMENTAL ACCOUNTING AND THE FOURTH INDUSTRIAL REVOLUTION

Environmental accounting has some identified problems which relay the two interrelated components of environmental accounting: internal management accounting (environmental management accounting) and external environmental accounting (Schaltegger, Hahn, & Burritt, 2000). While external environmental accounting delivers environmental accounting information to external stakeholders, the internal management accounting provides sustenance for internal managers' decisions. According to Kokubu and Kitada (2015), inaccessibility and poor quality of data, introduction of infrastructure for information gathering and sharing in supply chains, and changes in information collected by existent management control systems have been a problem to environmental management accounting. This is due to the fact that environmental management accounting requires data to be gathered to detect win-win situations in organisations where both environmental and economic performance can be enhanced (Burritt, Hahn, & Schaltegger, 2002). The 4IR might be used to improve both environmental well-being, environmental management accounting and external environmental accounting if extensive digitisation occurs in the Industry 4.0 revolution.

THE MENACE OF PLASTIC POLLUTION IN SOUTH AFRICA

Over the years, more than 300 million tonnes of plastic is manufactured globally with half being used only once and then disposed of. According to a report in African Development Bank Group report 2018, plastic makes our modern lives convenient and easy but plastic waste poses a significant challenge across Africa (Babayemi, Nnorom, Osibanjo, & Weber, 2019). This situation is compounded by the way it is disposed of, even though it provides an opportunity for radical thinking which is contributing towards the achievement of Vision 2063 for sustainable socio-economic transformation and sustainable development goals. Based on the great challenge posed by plastic waste, most African countries, South Africa inclusive have enacted laws to ban the production, use and importation of single use plastic (Godfrey, 2019). In South Africa, the use of plastics and plastic packaging is very rife - especially from retail stores as carry bags for purchase which also ends up as unrecyclable waste at landfill sites resulting in pollution of the marine environment. According to the report of World-Wide Fund for Nature, an average of 30kg and 50kg of plastic per person is used by South Africans annually.

South Africa is aggressively involved in battling environmental pollution and has not been reluctant to approve some global initiatives to enhance environmental sustainability, including those addressing plastic pollution (Nhamo, Nhemachena, & Nhamo, 2019). As a result, the South African Department of Environmental Affairs (DEA) launched several control measures to reduce pollution caused by inappropriate disposal of plastic waste. Moreover, the Association of Plastic Industry in South Africa (PlasticsSA) is uniting in efforts at collaborating with the retail sector, which is the major source of plastic users, to lessen its usage as carry bags to reduce the effect of plastic waste pollution. This is to ensure that environmental threat arising from the inappropriate disposal of plastic on human, animal and marine lives is mitigated. In line with this collaboration, Plastics SA has recently demonstrated a concerted effort to find a sustainable solution to reduce the littering of improperly disposed plastic in the environment. One of these efforts is the launch of some projects in six key areas (education, research, plastic recycling, public policy, plastic pellet restraint and sharing best practices) by Plastics SA to combat this environmental and societal menace. This will inadvertently increase the operation costs of Plastics SA which can make them operationally inefficient albeit they are making profit. Specifically, South Africa has about 210 plastic recycling companies with an average of 5 000 employees which has led to a lower price of recovered plastic material due to the high running cost (Arabi & Nahman, 2020).

Additionally, the SA retail sector is making efforts to reduce single-use plastics as plastic, shopping bags ranked first among the top ten plastic pollutants in South Africa, and the others are the commodities being sold by the retailers. For instance, in 2013, the Shoprite Group announced that plastic bags in Checkers retail stores were 100% recycled, thereby diverting 2 100 tons of plastic waste from landfills. On the other hand, the Woolworths retail group announced that by 2020, it would phase out single-use plastic shopping bags and by 2022, plastic straws and cutlery will be fully replaced with a more environmentally friendly product. Moreover, the Pick n Pay retail group launched the “Make Plastic Bags Extinct” campaign in 2008 and boasts that all packaging in its PnP Green range is fully recyclable. In the same vein, the Spar retail group in the Eastern Cape announced its intention to abandon plastic bags in favour of paper bags.

In other to reduce this plastic pollution, South Africans have stuck to plastic recycling to an estimate of 41.8%. Nonetheless, the growing plastic pollution challenge is a clear indication that despite the embracement of Industry 4.0 in South Africa, it has not been able to achieve the necessary environmental sustainability, nor been capable to sustain the drive from earlier struggles against plastic pollution. This

has led to much pressure on the total ban or production reduction of plastic in the country as it is alarming that the plastic menace in the Republic is still alarming. Is the proposed ban the way forward or would intensifying on the effort of Industry 4.0 curb the menace?

MAJOR CONCERNS ABOUT PLASTIC POLLUTION

Akachukwu, Arimoro, and Keke (2019) define pollution as something that could be liquid or solid. It may also be some sort of energy in the environment. The name ‘plastic’ comes from the way plastic is shaped, and structured raw materials are collected then chemically made to form a macromolecular structure that creates the plastic component in the end (Boucher, Dubois, Kounina, & Puydarrieux, 2019). Well-known plastics that are produced globally are Polyethylene (PE), polypropylene (PP) and polystyrene (PS)(Prata et al., 2019). Watkins et al. (2017) state that little pieces of plastic are called “micro-plastics” and their size is less than 5mm which can be seen on land, in the sea, or lakes. They become micro because of the plastic being exposed to sunlight or water which then breaks the plastic down into little pieces. Some of these micro-plastics cannot be seen with the naked eye (visible under microscope) and can also be swallowed easily without even being noticed (Letcher, 2020). According to Merino et al. (2018), the planet is mostly covered with plastics and it is littered the most compared to other items. This should trigger people to be mindful, start looking after the environment they live in and consider a friendly living condition for other species.

According to Syberg, Hansen, Christensen, and Khan (2018), a lot of people know how to use plastic because most things that we do at home or anywhere, depend on plastic usage. In addition, plastic pollution gives people an impression that the problem is becoming severe and this brings a significant risk to the lives of humans and animals. We cannot run away from the truth that in these present days, almost the entire world is faced with the problem of plastic pollution. Turpie, Letley, Ng’oma, and Moore (2019) highlight that every year, over 300 million tonnes of wasted plastic is made and that would equate to a human population weight. Nowadays, even the production of plastic has increased from previous years. Giesler (2018) agrees that plastic pollution is a problem; it takes many years to decompose because it first needs to break down into smaller pieces (micro-plastics) for it to fully decompose. It is quite evident that we should lower the percentage of plastic pollution on land and in water (sea and rivers). Vegter et al. (2014) state that if there are ways to address the pollution issue and there are non-prohibitive expenses to curb the situation, it would be a great cause to try to solve the problem while we can still avoid it.

Similarly, Wagner, Lambert, and Lambert (2018) agree that there is an estimated four times more plastic pollution on land than in the ocean (aquatic pollution). This shows that the aggregate number of economic impacts of plastic pollution is bigger in actual reality and the plastic industry is producing more and more plastic compared to previous years. Prata et al. (2019) argue that it sounds undo-able to have plastic removed from the environment because of all the different plastic pieces and dissimilar sizes. Reddy, Reddy, Subbaiah, and Subbaiah (2014) agree about the build-up of plastics - the fact that it really contributes to human or wildlife endangerment, and this effect can even result in death if taken internally by humans or animals when drinking polluted water. The government has now become concerned about this issue. “Africa has not yet reached the plastic consumption rates of the developed world. However, if substantial changes are not made now, waste pollution will increase by over 50% within the next 10 years and Africa will be the world’s fastest-growing region for solid waste generation by 2050”

(Turpie et al., 2019). Turpie et al. (2019) explain further that the amount of waste collected equates to an approximation of 42%, and a contribution of 4% is given by municipalities that recycle waste.

DANGERS OF PLASTIC POLLUTION

DG (2011) posits that the effects of plastic pollution are mostly documented on the sea environment and less on land effects. According to Merino et al. (2018), plastic pollution can have a direct impact on people's lives. This is due to the kind of food they eat and what they drink, and the packaging these come in. Ninety three percent of bottled water sourced from dissimilar brands from nine countries is found to be contaminated with micro-plastics (Dauvergne, 2018). Ochoa-Gutiérrez and Mueses (2014) state that some of the fish caught from the sea that humans eat are contaminated with chemicals. The chemicals are found in micro- and nano-plastics ingested by fish which are known to be toxic. No matter how much you try to clean the fish before consuming it, it would still be contaminated, but the level of how much contamination there is would be entirely dependent on the food (Boucher et al., 2019).

Dauvergne (2018) reports that chemicals humans are exposed to can result in heart disease, birth defects, cancer and pregnancy complications. Alabi, Ologbonjaye, Awosolu, and Alalade (2019) mention that combustion is another problem faced by humans through plastic pollution. Combustion is caused by fumes that spread out into the air and which human beings inhale. A detrimental effect may be caused when these fumes are taken in by humans or living species. Pollution of plastics in the air, sea and on land can also have an impact on tourism. As a tourist, you would want to enjoy your time in a clean environment, and beaches are mainly places tourists like to visit. Therefore, cleanliness of beaches will always be a sensitive issue concerning tourism attraction because this also affects the economy (Turpie et al., 2019).

WAYS TO COMBAT PLASTIC POLLUTION

Dauvergne (2018) reports on measures that can be undertaken to decrease the amount of pollution. Some of the ways that were highlighted are to reinforce initiatives that have been put in place previously such as the ban of using plastics once and the improvement of the entire country's waste management plans. According to Prata et al. (2019), education is still the most powerful weapon to reduce the unpleasant sight and effects of plastic pollution. By creating awareness about plastic pollution, it could lead to a possible reduction in consumption of dangerous products by humans (Alabi et al., 2019). Turpie et al. (2019) agree there is a need to have educational programmes, workshops and distribution of pamphlets that clearly show the negative impacts of plastic pollution. In addition, social media plays a huge role in getting messages across and having this platform to voice out this awareness would assist to lower the level of pollution. In the same manner, Gionfra, Richer, and Watkins (2020) highlight that having market-based instruments like taxes and charges encourages people to decrease the use of some types of products or materials used. Avery-Gomm, Walker, Mallory, and Provencher (2019) suggest a less costly method to reduce waste contamination and believe that source collection would be the right starting point. This can be done by making door to door visits to collect waste (up to the collector whether to claim waste collection fees or not).

Raab-Obermayr, Kossik, Gastermann, and Stopper (2017) report that waste disposal can be managed according to the levels which waste is divided into (reduce, reuse, recycle and remove). But the implementation process can be very slow and the cost for these management waste systems is highly expensive. Therefore, due to complexity of systems, some countries won't be able to succeed in getting the intended result of this sooner. Trying not to purchase plastic bags when shopping and using your own carrier bag is one way to reduce the amount of plastic being disposed. In addition, people should also try to use metal utensils instead of plastic ones in their households (Ochoa-Gutiérrez & Mueses, 2014). The reuse of plastic for consumption is encouraged to lessen the amount of plastic being bought or used. So instead of purchasing new plastic bags to carry groceries or other items, use the old bags previously bought (Merino et al., 2018). The recycling method is most effective in reducing plastic waste. According to Turpie et al. (2019), recycling was the very first solution to decrease the rise of plastic waste. However, the need to reuse or reduce the consumption cannot be replaced by recycling. Furthermore, recycling helps in various ways such as improving the environment we live in, reduction of pollutant emissions, saving of energy and resources and most importantly it creates job opportunities. Another way to reduce plastic pollution is by removing it from the environment, but this would require support in resources and volunteers for clean-ups (Raab-Obermayr et al., 2017).

CONCLUSION

This book chapter examined the accounting profession and environmental well-being in the era of Industry 4.0.

It is therefore recommended that:

1. There can be built in robots all around town to pick up plastic waste. By doing this, human beings will see the seriousness of the matter and will refrain from polluting the environment with plastics.
2. Outright ban is another option, but the economic effect on the plastic production companies also cannot be overemphasised as they also contribute to the economic growth of the nation.
3. The government should make it mandatory to label every single-use plastic either for packaging or not.
4. Management accountants should ensure that they enforce every organisation to allocate some of their operational costs to cater for plastic waste reduction. This will make it mandatory for the organisations and human beings to minimise the use of single-use plastic and find an alternative or a way of sensitising the end-users not to pollute with plastic. Automatically, a clean environment which will guarantee the well-being of humans is guaranteed.

SUGGESTION FOR FURTHER RESEARCH

It is therefore suggested that would-be researchers should examine the economic effect of the outright ban of single-use plastic in South Africa on the well-being of the single-use plastic manufacturing companies and the economy generally.

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Chapter 11

Changing Skills and Attendant Stressors Appraising the Efficacy of Traditional Wellness Programmes in the 4IR: Skills Development

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ABSTRACT

The need for pertinent skills is invaluable in every industrial evolution and will not be any different for the fourth industrial revolution. Appropriate employee wellness programmes will enable an increase in the potential of employees to develop the required skills necessary for the fourth industrial revolution. The fourth industrial revolution is having the blurring line effect between the physical, digital, and biological spheres characterised by systems, scope, and velocity. This chapter shall address the need of changing skills and its relevance to the fourth industrial revolution, employee effectiveness, and efficiency. The fourth industrial revolution requires employees to be multi skilled rather than being specialist skilled.

INTRODUCTION

This chapter deliberates on the impact of the fourth industrial revolution on skills which change as a result. Topics discussed in the chapter include the fourth industrial revolution and its impact on developed and third world countries, skill trends, an attendant stressor - job insecurity, the ways to develop skills, wellness and the fourth industrial revolution, followed by recommendations and conclusions.

DOI: 10.4018/978-1-7998-3347-5.ch011

In deliberating the skills and attendant stressors in relation to the fourth industrial revolution, it should be noted that the fourth industrial revolution does embrace changes that are fundamental to the way we live, relate with each other, as well as work. It has been considered as a human centred future that is inclusive. The need is created for all to go beyond technological perception but to see how to grant a number of people an ability (skill) in positively impacting communities, families and organisations (WEF, 2020).

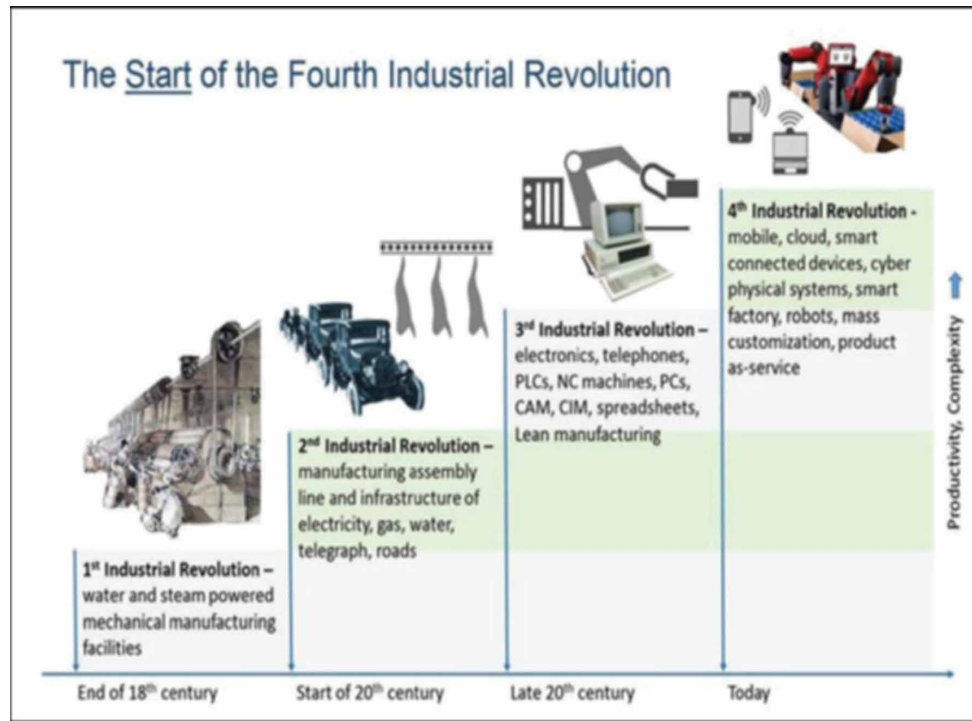
The technological innovations were considered to be skills biased by earlier researchers; the understanding was that it increased the demand for the relatively more educated than the less educated (Nelson & Phelps, 1966; Katz & Murphy, 1992; Goldin & Katz, 1998; Bekman, Bound & Machin, 1998; Violante, 2008). This is well illustrated by the quotation given by Nelson and Phelps (1966: 69) stating that “education enhances one’s ability to receive, decode, and understand information.” This may not be far from the truth in terms of the demands of the fourth industrial revolution as it unfolds, and the challenge of skills being adjusted to meet the needs becomes something of concern as this chapter is addressed. The traditional wellness programmes in terms of skills that are available and what will be required to match the demand of skills are significant in terms of employment.

The authors have often pointed out that what humans can do well and is well codified can be performed by computers. However, tasks that require situational flexibility, visual and language recognition as well in-person interaction are far out of reach for computers. These kinds of tasks include persuasion and problem solving as well as creativity. The tasks that have become achievable through technology have been incredible in ordinary terms. This has been noted in many cases. It can be exemplified by the self-driving car which can replace Uber for bus and truck drivers as well as construction machinery drivers. Language translations which include simultaneous translations have now become available to anyone with internet. This is available on Google translate and Skype translation. It was also noted that IBM’s Watson and DeepMind Health in 2016 was able to diagnose rare cancers more than human doctors. So many other tasks can be generated through technology including among others, financial advice, tax analysis, teaching, medical diagnostics, legal assistance, HR workers and even software programming (Frey & Osborne, 2017).

BACKGROUND

The fourth industrial revolution (Industry 4.0) is currently taking place and is changing the way we communicate, live and work. Previous industrial revolutions brought along many benefits that shaped the way people go about their lives (Figure 1). The first revolution saw the introduction of the commercial steam engine which enhanced transportation, the second revolution brought about the telephone which amplified communication, the third revolution saw the internet take the world by storm, and lastly the fourth revolution brought about disruptive technologies and trends such as the Internet of Things (IoT), robotics, and Artificial Intelligence (AI). Disruptive technologies are technologies that takes the place of an established technological discovery and either create a new industry or vastly change the current industry it is situated in (Morrar, Arman & Mousa, 2017). Like any industrial revolution, change is imminent and this change is said to be very powerful. Each of the revolutions has attained some benefits as noted in Figure 1, and it can be noted that there has been an increase in the levels of benefits. It all started with steam powered machines, and finally we are dealing with robots which eventually impact on the skills levels required for this revolution.

Figure 1. Benefits of industrial revolutions
Nkuni (2018)



THE FOURTH INDUSTRIAL REVOLUTION (INDUSTRY 4.0)

The fourth industrial revolution is said to have no common definition and some have even questioned whether it should be called the fourth industrial revolution. The fourth industrial revolution has been defined as a revolutionary change which occurs when IT proliferates all industries. This includes primary, secondary as well as tertiary industries. In other words, it refers to the horizontal expansion of IT (Lee, Yun, Pyka, Wan et al., 2018). The fourth revolution is growing out of the third but is considered to be a new era, rather than continuing on from the third due to disruptive technologies. We can therefore say that Industry 4.0 in a way blurs the lines between physical, digital and biological worlds (Ferreira & Lisboa, 2019). The technologies that drive the changes in the fourth industrial revolution include (Schwab, 2016):

- **Artificial Intelligence (AI):** Practically computers that can think like humans (e.g. Siri on Apple iPhone).
- **Blockchain:** Is a way to share data that is transparent but fully secure (e.g. Bitcoin).
- **Virtual Reality (VR):** Using a VR headset you are able to simulate the real world (e.g. Volvo Reality).
- **Biotechnology:** Genetic engineering such as the development of new pharmaceuticals and other materials by using cellular and biomolecular processes to create products (e.g. antibiotics).
- **Additive Manufacturing:** Such as 3D printing, allows companies to print their own tools and materials thus saving on costs.

- **Internet of Things (IoT):** Defined by everyday things that are connected to the internet (e.g. Smartwatches).
- **New Computing Technology:** New software to better expand everyday capabilities.
- **Space Technologies:** Development allowing for greater space exploration (e.g. reusable rockets).

In this revolution, competitiveness doesn't fully depend on optimisation of individual resources, but rather on the interconnectedness between companies and partners' products or services. These partner organisations range from small to large organisations. This paves the way for Small, Medium and Micro Enterprises (SMMEs) and therefore boosting job opportunities for entrepreneurial enterprises. This improvement will not only create job opportunities but it will also affect the economy in a positive way, which would see it grow. With the vast technology available to people today, people will have the right to physical, human and financial resources and managerial skills to become successful entrepreneurs with sustainable partner organisations (Sousa, 2014).

The ultimate goal of an entrepreneur is to transform their creative thinking into product or services that satisfy customer needs. During this revolution, leading-edge knowledge and skills are needed to develop business opportunities, devise business plans and test the viability before launching it onto the market. Entrepreneurs would have to follow the steps of the new business plan model which consists of business ideas, conducting an idea assessment, feasibility analysis and then developing a business model. Once you have developed the business plan, you will have to craft the business model and create a strategic plan to implement the model, and lastly, you are able able to launch the business (Scarborough & Cornwall, 2016). As technology becomes a supplement for the development of business in that it helps in business projects and helps develop plans, the skills levels required to match technological developments kick in and therefore put a demand on employees in becoming compliant with the new skills requirement.

BENEFITS AND CHALLENGES OF THE FOURTH INDUSTRIAL REVOLUTION

The benefits and challenges associated with the fourth industrial revolution can be varied depending on the context upon which it is being deliberated. Nonetheless, there are a number of benefits to organisations or enterprises as well as some challenges that are specifically faced by the workers as discussed in sections to follow.

First World Impact

The fourth industrial revolution is more than just driven by technology. It is powered by disruptive technologies which positively impacts industries such as education, health and businesses. Generally, first world countries are able to interact with these new technologies. It increases efficiencies in the work place but has come at a huge cost, the decrease in human labour required. Although the new technology can be seen as positive, industries willingly purchase new equipment which in turn allows for savings in the long term. Slowly it is becoming a norm for industries to restructure and lay off workers as new machinery takes over. Such new technologies are able to deliver at a greater level and have proven to be more efficient than manual labour (Xu, David & Kim, 2018). It is expected that Artificial Intelligence (AI) is said to play a much more active role in society, which can be beneficial to society but can also harm the development of enterprises. The one key skill required in the era is that of complex problem

solving; this however can be attained through AI. The fourth industrial revolution may harm the future of human employment somewhat. As people are replaced by machines and technology they develop stress for continued employment (Carvalho, Chaim, Cazarini & Gerolamo, 2018).

The benefits of the fourth industrial revolution can be exemplified by the occurrences noted below. These benefits are further seen as we engage more with the interaction of robotics, thus improving everyday activities. Activities such as repairing of cars which presently is done by a mechanic, in the future will be taken over by robotics thus leading to job losses as well as stress (Carvalho, Chaim, Cazarini & Gerolamo, 2018). Education has improved in innovative ways, from the old conventional ways into ways that offer students much more, however this improved educational system has a direct impact on employee job security. As AI becomes more available, repetitive tasks will become abolished such as face-to-face lecturing. Universities will benefit from lower wage expenses and students will benefit through the availability to repeat a lesson at their convenience. Disruptive technologies also reshape how businesses operate, for instance, the arrival on Uber, which provides a taxi service managed from a mobile App (Xu, David & Kim, 2018). In the fourth industrial revolution low barriers between markets and inventors includes technology such as 3D printing for prototyping. Benefits of 3D printing include faster production, easy accessibility, better quality, tangible design and product testing, cost-effectiveness, and creative designs. This clearly indicates that enterprises are likely to benefit more than employees, this may eventually lead to a lack of skills development as the reliance on human labour decreases.

THIRD WORLD IMPACT

General View

The highest impact of the industrial revolution in developing countries is on the unskilled workforces. The main reason for this is the lack of training that is available in these countries (Naude, 2016). The introduction of high-end technology, to countries like South Africa, which are labour intensive, could lead to thousands of workers becoming jobless. For example, the mining industry, which is prone to automation, will slowly lay off more workers as we progress into the fourth industrial revolution. New technology brings enhanced work abilities however in certain cases individuals may not be able to learn and comprehend fully that which is expected of them, thus will fail to implement such new technologies. This becomes a challenge to individuals as opposed to enterprises that benefit in the process.

South African View

Unemployment is at an all-time high, standing at 29.1%, with the decline of jobs in manufacturing and mining (Stats SA, 2020). It is worth noting that South Africa is still at the base level with regards to the industrial revolution thus is not fully prepared. The main issue is caused by the government departments, programmes and economic support structures that are crumbling. So even with the influx of technology, it is not possible to achieve economic growth without proper leadership skills which are expected in the fourth industrial revolution. To make matters worse, it is noted that technology change may even worsen this issue rather than repair it. Despite the all-time high unemployment rate, South Africans continue to strive. The major test that remains is connectivity issues, accessibility issues and insufficient skills development, although, it was stated that South Africa has an advantage over other underdeveloped na-

tions. It is not held down by infrastructure legacy problems and may have little trouble in implementing change (Department of Trade and Industry, 2019). Smart technologies are being introduced to South Africa however this is still in its development phase.

OVERVIEW: JOBS AND THE FOURTH INDUSTRIAL REVOLUTION

The debate regarding jobs and skills has recently dealt with the changes that have been brought about by the technologies as well as the future of work. This indeed means a lot in terms of skills that will be required and at the same time the available jobs as such. The study done by Frey and Osborne (2013) depicting that the US had a possibility of 47% of jobs at the risk of automation drove several researchers to undertake the study, however some ended up with double the estimate pointed out. The bottlenecks associated with automation included, among other things, that certain jobs could not be automated especially ones without occupational titles. Such jobs included, among others, social intelligence jobs that involved the negotiation of complex social relationships effectively, which included the caring of others or cultural sensitivities, and cognitive intelligence, that includes complex reasoning as well as perception and manipulation, and the carrying out of tasks that are physical in a work environment that is unstructured. It is also worth noting that recent studies have reduced the automation projections with significance. One such study is by Arntz, Gregory and Zierhan (2016) and has estimated that in the US it shall be 9%. This estimate is different from the one previously projected by Frey and Osborne (2013). However, following the population statistics of 2016, this does translate to 13 million people in the US. It can be understood that the risk of automation of jobs seems to be significant for the Organisation for Economic Co-operation and Development (OECD) region as per the findings given by OECD (2018). Different countries are expected to be impacted by the fourth industrial revolution in different ways, as stipulated below. There is a large proportion of automation across countries and this is noted, as in the case of Slovakia which is expected to have 33% of jobs automated, whereas Norway will only have 6% of jobs automated. It is also predicted that some countries have less automable jobs than other countries, and this is evident with countries like Nordic and Anglo Saxon countries and the Netherlands. Jobs in Eastern European countries, South European countries, Germany, Chile, Japan and South European countries have higher opportunities of being automated.

The differences in economic sectoral structure does not explain the level of automation more than the job tasks differences within the economic sectors. So far 70% of the job tasks employ different occupational mixes than 30% of the economic structural differences in cross country variations. Even in the same occupations the manipulations and perception frequency as well as the social intelligence and cognitive levels tend to vary. In many countries there is a need to point out jobs that are prone to automation and where labour substituting technologies are likely to be implemented.

Checks with data have yielded results of automation that yield comparatively similar results qualitatively with the empirical US survey of Adult results. The automation risk tends to vary but the picture of who is most affected is similar. One of the trends that is seemingly becoming common is that the analytical and social skills in jobs are growing in number. There is also a reduction in jobs involving physical strength as jobs intensive in those tasks become less. Jobs that used skills like social skills and analytical skills have been known to grow in number.

Automation has been known to impact a lot on agricultural jobs, manufacturing jobs and some service sector jobs such as food services, land transport, postal and courier services. One characteristic associated with jobs that require less automation is that they require professional training or tertiary education whereas the most automated jobs require less skills and training.

There are some propositions of technology affecting skilled jobs but as much as this proposition seems to be plausible, it is not supported by engineering framework bottlenecks designed by Frey and Osborne (2013). It may also be pointed out that AI puts low skilled jobs more at risk than high skilled jobs. The previous technological eras put middle class jobs at risk causing market polarisation. According to the study by OECD (2018), the risk of educationally attained jobs and skills is less likely but a monotonic decrease is predicted. Teenage jobs have a high risk of automation. According to the study by OECD (2018), it was noted that automation and age has a U-shaped dimension and that automation among the youth is more pronounced than with senior workers. It is with this observation that it can be noted that the feared automation is more likely to impact on youth unemployment than lead to early retirements. However, it should be noted that in a number of countries a number of young people are more skilled than their older counterparts and this may change the trend of unemployment. This therefore means that the task of adapting to new technological job variations by the youth can be possible in the process.

One of the observations as noted by the findings of OECD (2018) is that those in automable jobs are three times less likely to have done on the job training in a twelve month period as compared to workers in the non-automable jobs. Further to this workers in automable jobs are two times less likely to have obtained formal education and 3.5 times less likely to have involved themselves in distance learning. The findings point out the importance of training for workers in automable jobs. The German data has indicated the importance of training and that it moves jobs to a lower risk of automation. The automation risk declines upon subsequent training. Participants have often used requalification - obtaining a new qualification in the process that they end up transitioning from the more automable tasks.

PAST AND PRESENT TRENDS: SKILLS DEMAND

The use of automation as expected in the fourth industrial revolution is significant since it will impact on the nature of skills required by industries. Automation redistributes the demanded skills required by industries and businesses. The disruptive nature of the technological change associated with the fourth industrial revolution will have an impact on the nature of skills demanded and the readiness of educational systems in preparing these skills that are demanded.

There was a sizeable increase in highly skilled jobs within the OECD region between 2005 and 2015. Highly skilled occupations include managers, professionals, technicians and associate professionals (Handel, 2012). The growth share of jobs in terms of skills in service and sales grew by 1%, elementary occupations grew by 0.4%, whereas the production workers, clerks, agricultural workers and crafts workers declined by 0.8, 0.6, 0.9 and 1.8%. These projections are expected to continue up to 2025. The researchers of this work expect the sales and service sector to shrink in the coming decade. Most information technology (IT) jobs have been projected to grow at a slow pace and yet some of the jobs within the IT sector such as software developers, IT engineers and system managers are expected to grow at a faster pace (Bureau of Labour Statistics, 2016). The data in this case is mainly for developed countries and therefore there is a need to understand the rates in developing countries.

Skills developments have undergone changes as pointed out by researchers. In the United States there has been a decrease in cognitive and routine manual tasks since the 1980s whereas non-manual tasks have been decreasing since the 1960s. West Germany on the other hand experienced trends that are of a similar nature in the period between 1979 and 1999. With occupational skills trends in countries around the world it has been noted that there has been an increase in educational, cognitive and interpersonal skills but there has also been a decline in repetitive physical tasks, crafts and physical skills (Handel, 2012). Highly skilled Americans involved with non-routine cognitive tasks, the routine and cognitive tasks and the low-skilled involved with routine cognitive and non-routine manual tasks increased and was their wage bill (Michaels, Natraj & van Reenen, 2014).

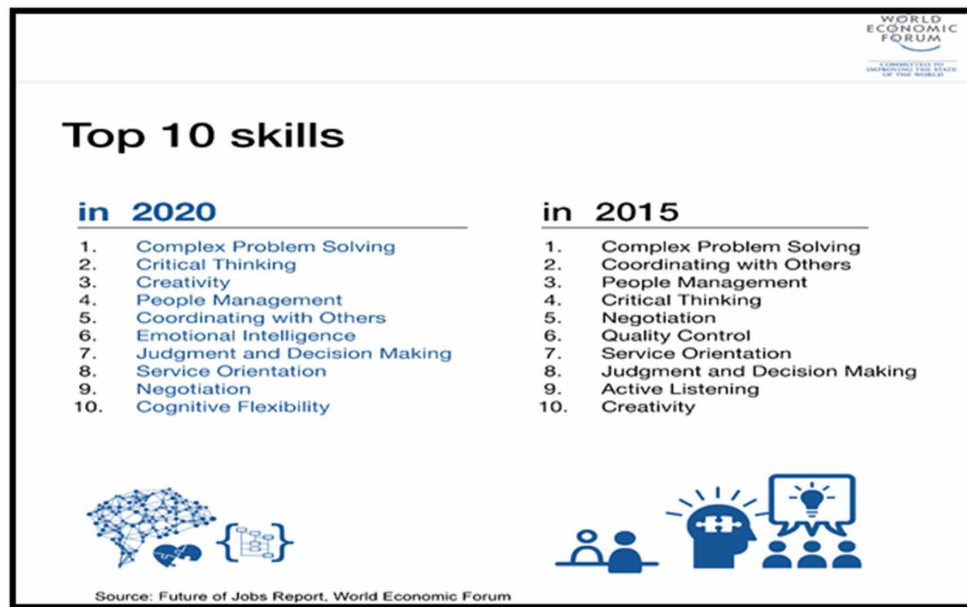
CHANGING SKILLS

Skills transformation and its associated stress has been considered in this chapter since they are unavoidably expected where there is an industrial revolution. Whether they would have a varied set of work experience such as being a “jack-of-all-trades” or by gaining the skills through school or working, further skills development would occur. The technological revolution brings about vast opportunities for anyone that has the skills and willpower to succeed. However, the one concern lies where most of the business opportunities require specific skills at higher levels. As a result of industrial demands for new skill sets there will be changing skill demands. Therefore by implementing short courses and lectures on the basic skills of each industry, this could increase the success rates of businesses in these developing nations. The training provided therefore helps in skills acquisition which is necessary for further interrelated aspects in the changing skills during the fourth industrial revolution. In the process of losing jobs, then attendant stressors will be indirectly felt by those affected, especially the workers, as they may be required to acquire skills they previously did not have to ensure future employment.

SKILLS NEEDED TO SURVIVE THIS INDUSTRIAL REVOLUTION

With the industry expanding due to technology progressing at a rapid rate, developing countries would need to prioritise education and upscale investments in the workforce. Creativity is probably the most important skill to have due to new technology and products available; business entities would have to become a lot more imaginative in order to actually profit from these changes. Complex problem solving and conflict solving are both different terms but both are majorly important skills in the upcoming industrial revolution. Businesses are therefore required to adapt to changes within the industry because inability to adapt to such changes may lead to inefficiencies which may ultimately lead to failure. The ability to adapt to new technology and fully understand technology available in the industry will be beneficial to businesses. Among others skills required are social skills, which include being able to talk to others in a respectful and cooperative manner (Grzybowska & Łupicka, 2017). Critical thinking is also seen as one of the key skills required as it enables organisations to process information before making a decision and acting on it. It is important to note that among the skills required in the fourth industrial revolution mentioned above, Figure 2 presents the top 10 skills necessary for this revolution. Some of the skills required in 2015 for example, like quality control and active listening, are not necessarily listed in the top 10 skills for 2020. This may therefore indicate that changing skills will continue and employees will need to acquire these skills in the process of time.

Figure 2. The 10 top skills in 2015 and 2020



JOB INSECURITY: AN ATTEDANT STRESSOR IN THE FOURTH INDUSTRIAL REVOLUTION

As the forthcoming changes are looked upon there are a number of changes that are expected to take place. Although there are benefits associated with the fourth industrial revolution, there are some fears associated with it. The technological revolution shall bring in some robotics and AI and as technology progresses to make work simple, the fear of job losses becomes the challenge that workers or employees face in the process. The present study findings reveal that employees' perception of job security associated with technological revolution is high. There is a concern that there will be human replacement by machines ((Nica, 2016; Peters, 2017; Prisecaru, 2016). Job insecurity does not only arise simply because of being removed from the job, but of the very existence of the job in the continued future. The recognisable day-to-day innovation technologically not only offers work opportunities but also threats to traditional workers. Large amounts of research have looked into the aspect of job insecurity from various angles, including gender, age, type of work, tenure, psychological factors, as well as environmental forces, but no connection has been linked to the industrial technological revolution having a significant impact on job security of employees (Taewoo, 2019).

WELLNESS AND THE FOURTH INDUSTRIAL REVOLUTION

A wellness programme has been defined as a programme that helps employees to stay healthy or helps them improve their health. The wellness programmes encompass a variety of ideas that may include helping an employee stop smoking, the losing of weight, on-site gyms or gym memberships as well as providing incentives with rewards for participating or gaining the desired results. Wellness programmes

are advantageous for both the organisation as well as employees. Most of the services in wellness programmes are directed towards health-related and personal matters rather than necessarily work matters (Abe, E., Fields & Abe, I., 2016). This indicates that there are personal issues that get addressed in the wellness programmes in order to progress the organisation's work. The organisation is likely to reduce absenteeism based on sickness as the health of the employees improves and this increases productivity. At the same time employees consider it as a benefit to work for an organisation that caters for their health and would become more committed to the organisation as a result (Bean-Mellinger, 2019). In deliberating on wellness, it has been reported that the fourth industrial revolution, while exhibiting benefits of productivity in organisations, will lead to task complexity which can be a stress for employees. Global business networks can lead to the destruction of employees' biorhythms, overworking as well as some cancers. The standard occupational health and safety measures will be difficult to apply to multinational enterprises as most of the work may end up being done almost at an independent level by individuals at different places. As enterprises or organisations end up using more big data to perform the tasks, the role of human duty is reduced and the wellness associated to them is considered less in the process. As wellness becomes subjective to the employers in the process, the challenge of increasing or attaining particular skills needed for the fourth industrial revolution becomes a pressing need for workers and may therefore become an attendant stressor in the process (Min, Kim, Y., Lee, Jang, Kim, I., Song, 2019).

CREATION OF THE WORK-LIFE BALANCE

The life of an employee can be quite frantic. At times, in order to be successful, an individual would have to work day and night to achieve their dreams. It is still important to realise that balance between work and life is required. There are many options available for employees to incorporate a sustained work-life balance. These include setting boundaries and allowing for breaks and time off to ease the mind. By setting boundaries employees will know when to stop working or over-working. These boundaries are also ways to impose vision and create a healthy habit. The main issue employees face is trying to make time for their families. Often, they work hard on routine work-related tasks and as a consequence, neglect their families. It is therefore important that they know when to take time off and focus on other aspects of their life. A lack of such balance may cause instability at work and less productivity which in turn will lead to workplace stress. A meaningful way to create work-life balance may include simple things like turning off one's smart phone and/or ignoring things that are unrelated to your goals, enabling one to be more productive.

RECOMMENDATIONS

The following recommendations are necessary. In order to achieve these skills it is important that business organisations as well as public entities prioritise education on skills development to better develop the workforce, thus adding value to it. It is important to note that the category of skills required to engage new technology, adapt, and commercialise innovations, will be less prone to forthcoming computerisation (Naude, 2017). Policy makers may require this recommendation for effective and efficient enterprise performance.

Education is important in order to improve skills development (Naude, 2017). It is for this reason that the following recommendations are proposed towards skills development among other recommendations that may offer a comprehensive approach in the fourth industrial revolution.

- It is proposed that there should be an expansion of business schools and technical colleges so that skills and practices are learnt from a young age.
- There is also a need for growth in science, technology, engineering and maths skills (STEM).
- Short courses should be introduced that focus on certain fields for people who weren't able to educate themselves and want to better themselves.
- It is significant to convey non-routine social and analytical skills to the labour force.

It is also recommended that they examine the particular consequences of industrial revolution on human health and the environment.

It is further recommended that before introducing a technology that creates job insecurity that the affected employees be psychologically counselled.

It is also recommended that further and/or additional skills be given to affected employees enabling them to develop the required skills qualifying them to remain and become more efficient within the organisation.

Failing internal placements employees may choose to become service providers, therefore it is recommended that they become equipped with entrepreneurial and innovative mindsets to eliminate the stress of unemployment.

These recommendations will help encourage an innovative environment that is favourable. It will help businesses to enter into new ground-breaking forms of manufacturing and other sectors. In each successful case, from the first to the third industrial revolution, the government played a significant part in implementing policies and conducting themselves in ways to improve the country, so we can say that it won't be different for the fourth industrial revolution (Bejinaru, 2018).

In addition to the above, the following recommendations become necessary allowing individuals to adequately equip themselves for employment in the fourth industrial revolution.

Individuals need more ways to improve entrepreneurial skills on a personal or individual level (Contreras, 2013):

- **Make use of Online Software/Courses:** By utilising multiple online software/courses so as to always be prepared for when an opportunity arises, thus, widening your array of skills so as to be skilled in multiple things.
- **Personal Learning Library:** Make use of resources to acquire new skills and increase your vocabulary. Social media networks like YouTube can aid in the process.
- **Participate in Online Communities:** The internet is a boundless place to share experiences, thoughts, and sometimes academic discussions with compatible individuals.
- **Seek Mental Encouragement:** Always aim to keep the mind active and healthy. Engage in mentally stimulating activities such as chess, puzzles, and brain training Apps.
- **Personal Journal:** Keeping a personal journal allows you to keep a record of daily events. Remember that writing about learning experiences will help you analyse how you made your decisions, why you came to certain conclusions, and what you can do to progress.

The above recommendations are vital for both enterprises as well as the labour force.

CONCLUSION

The focus of this chapter was based on skills development and its impact in the fourth industrial revolution. The chapter has deliberated on the industrial revolution, the changing skills and the attendant stressor of job insecurity among other areas of concern. These issues are relevant currently as developing countries find it difficult to attain the education necessary to improve skills due to poverty, lack of skills development and language barriers. The major concern with this industrial revolution is the essential skills which are required by individuals and organisations. The nature of skills required in the fourth industrial revolution has been addressed, and the impact of the fourth industrial revolution on the nature of skills demanded is going to change as this will mean training of individuals to be able to upgrade their skills to fit into the industrial revolution's requirements. This shall be subject to some changes as the revolution unfolds its demands. The advantage that some things shall be upgraded is one benefit but at the same time skills requirements shall not be the same as skills will keep on changing.

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Chapter 12

Future of Work, Globalisation, Technology, and Work–Family Satisfaction in the Fourth Industrial Revolution (4IR)

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ABSTRACT

The uncertainties around the future of work has engendered and continue to provoke stimulating discussions amongst scholars interested in the dynamics of the world of work, and other allied researchers. While the construction of these uncertainties is not far-fetched, scholars have somewhat reached a consensus, that the emergence of globalization spanning over four decades ago, has further exacerbated the magnitude of these uncertainties. To be sure, the apologists of globalization have argued that the emergence of globalization, rather than prospering the future of work, has provoked several threats to the continued relevance of work, rather than progression.

DOI: 10.4018/978-1-7998-3347-5.ch012

INTRODUCTION

The uncertainties around the future of work have engendered and continue to provoke stimulating discussions amongst scholars interested in the dynamics of the world of work, and other allied researchers. While the construction of these uncertainties is not far-fetched, scholars have somewhat reached a consensus, that the emergence of globalization spanning over four decades ago, has further exacerbated the magnitude of these uncertainties (May, Peetz & Strachan, 2013). To be sure, the apologists of globalization have argued that the emergence of globalization, rather than prospering the future of work, has provoked several threats to the continued relevance of work, rather than progression (Kahn, 2017)

While this contention continues to make the round, the literature on globalization and work exudes that, the threats entrenched in the uncertainties and progression of globalization to work cannot be neatly exhumed to arrive at a threshold of which outweighs the other. Slightly the discourse should be positioned concerning their peculiarities. Importantly, this discourse leads us to two sides of view. First, the emergence of globalization has attracted copious of gains for the global north, while it has rendered many nations of the global south redundant (De Cuyper et al., 2008). However, for the global south, the effects of these uncertainties have become so evident in the structure and arrangement of work (Samuelsson et al., 2012). Individually, the previous traditional standard work is being exchanged for non-standard work employment, devoid of work complacency (May, Peetz & Strachan, 2013). To be sure, what used to be known as work-family satisfaction derived from the outputs of work, are now being replaced (Jawando & Adenugba, 2014). To make a case, the uncertainties around the future of work has birthed a new form of work arrangement that has somewhat incapacitate the individual work to relish a fuller work-family satisfaction with the spread of all forms of atypical work types. This, among others, is the few uncertainties that are being promulgated by the recent changes in work.

The nitty-gritty of this chapter is to explain how globalization has exposed different cog of uncertainties to the world work, the individual worker, and the future of work in general. Specifically, the narrative sought to establish how these uncertainties on many fronts have affected the work-family satisfaction of the working population. In other words, the chapter aims to expose readers for the need to appreciate the globalization discourse, specifically through the lens of its many structural changes and uncertainties that have been engendered on the future of work, which to a greater extent has lessened what use to be conceived as work-family satisfaction.

The book chapter is divided into three sections. Section A will appraise the discourse of globalization and the future of work. To establish a fuller picture of this theme, the section will establish the progression and retrogression of globalization to work. Accordingly, this will enable the reader to appreciate the uncertainties around the future of work, specifically with the emergence of globalization. Arguments for and against this discourse will be well examined. Section B will trace the current challenges of uncertainties through the lens of globalization and labour market flexibilities to the future of work. The chapter will appreciate the various structural changes that the world of work has witnessed with the fast growth and influence of work. The section will further explore how technology and robots have been replaced for human work. Section C will be an appraisal of how the many uncertainties around the future work have constrained the work-family satisfaction. The narrative in this section will be mirrored through how the emergence of globalization has birthed several uncertainties for the world of work, such as the replacement of traditional employment patterns with non-standard employment, and how this has

affected the work-family satisfaction of the working people. Individually, issues in this section will be examined through the different temporary employment types that have reduced the satisfaction derived from work, such as those lacking social securities and other employment benefits.

The Fourth Industrial Revolution (4IR)

The 4IR, a term coined by Klaus Schwab, founder and executive chairman of the World Economic Forum. The R is seen as a system where “individuals move between digital domains and offline reality with the use of connected technology to enable and manage their lives” (Miller 2015, p.3). The scholars, Xu, David & Kim (2018) argued that the force, speed, and measure of the changes brought about by the 4IR cannot be ignored. There is no doubt that these changes have brought about the shifts in power, shifts in wealth, and knowledge. The 4IR comprises of computer generated product design and three dimensional (3D) printing, which can create solids object by building up successive layers of materials (Xu et al., 2018). The 4IR builds on the 3IR, the digital revolution that has been occurring since the middle of the last century. The 4IR is characterised by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres. According to Schwab (2015), the 4IR is evolving at an exponential rather than a linear pace.

Moreover, it is disrupting almost every industry in every country, and the breadth and depth of these changes herald the transformation of entire systems of production, management, and governance. The information age is replacing the jobs created by the industrial age. Much of losses in most industrial age jobs have less to do with government policy and free trade agreements than they do with the dramatic shift in an economy to the knowledge worker.

It has been argued that the 4IR will shape the future through its impacts on government and business. Governments and businesses will have no control over either technology or the disruption that comes with the 4IR. However, they can only predict the opportunities that come with the 4IR, namely: lower barriers between inventors and markets; more active role for the artificial intelligence; integration of different technics and domains (fusion)improv; ed quality of our lives (robotics) and the connected life (Internet) (Xu et al., 2018). According to Anderson (2012), the 4IR is likely to reduce barriers between inventors and markets gave the level of new technologies like 3D printing for prototyping. For instance, tissue engineers are now using rapid prototyping techniques to produce 3D porous scaffolds. These new technologies, such as 3D printing, also allow entrepreneurs with new ideas to establish small companies with lower start-up costs (Anderson, 2012). The 4IR enables entrepreneurs to bring products ‘to reality’ with the help of 3D printing, without the traditional time constraints often encountered with conventional prototyping methods.

Manyika et al. (2017) concurred that increasing trends in artificial intelligence point to significant economic disruptions in the coming years. Although artificial intelligence offers new avenues to economic growth by solving complex problems, however, it poses a considerable threat to many kinds of jobs. A survey conducted by McKinsey & Company revealed that half of all existing work activities would be automated by currently existing technologies, thereby enabling companies to save billions of dollars and to create new types of jobs (Manyika et al., 2017). According to Schwab (2015), 4IR creates an opportunity for innovative technologies to be integrated with different scientific and technical disciplines. Schwab (2015) avers that specific fundamental forces will come together in “a fusion of technologies that is blurring the lines between physical, digital, and biological spheres. The fusion of technologies goes beyond mere combination. Blending is more than complementary technology because it creates new markets and new growth opportunities for each participant in the innovation (Schwab, 2015).

Leading researchers (Jee, 2017; Peters, 2017; Schwab, 2015) have argued that robotics can and will change people's lives shortly. Evidence shows that technically robots are automated motorised tools. These robots can cook food, play our music, record shows, and even drive cars. However, it is difficult for one to see it because robots do not have a face where humans can interact with them. Robots have the potential to improve the quality of our lives at home, work, and many other places (Xu et al., 2018). It has been argued that customized robots have the potential to create new jobs, improve the quality of existing jobs, and give people more time to focus on what they want to do (ibid).

Holland, Cooper, and Hecker (2014) claimed that the fifth component of the 4IR is the Internet of things (IoT), Internetworking of physical devices. The IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine communications and covers a variety of protocols, domains, and applications (Holler et al., 2014). The interconnection of these embedded devices is expected to usher in automation in nearly all fields, while also enabling advanced applications like a smart grid, and expanding to areas such as smart cities. The revolution of the connected life came about thanks to the advance of the Internet. Around 1969, the first data was transmitted over the Internet and linked two mainframe computers. However, in this 21st century, the Internet is connecting personal computers and mobile devices. "By 2010, the number of computers on the Internet had surpassed the number of people on the earth" (Gershenfeld & Vasseur 2014, p.28).

GLOBALISATION AND 4IR

Globalization has become a dominant issue in the workplace worldwide. It has the potential to enrich not only the nation's economy but also the workplace as it enhances productivity, profitability, and performance. However, it has brought about specific dramatic changes, particularly in the workplace, including privatisation, deregulation, liberalisation, subsidies removal, casualization, downsizing, rightsizing, rationalisation, recapitalisation, merger, and acquisition among others. Given the pace of globalization, in recent times, the anti-globalization protests have increased all over the world as a form of resistance to the changes (Okafor, 2007). The scholar argues that globalisation has become a very prominent phenomenon characterising ending part of the 20th century and, of course, has become the dominant force that will propel the direction of most organisational activities in the now emerged the 21st century.

Historically, the term globalization appeared shortly after the end of World War II, when the allies led by the United States decided to support a worldwide "open" trading and investment systems. Understandably, several progress has been made in the world since then, and these are, of course, the evidence of the benefits of the system. There has been a constant growth of the globalisation of businesses world over as a result of progress and advances made in the areas of information and communication technology. This has brought about increases in the trade of goods and services worldwide. This, in turn has led to increased investment and competition (Jones, 1994; Went 2000; Woods, 2000). The concept of globalization thrives based on global interdependence. The present situation is that nations are now more interdependent than ever in the history of man. The current structure of the world economy is such that resources movement around the world has become critical for its growth and sustained global welfare. Against this background, the location and integration of an organisation's operations across several international boundaries have been considered as the essential ingredients of globalization (Afonja, 2003). A number of technological innovations have been identified as the drivers or force behind globalisation, namely: television, the Internet, telephone, and microchip. These technologies have revolutionized communication during the past decades.

The term globalisation has been conceptualised scholars and researchers in different ways. This means that there is no universally accepted definition of the term globalization. According to The International Monetary Fund, IMF, (1997, p.25), globalization refers to “the growing economic interdependence of countries across different boards through the increasing volume and variety of ‘cross border’ transaction in goods and services and of international capital flow as well as through the more rapid and widespread diffusion of technology”. Moreover, Kwanashie (1998, p.4) conceptualises the term globalisation as “a process of integrating economic decision-making, including consumption, investment and saving process across different countries.” The scholars argue globalization creates a global market where all nations are forced to participate.

To Afonja (2003) globalisation refers to the elimination of trade barriers between countries so that the world becomes a global village. Afonja (2003) postulates that globalisation increases the interconnectedness of individuals, groups, companies, and countries. McShane and Travagoline (2007) concurred that globalization refers to the economic, social, and cultural connectivity with people in other parts of the world. For Pradhan (2010), globalisation is a process in which the events, decisions, and movements occurring in a part of the world affect the other elements in a meaningful way. Chang and Lee (2010) see globalisation as a movement in the direction of increasing world economic integration through the reduction of barriers to exchange and increased international flows of capital and labor force. According to Özel (2012), globalisation is the elimination of the factors that impede the entry of goods and services to the country as well as the free movement of goods and technology that are necessary for production. From the aforementioned definitions, it is clear that globalisation is the term used to describe the growing worldwide interdependence of people and countries. In this context, globalisation can be viewed as a relative concept since it relates to value judgment and ideology in a sense that. In contrast, it enriched other nations, and for others, it has impoverished them.

Changes Created by Globalisation

Scholars such as Aribisala (2005), Nnebe (1991), and Odulaja (2005) postulated that globalisation had created several changes, particularly in the socio-economic and political environments in which work organisations operate and this has, in turn, engendered various types of changes within work organisations themselves. These changes are discussed as follows.

Technological Changes: Technology refers to new ways of doing things. The twenty-first century has seen significant expansion in the use and availability of Information Communication Technology (ICT), which has created a paradigm shift in how we can work (Holland & Bardoel, 2016). Evidence suggests that changes in technological and highly competitive market conditions strongly influence the innovation needs of enterprises worldwide (Mai & Phuong, 2016). Technological changes encompass new products, new techniques of production, upgrading of the quality of labour force, the introduction of new skills, and improvement in the quality of management. It also includes invention and innovation. Every day new plants, as well as machinery, new tools, equipment, new procedures, are emerging as a result of the change. Importantly, these machines may cost saving devices that can render some workers redundant in their workplace, thus forcing management to trim down the number of workers needed to accomplish specific tasks. Eitzen and Maxine (2000) suggested that that current technology would permit organisations which would replace millions of workers with machines that increase productivity and profit. Hence they typically reduce labour cost whenever possible by downsizing and keeping wages and benefits as low as possible. For firms to create a successful innovative project or implement a successful

technology transfer project, they must seek a wide variety of expertise and knowledge provided by many complementary sources. The use and control of IT offer an opportunity for firms as well as employees to be innovative (Harvey, 2010). Howcroft and Taylor (2014) argued that society is currently witnessing a new wave of revolutionary technology that provides the platform for significant change in the way we work. These changes are creating renewed interest in how work is conceptualised.

Structural Changes: Apart from technological changes, globalisation has also brought about structural changes in many organisations across the globe. These encompass of organisational structure such as a system of communication, authority, workflow, planning, controlling, directing, motivating, leading, and so forth. Moreover, alteration and modification of the structure of an organisation including the appointment of a new director, the appointment of the new board, and new management are all structural changes. The structural reforms could also comprise of expansion or reduction of departments and the creation of new departments. For example, the recent N25billion bank recapitalisation in Nigeria, saw many banks being merged or acquired by other banks which eventually resulted in workers being demoted, retrenched, sacked, rationalised while some positions were scrapped entirely by the new management (Adeyemi, 2004; Okhomina, 2006; Oritse & Ekwujuru, 2006).

Environmental Changes: Globalisation has also brought about significant changes in the environment in many countries. There are several ecological forces that can exert pressure on the organisation, including economic, political, social, cultural, legal, religion, population, ecology, and competition. These environmental forces often create new problems, risks, opportunities, and threats for which organisations have to mobilise resources before such changes make their impact felt. Under the current globalizing era, changes in the larger society and work organizations are inevitable. These changes different forms, such as privatisation, commercialization, restructuring, downsizing diversification, freezing of wages, removal of subsidies and casualization, recapitalization, merger, and acquisition. For example, the recently concluded recapitalisation of the banking sector that produced only twenty-five relatively stable banks resulted in thirteen banks closing shops. Generally speaking, the effect of environmental changes in Nigeria has led to most workers of the affected banks losing their jobs, including those banks where merger and acquisition had taken place (Oritse and Ekwujuru, 2006).

Opportunities Created by Globalisation

Post-World War II, progress experienced in many countries, including Asia, is pronounced as a significant outcome of globalization. Potrafke (2014) points out that from the perspective of workers in developed countries. However, globalisation may be seen as a potential threat, increased employment in developing countries is seen as a significant contribution to reducing poverty and meeting the Millennium Development Goals (MDG). Jenkins (2006) argues that one significant contribution of globalisation on labour markets and the mechanisms in the global economy is that it leads to job creation. Although globalisation is often criticised by increasing competitive pressures and market volatility, however, it provides many organisations and nations with new markets and resources as well as a broader net to attract valuable knowledge and skills (Ehambaranathan, Samie & Murugasu, 2015). According to Dreher (2006), globalisation has a positive impact on the welfare of the country. Globalisations have eliminated boundaries, and as a result, more countries are entering into efforts to find cheaper and more qualified labour. The growth in trade is connected with the internationalization of business in manufacturing corporations

Empirical research shows that globalisation increased trade, foreign direct investment (FDI), and international technology transfer (Jenkins, 2006). The process of globalization is a global economic order which leads to the progressive integration of the world economy through pulling the barrier of trade, exchange rate, and greater mobility of factors of production (Bhandari & Heshmati, 2005).

Challenges of Globalisation

Contentions over the uncertainties of globalisation on businesses and different societies worldwide have, over the years, generated diverse opinions on whether it should be encouraged or discouraged. Although some researchers and academics see globalisation as a form of unavoidable interdependence among countries which equally leads to national development, however, radical scholars consider it as a form of imperialism consciously which is designed to further exploit the resources of the developing nations and perpetuate their poverty in the interest of developed countries (Onwe & Nwogbaga, 2014). Empirical research shows that some countries have been unable to take advantage of globalisation, and their standards of living are dropping further behind the wealthiest countries (World Bank, 2004; UNDP, 2004). Research shows that given the pace of globalisation, increased trade and travel have facilitated the spread of human, animal, and plant diseases, like HIV/AIDS, SARS, and bird flu, across borders. The AIDS crisis, in particular, has reduced life expectancy in some parts of Africa to less than 33 years, and delays in addressing the problems caused by economic pressures, have exacerbated the situation. Globalisation has also brought at increasing use and abuse of cigarettes and tobacco, especially in developing countries, with significant adverse health and financial costs associated with that (World Bank, 2004). Another severe effect globalisation is the increasing interdependence of countries in a globalised world, which makes them more vulnerable to economic problems, for example, the Asian financial crisis of the late 1990s.

Literature reveals that trade liberalisation and technological improvements have changed the economy of many countries, destroying traditional agricultural communities and allowing cheap imports of manufactured goods. The phenomena have resulted in rising unemployment, particularly in developing nations. Globalisation creates artificial 'brain drain' of skilled workers in developing countries, as highly educated and qualified professionals like doctors, engineers, and IT specialists migrate to developed countries to benefit from the higher wages and more celebrated career and lifestyle prospects. This creates severe labour shortages in developing countries.

Aslam and Azhar (2013), in their research on the topic globalisation and development: challenges for developing countries highlighted the effects of globalisation including rising unemployment, employment, poverty, income inequality, environmental pollution and degradation, climate change, and so forth. Cao, Zheng, and Zhang (2019) discovered that although globalization represents an intriguing new way to increase global prosperity, however, it creates a dramatic contrast to events in previous centuries, both in the West and in China, when most unions resulted from warfare and conquest rather than from peaceful negotiations. Besides, the study found that globalisation has contributed to an increase in military conflict and a decrease in political stability in many parts of the world in recent years (Cao et al., 2019).

In advanced nations, research shows that inequality has increased. The middle and lower-middle classes (whose income is between US\$15,000 and US\$35,000 PPA) are in relative decline, due in part to globalisation, the effect of the Great Recession and the impact of the skill-substituting technological and digital revolution we are witnessing (Milanović, 2016; Milanović & Roemer, 2016; World Bank, 2016; ILO, 2016). In the emerging economies, there is a growing risk that the introduction of labor-

saving technologies can reduce the trend of employment creation that has been driving prosperity in the last decades (Teulings & Baldwin, 2014). Globalisation brings to the fore governance challenges, which may cause problems for some countries with less developed legal frameworks.

4IR AND FUTURE OF WORK

The most significant question that one needs to ask is, how does the future hold for work in the 21st century? According to Karoly and Panis (2004), three major trends will shape the future at work in this 21st century, namely: shifting demographic patterns, the pace of technological change, and the path of economic globalisation. Karoly and Panis (2004) pointed out that governments and employers, as well as stakeholders all over the world, need to consider the implications of these trends for critical aspects of the future workforce and workplace, including the size, composition, and skills of the workforce; the nature of work and workplace arrangements; and worker compensation. The scholars argued that the pace of technology would almost certainly accelerate in the next 10-15 years, with synergies across technologies and disciplines generating advances in research and development, production processes, and the nature of products and services. Technological changes, for example, in microprocessors, will support real-time speech recognition and translation, and artificial intelligence and robotics are likely to advance further. The use of more intelligent robotics in manufacturing will help the ability to quickly reconfigure machines to produce prototypes and new production runs, with implications for manufacturing logistics and inventories. Further technological advances are expected to continue to increase demand for a highly skilled workforce, support higher productivity growth, and change the organization of business and the nature of employment relationships. Also, the future reach of economic globalisation will be more extensive than before, affecting industries and workforce segments relatively insulated from the trade-related competition in the past.

It has been argued that disruptive changes to business models as a result of the emergence of the 4IR is likely to have a profound impact on the employment landscape over the coming years. Many of the significant drivers of transformation currently affecting global industries are expected to have a significant effect on jobs, ranging from significant job creation to job displacement, and from heightened labour productivity to widening skills gaps (World Economic Forum (WEF), 2016). New evidence shows that, given the pace of the 4IR, approximately 65% of children entering primary school today will ultimately end up working in completely new job types that do not yet exist. In such a rapidly changing environment, the ability to forecast and prepare for future skills requirements, job content, and the aggregate effect on employment is increasingly critical for businesses and governments (WEF, 2016).

As the 4IR unfolds worldwide, the future of some jobs can be expected to develop with both standard and differentiated characteristics across different countries and regions globally. The WEF (2019) indicates that vulnerable jobs that require a high level of physical work and repetitive tasks will be most affected by the 4IR. Several reports revealed that those industries that will be hit by the IR include retail & trade, transportation, agriculture, admin, office & support, accommodation & food services, and production & manufacturing industries (WEF, 2017). It was reported that jobs in cookery, writing, tourism, design, and medical care, for example, where human qualities are essential, will be more resistant to change (WEF, 2017).

Conversely, the WEF (2017) report indicates that other areas that will witness stable demand for years to include media and entertainment, consumer products, healthcare, energy, professional services, ICT, mobility, infrastructure, and financial/investor services. According to WEF (2017), major industries that will buffer against the possibility of unemployment in the future are artificial intelligence, robotics, 3D printing, nanotechnology, quantum computing, biotechnology, autonomous transport, aerospace, and genomics.

It was discovered that installation and maintenance jobs, for example, will see significant productivity enhancements and steady growth in green tasks such as the installation, retrofitting, repair, and maintenance of smart meters and renewable energy technologies in residential and office buildings (WEF, 2017). Additionally, evidence shows that automation of checkout processes and intelligent inventory management through sensors and other applications of the Internet of Things are some of the factors expected to lead to a decrease in demand for traditional roles in the Sales and Related job family. Furthermore, it was found that two job families, namely: business and financial operations and management, will be affected negatively (Schwab, 2015). However, there will be strong employment growth in the computer and mathematical job families (WEF, 2017).

According to the WEF (2018), advances in mobile internet are likely to have a significant impact on future jobs like the aviation, travel and tourism industry, the financial services & investors industries, and in the consumer industry. It has also been found that the rapid adoption of new technologies by consumers, as well as advancements in cloud technology, are set to drive growth in the ICT industry. At the same time, the availability of big data is expected to have an even broader impact on the financial service and investors and the energy utilities and technologies industries (WEF, 2018). However, the WEF (2018) explains that among non-technological drivers of business growth, increasing affluence in developing economies is poised to drive growth in industries such as aviation, travel and tourism; global health & healthcare; and chemistry, advanced materials, and biotechnology industries.

Frey and Osborne (2013) discovered that jobs in the banking and financial industry, which are at high risk, include loan officers, receptionists, and information clerks' financial advisors. Conversely, future jobs related to the banking and financing industry include user experience designer, behavioral psychologist, algorithmic risk specialist, community builder, and telematics specialists. Profita (2016) points out that in the coming year, the demand for jobs dealing with topics like innovation to zero, green innovation, and the economy will increase. Frost and Sullivan (2012) argued that change to zero is a mega vision driven by companies and governments that should enable zero carbon emissions and carbon-neutral cities. However, to achieve such vision, the demand for jobs like environmental scientists and consultants, agricultural engineers, climatologists, bioinformatics, and archaeologists, just to name a few, will increase steadily (Profita, 2016).

EFFECTS OF TECHNOLOGY AND ROBOTS ON HUMAN WORK

The pace of technological change and the use of robots are gradually replacing the traditional work often performed by workers. Technological advancement is expected to continue to increase demand for highly skilled labour, support higher productivity growth, and change the organisation of business and the nature of employment relationships. This implies that workers with obsolete skills are likely to lose their job in the coming years if they fail to upgrade their skills. The Citi and Oxford University joint report in 2016 estimated that approximately 57% of jobs across the OECD are at risk of automa-

tion. WEF (2017) reports that technological advances such as artificial intelligence and robotics have disrupted many jobs in the services sector and labour-intensive industries. Frey and Osborne (2013) warned that more than 47% of employment in advanced countries are at high risk of being automated in the coming decades. The computerisation of the labour markets is likely to cause a decline in jobs in routine and intensive tasks. In the past, computerisation was meant to support routine tasks involving explicit rule-based activities. However, new algorithms for big data are now rapidly entering domains reliant upon pattern recognition and will substitute human labour within a vast range of non-routine tasks (Frey & Osborne, 2013).

According to Ian (2014), the organisational philosophy in the banking and financing sector will witness a dramatic shift from product-oriented to customer-oriented strategies. Hence, banks and other financial institutions will have to act fast by integrating and adopting new technologies so that they can develop the ability to engage with customers anywhere and anytime. Although most banks still have many branches, the digitalization of the industry has already begun. Currently, the banking sector has gone digital to diversify their distribution channels as well as increase the customer's satisfaction (Accenture Consulting, 2017).

According to Holland and Bardoel (2016), the twenty-first century has witnessed a significant expansion in the use and availability of technology, which has created a paradigm shift in how we can work. Morgan (2014) explains that many fascinating things are occurring in the world of technology that is impacting on work. The use and control of IT provide several opportunities for workers to be innovative in their work. Evidence suggests that technological advances can offer an unprecedented level of electronic monitoring and surveillance of work and employees both inside and outside the workplace (Holland, Cooper, & Hecker, 2015), and have the potential to create 'deadly combinations' (Becker, Huselid, Pickus, & Spratt, 1997), mainly when linked with HR practices designed to develop trust and high commitment relationships. This technological advancement can be likely to have a significant negative impact on work and employees.

As discussed above, scholars such as Jee (2017), Peters (2017), and Schwab (2015) postulated that robotics could and will change people's lives shortly. According to them, technically, robots are automated motorised tools. These robots can cook food, play our music, record shows, and even drive cars. Robots can improve the quality of people's lives at home, work, and many other places (Xu et al., 2018). Customised robots can create new jobs, improve the quality of existing jobs, and give people more time to focus on what they want to do.

UNCERTAINTIES IN WORK FAMILY SATISFACTION

According to WEF (2019), expected employment changes over the next five years vary widely by job family (or category). The survey released by the WEF (2019) revealed that job family such as Office and Administrative" will witness the most significant drop with 4.91%, much more than the decrease in "manufacture and production" at 1.63%. The survey showed that the main drivers of the reduction in "Office and Administrative" are big data, mobile internet, cloud technology, workplace flexibility, and so on. The data showed that expected declines in "Manufacturing and Production" employment also would be driven by technologies that can substitute human labour.

However, some categories job family showed an increase on employment, such as “Computer and Mathematical” (3.21%) driven by changing nature of work, flexible work, sharing economy, big data and internet of things, and “Architecture and Engineering” fueled by the need for skilled people to run and manage new technologies like robotics, autonomous transport, new energy supplies, and 3D printers. The WEF (2019) has identified a number of job families that will be affected by globalisation and 4IR including Architecture and Engineering (i.e Robotics, autonomous transport, climate change, natural resources, Internet of Things, advanced manufacturing, 3D printing, changing nature of work, flexible work, new energy supplies and technologies and geopolitical volatility); Computer and Mathematical (rapid urbanization, middle class in emerging markets, changing nature of work, flexible work, sharing economy, crowdsourcing, processing power, gig data, Internet of Things, geopolitical volatility, mobile internet, cloud technology and consumer ethics, privacy issues); Installation and Maintenance (i.e climate change, natural resources, changing nature of work, flexible work, mobile internet, cloud technology, Internet of Things); Manufacturing and Production (i.e advanced materials, biotechnology, robotics, autonomous transport, new energy supplies and technologies, middle class in emerging markets, climate change, natural resources, geopolitical volatility, changing nature of work, flexible work, longevity, ageing societies, advanced manufacturing and 3D printing); Business and Financial Operations (i.e sharing economy, crowdsourcing, middle class in emerging markets, changing nature of work, flexible work, young demographics in emerging markets, geopolitical volatility, climate change, natural resources, processing power, big data, mobile internet, cloud technology, consumer ethics and privacy issues.

WEF (2018) in its survey discovered that the rapid adoption of new technologies by consumers and advancements in cloud technology are set to drive growth in the Information and Communication Technologies industry, while the availability of big data is expected to have an even broader impact on the Financial Service and Investors and the Energy Utilities and Technologies industries. New energy supplies and technologies, in tandem with advances in computing power, are set to drive gains in the Energy Utilities and Technologies sector. Among non-technological drivers of business growth, increasing affluence in developing economies is poised to drive growth in the Aviation, Travel, and Tourism; Global Health and Healthcare; and Chemistry, Advanced Materials, and Biotechnology industries.

SOLUTION AND RECOMMENDATION

It is an undeniable fact that the 4IR and globalisation have brought about uncertainties around the future of work. It is evident that given the pace of globalisation and 4IR, robotic technology is set to be adopted by companies depending on the industry. The 4IR creates main opportunities for innovative technologies to be integrated into different scientific and technical disciplines. Leading researchers have argued that that smart human intelligence, knowledge, and skills are required to fit into the scope of the 4IR. The 4IR is found to have profound effects on many spheres, not least of which is jobs and employment. Although industries are creating fewer jobs, those jobs require advanced skills. This implies that workers who have no advanced skills will become obsolete. Studies suggest that globalisation has created several changes, particularly in the socio-economic and political environments in which work organisations operate, and this has, in turn, engendered various types of changes within work organisations themselves. Although globalisation may be seen as a potential threat, increased employment in developing countries is seen as a significant contribution to reducing poverty. For employers and employees to keep pace with the new technologies and globalisation, there is the need to invest in skills training and development. Skills

training and development should focus on critical areas such as analytical skills, cognitive skills, social skills, emotional intelligence, technical skills, creativity, and ICT literacy. Also, governments, organisations and civil society should collaborate to design a future sustainable job ecosystem corresponding to the 4IR. Furthermore, academics institutions should conduct mid-term and long-term research development and educate R&D personnel with governmental support regarding the implications of globalisation and the 4IR.

DIRECTIONS FOR FUTURE RESEARCH

The 4IR is likely to shift from labor-intensive production to knowledge and skills-intensive output in the coming years. This means that governments, as well as organisations over the world, will need an adequate pool of available digital, technical, commercial, and management expertise to propel the immediate adoption and use of emerging technologies. Shortly, human ingenuity and creativity may become more, not less, prominent in the production of goods and services. Hence, it is essential to study the drivers of the shift from the labor-intensive production to knowledge and skills-intensive production. Future studies should also focus on how the infusion of technologies and globalisation into the world of work will improve productivity as well as reduce job loss.

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KEY TERMS AND DEFINITIONS

Environmental Changes: Environmental forces that can exert pressure on organisation including economic, political, social, cultural, legal, religion, population, ecology, and competition.

Globalisation: The growing economic interdependence of countries across different boards through the increasing volume and variety of ‘cross border’ transactions in goods and services and of international capital flow as well as through the more rapid and widespread diffusion of technology.

Structural Changes: These encompass of organisational structure such as the system of communication, authority, workflow, planning, controlling, directing, motivating, leading, and so forth. Moreover, alteration and modification of the structure of an organisation including the appointment of a new director, the election of the new board, and new management, are all structural changes.

Technological Changes: Technological changes encompass new products, new techniques of production, upgrading of the quality of labour force, the introduction of new skills, and improvement in the quality of management. It also includes invention and innovation.

Chapter 13

Disruptions of the Fourth Industrial Revolution: Implication for Work–Life Balance Strategies

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ABSTRACT

The Fourth Industrial Revolution has resulted in the disruption of the world of work whereby technological innovation such as artificial intelligence (AI) and robotics. These disruptions may be creative in that as some jobs are lost due to the development of artificial intelligence, new ones are created. This chapter explored the impact of disruptive technological innovations on the future of work. The skill gaps brought about by the emergence of the Fourth Industrial Revolution was also explored in this chapter.

INTRODUCTION

Scholars have predicted that the Fourth Industrial Revolution (4IR) will result in the disruptions of the status quo, whereby organisations systematically replace human capital in their day-to-day operations with the use of artificial intelligence (Peters, 2017; Rubery, 2019). In other words, 4IR is regarded as a process that will bring about disruptions in the world of work. These disruptions may be creative in that as some jobs are lost due to the development of artificial intelligence, new ones are created. However, how new jobs will be created, and the skill set that will be required for the new jobs, have not been clearly defined.

DOI: 10.4018/978-1-7998-3347-5.ch013

The fundamental characteristics of the 4IR are innovations such as artificial intelligence (AI), robotics, nanotechnology, 3D printing, big data and cloud computing, internet of things (IoT), autonomous vehicles, genetics and machine learning. It is no gainsaying that the nature of work is being altered as a result of the emerging Industry 4.0, as it is sometimes referred to. To successfully embrace the 4IR, many firms will need to support the technological transformation with training and development of the workforce to fill the emerging skills gap (Romero, Stahre, Wuest, Noran, Bernus, Fast-Berglund & Gorecky, 2016).

The emergence of the 4IR implies that workers can have access to their office activities from remote locations, which enables them to carry out job functions from any part of the world. The advancement in technology has completely changed the way people work, thereby resulting in a shift in the ability of individuals to achieve a balance between work and family. As suggested by Ras, Wild, Stahl and Baudet, (2017, p.430) the “roles of the workforce are changing from being production-centric to being knowledge and data driven, reacting to the change in demand in the associated workplaces.”

DISRUPTIVE INNOVATION IN THE FOURTH INDUSTRIAL REVOLUTION

The concept of disruptive innovation was developed by Clayton Christensen to explain the development in technology, invention and ideas which defy conventional knowledge (Meyer, 2010). The concept of disruption is also used in the business arena to refer to a situation whereby the development or improvement in existing product satisfies the mainstream market (Christensen, Raynor & McDonald, 2015; Meyer, 2010). Taking a cue from Christensen et al. (2015) and Danneels (2004), disruption in the 4IR refers to a process of technological transformation, which operates through a specific mechanism and has a specific consequence. The 4IR is presumed to enhance global standard of living resulting in the improvement in the quality of life of people globally (Schwab, 2016). However, as the 4IR continues to birth various technological innovations which make life worth living, Daneels (2004) suggests that the revolution in technology could also widen inequality and disrupt global labour markets.

The disruptive technologies typically demonstrate a rapid change in capabilities in terms of performance relative to alternative approaches (Manyika, Chui, Bughin, Dobbs, Bisson & Marrs, 2013). Manyika et al. (2013) further argue that an economically viable disruptive technology must have a far-reaching impact on organisations, products, services and consumers’ shopping experiences. The disruption of the 4IR is a technological innovation that brings about changes in the way businesses are conducted (Smith, 2019). Various businesses, in the bid to not be left out of the 4IR buzz, are incorporating new technological innovations to stay competitive and enhance profitability. Therefore, the disruptions brought about by the 4IR involve innovations such as e-commerce, autonomous vehicles, 3D printing, quantum computing, augmented reality, nanotechnology, blockchain and many others.

Disruption is not only limited to the 4IR. Disruption in the 4IR has also been reported in the global health sector. A study conducted by PricewaterhouseCoopers (PwC) revealed that consumers are willing to have human doctors replaced with AI and robotics because these are perceived to be more accurate and accessible (Brown, 2018). The study by PwC is an indication of the transformation of global health care and the readiness of the people to embrace AI as the new normal for their health care needs. Kaplan (2017) linked the disruption in the health care sector to two sources, which include government formulating policies to reshape the big picture business model, and grassroots startups that employ technology to challenge the status quo. The global health care crisis can be a thing of the past if disruptive technologies can thrive through the formulation of favourable policies. This may be achieved by allowing

disruptive businesses to compete and take a share of the health care load (Glabman, 2009). Therefore, disruptive innovation in the health care sector involves technologies, products, and/or services which are less-expensive, simpler, and more convenient making it possible for people in need of health care to have access and care for themselves (Plsek, 2014). Summarily, in addition to the benefits, disruptive technologies of the 4IR will result in the loss of jobs, earnings, employee health, distortion of the structure of interpersonal relationships at work, as well as create a skills gap in the workplace.

THE SKILL GAPS IN THE FOURTH INDUSTRIAL REVOLUTION

The widest and possibly most universal criticism about skills remains the knowledge that there exists a systematic shortfall in skills across a whole age-group of the population, thereby leaving a skills gap. Normally the argument is that the deterioration is linked to the inadequate skills of school leavers, and the reason adduced for the shortage is that schools have been unsuccessful in transferring the required skills, so academic performance of pupils has deteriorated (Meyer, 2010; Morrar, Arman & Mousa, 2017).

One of the effective steps taken in the 1990s to address the skills gap was the school-to-work movement, which emphasised that the method to advance student skills and to grow employability was to align students and employers together in a bid to provide flawless transition from school into work (Lerman, 2003; Stern, Dayton & Raby, 2003). The alignment resulted in the adoption of apprenticeships, coop courses, internships and other engagements that are valuable in helping students to use a practical approach such as workplace scenarios in skills development. In the United States of America, the School-to-Work Opportunities Act of 1994 (STWO) enabled directorial and financial support to assist in ensuring effectiveness (Stull & Sanders, 2003).

The 4IR brought about a wave of innovations in the manufacturing sector which cut across the value chain (Thoben, Wiesner & Wuest, 2017). The current advancement in industries necessitates changes in processes on all stages of mechanisation. Novel cyber physical systems (CPS) enabled the employment of data to advance work of humans and automation by machines (Krugh & Mears, 2018; Thoben et al., 2017). The convolution of systems configuration, operation, and maintenance is growing because of the following factors: (a) Horizontal integration of the value network, (b) Vertical integration of networking production systems, (c) Digital continuity of engineering across the whole value chain, (d) Dynamic adaptation of business and engineering processes, and (e) Data-driven planning and steering of production processes. To adequately manage these complexities, specialists are required to prepare adequate preparation and description of models as a foundation, coupled with smart assistance systems and data analysis methods, which support complex question solving in the 4IR environment (Romero et al., 2016; Smith, 2019).

Another complexity to consider in the 4IR is the looming disruption to jobs and skills as the required skills set across industries will be different from what is currently obtainable (Manyika et al., 2013). In the manufacturing sector, occupations with diverse activity profiles are affected by the developing and anticipated further change. For instance, specialists working in the process of production systems will have to obtain fundamentally altered skills, with the scope of their responsibilities changing (Thoben et al., 2018; Krugh & Mears, 2018). Likewise, specialists saddled with networking of production system apparatuses will have to institute interconnectivity and interoperability across dispersed system constituents and data streams. In as much as changes brought about by the advent of 4IR will alter many conventional required skills to 4IR compliant ones, the inevitable of some jobs disappearing, and

emerging new jobs skills needs related to 4IR, termed ‘collateral’ effects, would still entail non-routine work demanding human expertise entrenched through hi-tech items. It is pertinent to know that the more dependent humans are on automation and robotic inventions, the more highly-skilled, qualified and practiced people are required to make the systems irrepressible, acting as the last line of defense against presumed, anticipated and sometimes inevitable failures (Arntz, Gregory & Zierahn, 2016; Spöttl, 2016; Frey & Osborne, 2013).

The disruption in the labour market is evident by the adoption of automation by many firms to conduct routine tasks or carry out job functions. Organisational adoption of new technology implies a tremendous need for reskilling and upskilling to meet the demands of the 4IR especially in developing countries such as South Africa (White et al., 2015; Balkaran, 2017). In other words, the continuous change in the digital landscape does not imply the availability of relevant skills and knowledge required to apply digital thinking in business process. While the adoption of technology may hasten and efficiently complete job tasks, it does not have the social and cognitive skills needed in the day-to-day operation of a business.

The 4IR narratives explain the perspective of technology as a disruption and innovation enabler in the current 21st century. The development of AI is an evidence of the disruption of the 4IR in that as AI provides solutions to many complex problems and offers new frontiers to societal development, threat is also posed to employment (Xu, David & Kim, 2018). The 4IR highlights the flashpoints of innovations such as big data, AI, block chain, cloud computing, 3D printing, biotechnology and nanotechnology. The technological innovations are drivers of change with each interacting in various directions and intensifying one another (World Economic Forum, 2016). These innovations are already altering the way we work, live and cohabit with other billions of mankind and devices that are associated with our daily work and family lives.

Here, technology is just a part of the journey and the other part is the global consciousness on how we need to accept the present realities of the 4IR mantra. The various governments and their parastatals, firms and the informed workers’ involvement should not be that of observers but active participants. A report released by LinkedIn suggests that 76% of hiring managers are of the view that the 4IR will have a significant impact on workforce recruitment globally (Anonymous, 2019). This implies that the 4IR will eventually usher in a new age of world of work and improved quality of life which may widen the skills gaps (World Economic Forum, 2018).

Schwab Klaus, speaking at the world economic forum in (2016), affirmed that “we do not yet know how the 4IR will unfold, but one thing is clear; the response to it must be integrated and comprehensive, involving all stakeholders of the global polity from the public and private sectors to academia and civil society.” The highlights of the disruption resulting from the 4IR as suggested by Schwab (2016) include:

- Newer technologies and platforms will allow governments to engage better than their citizens and improve their protection.
- Disruption emanates from simple, innovative businesses using global digital perspectives to remove well-established incumbents by improving the quality, speed and price of such services.
- The revolution will have a significant impact on workers/employees’ work-life balance and family health and satisfaction.

Furthermore, the 4IR is understood to be the mix between technology advancement and breakthrough in the arena of AI, robotics, autonomous vehicle, 3D printing, nanotechnology and quantum computing which had created a complex web for a new opportunity for the firms (private mostly, and public),

governments and people alike (Romero et al., 2016; Schwab, 2016). The major and critical thinking is that this revolution will be exceptional for the speed of change and will also be complex and deeply inter-connected globally.

THE FUTURE OF WORK IN THE FOURTH INDUSTRIAL REVOLUTION

The debate over the technological disruption of work is not a recent phenomenon. History has shown that technological innovations are often followed by a process of disruption resulting in a paradox (Frey & Osborne, 2013). This paradox stems from the notion that, as enormous wealth is created as a result of the technological innovations, there are also undesired disruptions. This argument resonated with the World Economic Forum (2016), as it was revealed that past technological innovations resulted in wealth creation which were not devoid of risk or difficulty.

The 4IR is driven by technological innovations which are expected to impact on the global labour market. A study conducted by McKinsey Global Institute revealed that one-fifth of the global labour force will be affected by the adoption of AI and automation by firms (Change, 2019). An example of the jobs that are rapidly fizzling out due to automation is airline ticketing agencies jobs. Many customers of airlines can book their tickets online using their phones or personal computer in the comfort of their homes. This implies that the jobs of ticketing agents, which used to be considered lucrative especially in developing countries, are no longer relevant in this age of the 4IR revolution.

Economists have attributed the upsurge in the poor performance of labour markets globally to what is referred to as technological unemployment (Frey & Osborne, 2013). Frey and Osborne (2013) argue that the decline in routine jobs that adopt a well-defined process such as manufacturing and banking jobs are linked to the development of AI, which could carry out the job functions better than humans. Recently, Standard Bank of South Africa announced the retrenchment of 1200 employees and the closure of 91 branches due to digitisation and the adoption of AI in the operation model of the bank (SABC, 2019). The continuous adoption of AI by firms globally is an indication that the skill sets that are relied upon by the firms in their day-to-day operation will be replaced by AI.

The 4IR has brought about a global shift in the world of work. The global shift is characterised by a variety of new technological innovations which are melding the physical, digital and biological worlds, affecting all countries and industries, and even challenging the status quo on what it means to be human (Schwab, 2016). Anderson (2012), in his submission on the global shift, relays the following instances:

- Continuous advancement in technologies such as 3D printing and AI will afford entrepreneurs with new ideas to establish SMEs with lower start-up costs, which may bring the development of new products to reality.
- Increasing trends in AI point to significant economic disruptions in the nearest days. Although AI solves human problems and increases new opportunities for economic growth, they pose danger and threat to employment relationships (Manyika et al., 2017). For instance, self-driving cars will soon take over the taxi and Uber drivers' jobs resulting in the loss of jobs.
- Technological innovation will give rise to the emergence of new skills which may create new job opportunities and expand the global labour market.
- Robotics science will also change the future and work-life experience. This consequently will improve the quality of individuals' lives at work and home.

- The internet, where the internet working of physical devices is possible, makes the connectivity of devices; systems and services go beyond machine-to-machine communications and cover a variety of protocols, domains, and application (Holler et al., 2014). In their submission, Gershenfeld and Vasseur (2014) maintained that the number of computers on the internet will surpass the number of people on planet earth.

WORK-LIFE BALANCE STRATEGIES IN THE FOURTH INDUSTRIAL REVOLUTION

Work-life balance (WLB) emerged from the notion that every employee deserves to have a good quality of life such that time and effort devoted to work does not encroach on the quality of time devoted to non-work activities (Ganiyu, 2019). Work-life balance strategies (WLBS) refer to organisational policies aimed at helping employees address stressors emanating from work and family domains (Ganiyu, Derera, Fields & Atiku, 2020). WLBS are considered one of the most valuable HR tools used by organisations to enhance employees' productivity (Abe, Abe, Ziska Idris, 2018; Ganiyu et al., 2020). Strategies of WLB include, but are not limited to, a flexible work arrangement, and a health and wellness programme. There has been suggestion that the 4IR will enhance the achievement of WLB. Jensen, Forlini, Partridge and Hall (2016) argue that the concept of work-life emerged from two basic issues. The first was the childcare programme, which stems from the increasing number of women entering the labour force in 1970s and 1980s. The second was traced back to the adoption of Employee Assistance Programs (EAP) that were introduced by many organisations in the 1970s. Jensen et al. (2016) explained that the catalyst that propelled the attention given to WLBS in the 21st century include the increasing number of women entering the labour force, the media, the attempt to build corporate image and reputation, feedback and demands from employees, and the emergence of professional group and consortia. Supporting the position, Lewis, Gambles and Rapoport (2007) argued that the attention accorded to WLB in the 21st century by researchers, media and organisations brought about the impression in some quarters that WLB is a new area of concern or a transient fad. However, empirical evidences have proved the contrary. The complexities of the 21st century and organisational factors such as work schedule and demands propel the copious attention given to WLBS by researchers and practitioners (Mazerolle, Eason & Trisdale, 2015). Perry-Jenkins, Morris and Madsen (2007) argued that the attention given to WLBS by researchers and practitioners is stimulated by high global competition resulting in mergers and acquisitions, downsizing, government policies, demographic changes, the increased complexity of work and family roles, the high amount of occupational stress and its impact on workers' health and wellness.

WLB has been a key issue in the 4IR. The development of 5G network AI and IoT are completely changing the structure of work. Flexible work arrangements (FWA) are considered a component of WLBS that are crucial to the emerging 4IR. The technological innovations are presumed to enhance FWA options such as telecommuting and remote work arrangements. Wise and Bond (2003) highlight four factors that drive organisations from adopting WLBS such FWA; these include: (1) to build goodwill in order to attract the best talent, (2) to curtail undesirable work practices such as long hours of work, (3) employees' retention, and (4) to develop organisational culture through employees' inclusiveness and motivation. The inability to access and use organisational WLBS such as FWA may result in low productivity, higher stress, work-family conflict and health disorders (Russo, 2015).

IMPLICATION OF THE FOURTH INDUSTRIAL REVOLUTION ON HUMAN CAPITAL DEVELOPMENT

Evidently, modifications in the skills gap as a result of 4IR have consequences for labour protection, public policy, commerce, and the social order in general (Malý, Sedláček & Leitão, 2016). These modifications also have significant consequences for career advancement and how conspicuous representations and perceptions in career examination and training can suit them. Some of the most persistent issues for career development that occur from the changes related to 4IR could be likened to (a) be self-focused and malleable in one's career improvement, (b) participate in self-concentrating career management in its entirety, (c) build a sense of importance and distinctiveness in the work role notwithstanding inconsistent work engagements, and (d) protect work that is able to accomplish simple human desires in spite of the loss of conventional employment interactions. Suggested mitigating factors to address the challenges are in the works of these authors respectively. Ability to adjust to the inevitable changes (Hall, 2004), adjustment to be relevant across borders/ internationally (Müller, Buliga & Voigt, 2018), social cognitive career theory, career building and life scheme (Savickas, 2013; Savickas et al., 2009), and the psychology of working theory (Blustein, Kenna, Gill & DeVoy, 2008; Duffy, Blustein, Diemer & Autin, 2016), appear predominantly helpful.

The use of technology will be the main avenue through which mining firms efficiently enable additions, low cost and profitability improvement in order to improve the price volatility in years ahead. The adaption of IoT, which gives rise to inter-networking of physical devices like mining machines/equipment, vehicles, buildings, electronic devices and sensors in order to facilitate the use of revolutionary developments such as big data analysis, AI and automation, is the most significant step miners can take in obtaining and achieving a competitive advantage.

The following will be the flashpoints and milestones of the 4IR for highly competing firms and knowledge workers:

- Market expansion for investments.
- Clients' interest in more investments depending on the industry segment.
- The welcome of digital transformation.
- Competitive and peers will be monetising the successes of the 4IR.
- The 4IR readiness index assesses the market maturity of about 50 economies.
- Back to back (B2B) surveys will help analyse future technology strategies of companies by industry.
- The success stories of organisations using 4IR technologies will inspire members as they continue to innovate.
- The 4IR readiness index will benchmark each country by institutionalising frameworks including a technology policy.

CONCLUSION

The 4IR is not only a concept of technology-driven change but that of the disruptive innovation that positively and significantly affects our major firms and industries, as well as our education, health, business and government corridors. With the infusion of AI and machine learning ability, robotics engineering

has become smarter and autonomous, although still lacking moral reasoning. This limitation impinges their capability in making good and ethical calculations in critical and complex work environments.

There is no gainsaying that the industrial revolutions stages had changed from the mechanisation of production from the first industrial revolution to the mass production in the second; then, the automation of production in the third, while considerable advancement is seen in the journey toward the 4IR. The 4IR has the ability to make even bigger and greater improvement on every facet of lives, as compared to the previous three industrial revolutions in totality.

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Chapter 14

Green Work–Life Balance and Global Leadership in Industry 4.0

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ABSTRACT

Industrialization brought about by the development in science and technology is like a double-edged sword. Despite the benefit of the massive industrialization to humanity, it is noted to exert huge pressure on the ecosystem and the environment. Green work-life balance is an emerging concept aims at reshaping the work-life debate by introducing environmental dimension. Employees as agents of change are saddled with the implementation of organizational green work-life balance policy. However, the implementation of green work-life balance policy across the diverse culture by multinational companies poses a serious challenge. This chapter explores green work-life balance and global leadership in Industry 4.0.

INTRODUCTION

Industrialisation brought about by advancement in science and technology is like a double-edged sword. Despite the benefit of massive industrialisation to humanity, it is noted to exert huge pressure on the ecosystem and the environment. In other words, industrialisation came with both laudation and scepticism especially regarding an increase in the greenhouse effect on the planet. There is an upsurge in the level of ecological contamination emerging from industrial waste, which necessitated an increase in the enactment of guidelines by government and private sectors for the purpose of reducing the damage to the ecosystem and the eventual adverse effect on communal well-being (Martinez- Fernandez & Hinojosa, 2010). Boiral (2006) posits that there is improved acceptance and awareness of the need to manage the environment strategically, however, it much be given much importance as companies' bottom-line.

DOI: 10.4018/978-1-7998-3347-5.ch014

Green work-life balance is an emerging concept aimed at reshaping the work-life debate by introducing the environmental dimension. As an emerging concept in green human resources management (HRM), green work-life balance places emphasis on the development of environmentally friendly values and behaviour in employees' work and family domains (Datta, 2011; Vasa & Thatta, 2018). In other words, it is a reconciliation of employees' work and family lives with respect to environmental values, attitudes and behaviour (Muster & Schrader, 2011). Employees as agents of change are responsible for the implementation of organisational green work-life balance policy. Green work-life balance involves availing employees with sustainable strategy which helps to promote environmentally friendly behaviour both at work and family domains.

'Eco-consciousness or colour green' as posited by Dutta and Kolkata (2012), indicates the level of attention being accorded environmental issues in individual daily lives both at work and on the home front. Consistent with this argument, Atiku and Fields (2017) suggest that global leadership is faced with environmental challenges which require a holistic multicultural orientation of the business environment. Multinational companies (MNC) have global operations which traverse cultural boundaries. The implementation of green work-life balance is aimed at promoting environmentally friendly behaviour in work and family domains of the workforce. The introduction of environmentally friendly policy to align with overall strategy of the organisation in some parts of the world by the MNC is seen as bias (Bueno, Girot & Gutiérrez-Orrantia, 2017; Tricoire, 2019). This is because such policy is perceived not to meet up with the environmental challenges in other cultures where the MNC operates. This explains the frequent demonstrations in addition to environmental activism in developing countries where people protest against MNCs regarding their corporate policies that damage the haunting beauty of flora and fauna of those countries.

The introduction of Industry 4.0 to the global scene specifically from the green eco-system perspective has been attracting scholarly attention over the past two decades (Müller, Buliga & Voigt, 2018)). Industry 4.0 is established to be synonymous with innovative experiences and a sharp departure from the traditional ways of doing things to an automated system, especially with the aid of highly-digitalised information technology. For instance, the innovative idea of electric cars has succeeded in eradicating the emission of carbon monoxide which has contributed over the years to the toxicity of the ozone layer, causing what is today known as global warming. Also, the introduction of renewable energy through Industry 4.0 has recorded an increase in the global level of energy intelligence ensuring a further reduction in global warming and enhancing the global agenda of a green ecosystem.

While considering the role and the importance of global leadership towards green work-life-balance, the focus of this chapter rests more on the implementation of green work-life balance. Green work-life balance includes everything that has to do with the implementation of conscious practice towards a healthy and sustainable environment conducive for not only habitation but also business purposes.

WORK-LIFE BALANCE

Work-life balance is a complex phenomenon that has constantly continued to spark the interest of scholars and human resource practitioners worldwide (Ganiyu, Derera, Atiku & Ziska, 2020, Ganiyu, Ziska & Atiku, 2017). There is no consensus among researchers as to the origin of the concept of work-life balance. Pradhan, Jena and Kumari (2016) argue that the concept of work-family balance emerged in the 1970s in Britain to denote the capacity of individuals to cope with work and family responsibilities.

Munn and Chaudhuri (2016) traced the origin of the concept of work-family in the United States to the 1970s when Kanter (1977) saw the benefits for organisational incorporation of policies to address the work and family life of employees. The scholars argue that the term work-family later metamorphosed to work-life to ensure the inclusiveness of all employees irrespective of the level of family responsibilities. Researchers are increasingly moving away from the notion of work-family balance, replacing it with 'work-life' balance in recent years (Deery & Jago, 2015; Munn & Chaudhuri, 2016; Pradhan et al., 2016). In scholarly articles, work is mostly referred to as paid employment, while life is referred to as everything outside of paid employment with emphasis on family ties (Akanji, Mordi & Ojo, 2015).

The notion of 'family' as used in the work-family debate includes extended relatives, parental obligations, same-sex relationships, relationships with friends, other community and support network (Amazue & Onyishi, 2016). However, while many authors in the twenty-first century prefer to use work-life balance, others prefer to stick to the traditional concept of work-family balance. The use of work-family balance stems from the view that to many individuals, work and the nuclear family are the two domains that required a great deal of attention and are also prone to conflict (Kossek, Hammer, Kelly & Moen, 2014). Kaliannan, Perumal and Dorasamy (2016) argue that work-life balance is the dividing line between work and life by which separation is ensured in a person's career and other aspects of the person's life. Therefore, many scholars and practitioners perceive work-life balance as an important measure of promoting employee commitment and satisfaction with work.

Work-life balance has generally been viewed as the absence of conflict between work-life and family-life (Pradhan et al., 2016). Organisations globally have realised that, for them to stay competitive, work-life balance can be used as a measure to attract and retain a skilled workforce. However, the concept of balance and organisational adoption of work-life balance strategy (WLBS) varies from individual to individual and organisation to organisation. As Andysz, Jacukowicz, Stanczak and Drabek (2016) put it, what constitutes balance is subjective and depends on various factors which include values, time and individual perception of balance. The authors argue that individuals may still be able to achieve a balance between work and family irrespective of the inequality in time and energy given to the two domains. Organisations perceive work-life balance as an avenue to achieve a healthy balance for employees' work and family lives (Daverth et al., 2016). WLBS are implemented to enhance employees' productivity and commitment, which can have a positive impact on organisations' bottom-line.

Work and family are the utmost vital facets of an individual as both domains are interconnected (Saleem, 2015). These two domains are such that a deficiency in one could spill over to the other. For instance, in Nigeria, the harsh economic reality has resulted in downsizing by the private sector. This coupled with the high unemployment rate and job insecurity has increased the level of stressors experienced by employees in the country. The emergence of dual earners in a family and the 'breadwinner' syndrome brought about by the family system in Nigeria is also contributory to the stressors emanating from the family domain. The imbalance in work and family domains leads to conflicting outcomes (Amazue & Onyishi, 2016; Armstrong, Atkin-Plunk & Wells, 2015). The conflict is because of the imbalance of results in stressors. Employees experiencing stressors are less satisfied with the job roles with adverse effects on productivity and turnover intention (Abe, Abe, Fields & Idris, 2018; Ganiyu et al., 2017).

Sørensen (2017) argues that the work-life debate is embedded in the assumption that an individual has choice and responsibility that tend to be gender-neutral. This gender neutrality feature of work-life balance tends to enhance inequality such that the sensitivity of gender-tension and feminism position on work-life balance is based on a concept of choice. Similarly, Rajan-Rankin (2016, p.228) documented that "globalisation and the emergence of the new economy have posed particular tensions in the reconciliation

of work and family life, against the background of often contradictory cultural discourse.” This explains why the European Commission initiated a policy to fill the gender gap challenge of work-life balance to ensure that nursing mothers can achieve a balance between work and parental responsibilities (Bouget, Spasova & Vanhercke, 2016). Pandita and Singhal (2017) argue that the rising diversity in the family and work-life indicate the need for human resource (HR) practitioners to have a clear understanding of how the dynamics can impact on employees’ work-life balance and subsequently devise a means to help employees achieve a balance between work and family irrespective of their gender.

EMPLOYEES’ GREEN WORKPLACE BEHAVIOUR

Several environmental challenges have become inimical to environmental sustainability and this has been linked to human behaviour (Steg & Vlek, 2009). Consequently, a behavioural change is required to protect and preserve the environment, hence, the green behaviour. Green behaviour is a conscious eco-friendly practice that reduces harm to the environment. Recently, employees’ green workplace behaviour has been described as environmentally friendly behaviours targeted at reducing harm to the environment for preservation and sustainability (Peng, Hou & Pang, 2019).

Companies are shifting their business strategies toward a more ecologically friendly programme. Scholars and practitioners in human resource management (HRM) are at the forefront of this eco-friendly workplace agenda, and have subsequently expanded its mandate by integrating eco-friendly management to facilitate its core HR functions (Angel Del Brio, Junquera & Ordiz, 2008). Boudreau and Ramstad (2005) posited the competences HR practitioners possess in measuring employee characters, aptitude, cognitive capacity and drive, which put HR in a position to effectively drive environmentally sustainable policies (Renwick, Redman & Maguire, 2013). As a result, HR can effectively elicit employee workplace green behaviour by strategically attracting employees with similar dispositions to environmental preservation values. In addition, the organisation can design a training, performance and reward system aligning with environmental performance. Also, a continuous ecological awareness system, strategy and broad-based knowledge can be developed (Datta, 2015).

Employee green behaviour is favourably disposed to societal protection and environmental preservation (Chou, 2014). In consideration of this, a practical system of repetitive workplace green behaviour would comprise both in-role and extra-role green behaviour (Ramus & Killmer, 2007). These roles are the bedrock of value on which green behaviour’s success is founded. The classification of these roles is dependent on the organisational structures and expectations from employees (Paillé, Chen, Boiral & Jin, 2014). There seems to be a relationship between HR and management on green behaviour as HR is saddled with recruiting eco-friendly staff and effectively ensuring green behaviour is adhered to. Similarly, Triple Bottom Line (TBL) in accounting mandated management to ensure that profitability is not the sole measuring tool for meeting organisational target such that profit is not made to the detriment of the environment. Hence, the People, Profit, Places (PPP) mandate. There are rules that require employees to behave “green,” for instance, functions involved in disposal of waste whereby employees are mandated to ensure that toxic waste is not disposed of into local water systems or that hazardous by-products or waste is disposed of in line with organisational policies and government regulations. Such behaviours are expected of employees responsible for such functions which in turn guide their daily behaviour in discharging their duties. However, extra-role green behaviour is more ambiguous as it involves several ethical duties like switching off lights if not in use or adherence to paperless communications and turning

off gadgets at close of work (Paillé et al., 2014). The importance of in-role and extra-role green behaviour is paramount to accomplishing organisational green goals (Norton, Zacher & Ashkanasy, 2014), although both roles may have different functions as employees have diverse attitudes in exhibiting these behaviours in the workplace (Hoffman & Dilchert, 2012).

LINKS BETWEEN GREEN WORK-LIFE BALANCE AND GREEN HRM

The last two decades has seen an explosion in studies exploring the interplay between green HRM and green work-life balance. The various studies aimed at bringing the issue of environmental sustainability to HRM practices such that organisations reap the benefits of environmental protection. Meta-analytic outcomes on the relationship between green work-life balance and green HRM suggest that HRM influences institutional performance through its effect on employee work ethics and behaviour (Mazur, 2016). The HRM behavioural writings also show that employee concerns of HRM are principally reliant on HRM acknowledgments (Nishii, Lepak & Schneider, 2008). Green HRM influence on employee workplace green behaviour are attributed to green HRM functions, such as propagating an organisation's green focus through green values in recruitment processes, and encouraging green values through training, with resultant effect on an increased employee green understanding (Renwick et al., 2013).

Pless, Maakby and Stahl (2012) posit that building a sustainable work strategy that is environmental-centric will facilitate improved consciousness, employee knowledge competence and skills, and which is assisted by continuous training to imbibe green activities conducts by employees. In the same vein, employees' perception of the need for green behaviour is enhanced when they understand the rationale behind HRM work green behaviour and antecedent merits attributable to such behaviour (Nishii et al., 2008). Open communication of green HRM policies clearly shows employees the organisation's dedication to green practices which may serve as a pointer and influencer on the conducts of employees acting in agreement with the organisation's green policies. In addition, a clear unambiguous reward pattern closely linked to green performance through appraisal, promotion, training and cash incentives can serve as a key motivator to engage in green work behaviour (Renwick et al., 2013).

Chou (2014) describe green climate as the prevailing psychological atmospheric green condition developed by an organisation HRM to assist such organisation to sustain its green work-life objectives; such a climate puts employees in a state of green consciousness in line with the organisation's green policy (Saeed et al., 2019; Paillé et al., 2014). Psychological green climate creates 'green champions' among staff who have fully bought into green work behaviour thereby serving as unofficial advocate to imbibe green work culture through social interactions, which also enhances the value attached to such green behaviour in the workplace (Saeed et al., 2019; Kuenzi & Schminke, 2009). By embracing green HRM practices, the organisation shows its concern for the need to preserve the environment beyond economic achievements, and also demonstrates its determination to involve employees in green-associated practices (Renwick et al., 2013). Empirical findings suggested the need to personalise green work behaviour by making employees personally responsible for the upkeep of their work tools by explicitly identifying individual's green responsibilities in the work space and properly designing reward mechanisms for adherence while sanctions will be applied for flouting such responsibilities (Chou, 2014). Green work behaviour facilitated by green climate is majorly influenced by employees' perception of the value of such behaviour in enhancing their productivity while preserving their health (Chang, Zhang

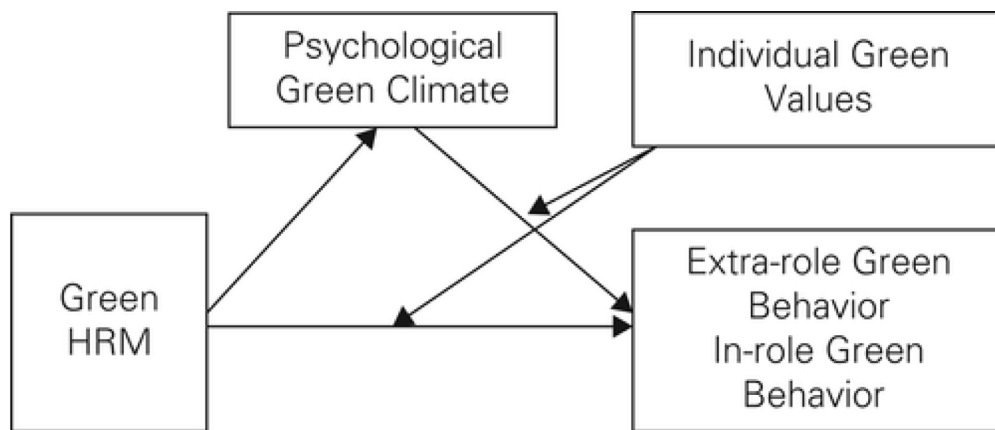
& Xie, 2015). Norton et al. (2014) agreed with these findings and proved also that there is a correlation between apparent existence of organisational environmental guidelines and employee behaviours; pre-emptive green behaviour intermediated by green climate.

Low (2013) explained the relationship between contemporary values and the significance of personal values in elucidating distinct attitudes and behaviours. Two key theories were explained in relation to the relationship, namely the supplies-values fit (SVF) theory (Edwards, 2007) and the value-belief-norm (VBN) theory (Stern, Dietz, Abel, Guagnano & Kalof, 1999). These theories majorly elucidate the effect of such values on employee behaviour. The (SVF) theory explained the compatibility of personal values with organisational values, which synchronises to produce a positive effect on employee work behaviour (Edwards, 2007). However, there are instances where value contradiction exists between an employee and the organisation. Where this is noticed it is beneficial for the organisation to advocate shared, compatible values (Paarlberg & Perry, 2007). By adopting shared value in this instance, the organisation will be able to convince the employee to 'buy' into the organisational values which will most likely result in ideal employee results, such as reinforced organisational empathy and sense of work, and positive work behaviour (Edwards & Cable, 2009; Paarlberg & Perry, 2007). Likewise, the (VBN) theory postulates that individual values, principles, and standards have significant influence on employee work behaviour (Stern et al., 1999). Pragmatic research by authors, such as Chou (2014) and Schultz, Hoffman, Fredman, and Bainbridge, (2012) showed significant influence of individual environmental values on distinct environmentally sociable behaviour. Also, it was advocated that the stronger an employee connects with his or her organisation via aligned values, the better the possibility that the employee would oblige to accomplishing organisational goals (Liu & Cohen, 2011). We can assume therefore that there is a clear relationship between personal values and organisational values which influences employee green behaviour.

Rupp, Ganapathi, Aguilera and Williams. (2006) posit that employees make clear decisions about their organisation's communal accountable policies and behaviour, and it seems these decisions determine the degree to which employees' emotional desires are fulfilled. Therefore, the (SVF) theory's central theme gave credence to the influence conducive organisational environmental values have on individual employee values in optimising employees' green values which are tantamount to flawless exhibition of green workplace behaviours. Conversely, if employees' values are different to those of the organisation or the organisation does not create a value-related environment that is in line with the desires of the employees, then the inevitable happens - which is employees not conforming to the organisation's green behaviour in the workplace. In a nutshell, it is safe to say that individual green values and organisational green values unequivocally inspire employee workplace green behaviour. In addition, green HRM practices and mental green climate express the effect of employees' decisions on the organisation's green values. Therefore, specific green values will regulate the impact of green HRM and mental green climate on workplace green behaviour. There are several other meta-analysis studies that link green work-life balance and green HRM together, among which are works by Lülfs and Hahn (2014), whose work advocates green workplace behaviour. Dumont, Shen and Deng (2017) explained the relationship between green work-life balance and green HRM in four major ways bearing in mind the relevance of organisational green environment values and individual employee values. First a distinction between behaviour requirement in an employee's role from behaviours that are voluntary was reviewed. Contemporary pragmatic research has buttressed such a distinction (Bissing-Olson, Fielding, Iyer & Zacher, 2014; Norton et., 2014). Secondly, factors that followed a structured concept

at the organisational and employee levels were reviewed to ascertain the level of influence of the different types of employee green behaviour (EGB), and how EGBs subsequently impact results at these levels. Thirdly, the study shows that a thorough examination of EGB entails a meticulous explanation of its conventional laws, and the precise bearing of connections with other important factors. As a result, backgrounds and significances of EGB were reviewed, and interceding instruments were deployed in explaining the relationships, which helps explain the circumstances that affect the survival and strength of the relationship (Aguinis & Glavas, 2012). The findings are very similar to the approach companies adopt regarding corporate social responsibility. Based on the forgoing, Dumont, Shen and Deng (2017) proposed a theory-based theoretical framework depicted in Figure 1.

Figure 1. The conceptual model adopted from Dumont, Shen and Deng (2017, p. 614)



The conceptual framework showed the symbiotic relationship existing between green HRM and green behaviour. The framework also showcases the influence green HRM and psychological green climate have on employee green behaviour and the effect of such relationships in enhancing individual green value. The connectivity of these variables as depicted above shows the possibility of a global green work-life balance agenda as global leaders make concerted effort to tackle global environmental challenges and the adverse effects on a green eco-system as the world embraces the fourth industrial revolution.

GREEN WORK-LIFE BALANCE IN THE FOURTH INDUSTRIAL REVOLUTION

Digital revolution, termed Industry 4.0, without argument is the next prevalent transformation in the business world since the last industrial revolution was in the 1970s. Therefore, Industry 4.0 connotes the fourth industrial revolution. The essential feature of Industry 4.0 is the real-time accessibility of all-important information through the combination of all items in the value chain and the volume to define the ideal worth of movement at intervals from the data. The connectivity of persons, substances, and structures facilitates vibrant, real-time multiple business value accumulating linkages that can be enhanced in line with numerous standards.

Green work-life in the fourth industrial revolution connotes safeguarding the future of human civilisation as we know it, developing a conscious resolve to tackle environmental challenges and work-life balance by providing solutions such as decreasing environmental pollution, creating efficiency and accessibility to healthcare facilities to all and sundry, inventing clean and sustainable energy and providing food security. Advent of technology has enabled the realisation of solutions to the challenges. Several studies already show this is attainable, such as through the development of essential technology such as sensors that permit a smooth interface between objects and their environment, or system software which instructs machine-to-machine communication to carry out specific instruction and job functions. Therefore, the concept of Industry 4.0 has gained massive attention in recent time, especially in the way businesses are conducted and products are manufactured with environmental preservation as the focal point of innovations and implementation.

Digitisation and automation of processes through internet has transformed many industries. Digitisation and automation of processes can be compared to a network of physical items that comprise of technology to converse, feel and interrelate with their core ‘brain’ to perform mundane acts just like humans, and to relate with the external environment, enabling limitless possibility. Cisco, one of the biggest manufacturers of network hardware and software telecom equipment, forecasts that 500 billion machines are projected to be linked to the internet by 2030. Digitisation and automation of processes (DAP) will blur the lines between machines, humans and the environment. Such environments can be workshops, driverless vehicles, smart devices, robotics, and automated grids to mention a few.

The merits of Industry 4.0 through digitisation and automation of processes involve cautious review of present procedures and infrastructure to ascertain the need for digitisation in business processes. This is necessary for proper integration of present and old systems with new devices and systems. One of the major considerations is to ascertain the reason for the need of the upgrade from old and present system. To put this into perspective, critical examination of the current applications systems, procedures, effectiveness, safety of user and ultimately the effect on the environment must be defined. This is in addition to other affiliated reviews like cost of implementing the system, the improvement in operational equipment and enhanced skills of employees, lower operational costs, reduction of wastages and other identifiable reasons for wanting to automate processes.

When a company decides to adopt Industry 4.0, it is essential the corporate mission and vision of the company reflects their new ideology as they depart from their customary comfort zone, inspiring innovative thinking which centres on novel business competencies. Therefore, the change will start with staff profiling, which is an important factor. HRM has a lot to do in this regard as they must decide the cost associated with recruiting staff that are favourably disposed to green environment, training existing staff, redeploy, and retrench redundant staff. There are other prerequisites needed for production on the one hand and the improvement of innovative technologies on the other hand. In furtherance to this, Industry 4.0 came along with notable competition from sectors not primarily contesting in some specific areas, the advent of this revolution has blurred any existing line demarcating different sectors hitherto, necessitating the need to manage the revolution consciously and most significantly. Therefore, the ideas and methods needed to be defined in support of the revolution.

Schwab (2016), executive chairman of the World Economic Forum, mentioned in his address that “we are in the middle of a fourth industrial revolution, which implies the evolving technologies cut across many fronts ranging from robotics, blockchain technology, simulations, the internet of things, nanotechnology, 3D lithography, and quantum computing among others”. Critical questions were asked in determining the relevance and effect of this revolution in changing standard of living, work-life bal-

ance, ecological effects, management of employees, and associated costs. Universally, the International Labour Organization approximates that presently 2.3 million people are exposed to work-related mishap annually. The tasks of dealing with health and safety matters in the workplace as a result of the introduction of complex machinery and automated systems due to the advent of Industry 4.0 is more urgent. More so, that it seems the reported cases of occupational hazards estimates, including fatal accidents, are grossly under-reported shows the need to substantially regulate the effect of the revolution on employee well-being, ecological effects and work-life balance respectively. Aside from the issues, the world is experiencing an ageing working population especially in Europe as reported by the European Commission (2018) Aging report, where it was projected that the working-age population will shrink considerably from 333 million in 2016 to 292 million in 2070. As a result, the senior-citizen reliance ratio (people who are 65 years and above in relation to those aged 15 to 64) in the European Union (EU) is predicted to grow by 21.6 percentage points, from 29.6 percent in 2016 to 51.2 percent in 2070. The implication of which shows that there will be a reduction from 3.3 working-age persons to two for people above 65 years in the EU. The ageing of the EU's populace has substantial consequences for its labour force, as there is an estimated drop of 9.6 percent between 2016 and 2070. In America, a joint report released by Administration for Community Living and Administration for Aging (2018) showed that the population of people in the age-range of 65 years and above increased from 37.2 million in 2006 to 49.2 million in 2016, an increase of 33 percent with a projection of substantial increase to almost 98 million in 2060. In South Africa, the percentage of ageing population was reported based on racial demography, however, the report showed all races experienced an increase in working-population aging from black Africans with 0.5 percent, to coloureds by 2.7 percent, Indians/Asians by 4.2 percent and among whites by 7.3 percent (Statistics SA, 2017). The relevance of all these aging working-class population reports is to support the concerns of critics and advocates of Industry 4.0 regulation and implementation to support work-life and the environment respectively. The reality check of this aging population report has led some countries in Europe, America and Canada to open their doors to young professional immigrants from various countries through special entry programmes such as express entry in Canada and Visa lottery programme in America. With these unwritten succession plans, sustainable green ecosystem is sustained through both in-role and extra-role green behaviour as earlier discussed.

Industry 4.0 effects are anticipated to be largely constructive with respect to efficiency, economic prospects, productivity and ease of future work processes. The World Economic Forum (2018) suggests that Industry 4.0 has the capacity to increase global earnings and increase the quality of life for the world's populace. The infusion of machine and manpower will greatly benefit the workforce in the light of the imminent deficiency of skilled labourers, the ageing workforce could prolong their job life span as most processes will be automated. Automation of work processes could also enhance work flexibility thereby promoting work-life balance. However, Garibaldo (2016) and Hirschi-Kriensen (2014) are critical of the optimism expressed by many in Industry 4.0, as they argue that the social consequences of the project in relation to unemployment and labour professional skills composition are underestimated. Garibaldo (2016) affirms that technologies are not totally independent of social structures, but they are entrenched in social and control interactions which implies that they are not biased, but rather exposed to social choices. The unpredictability stems from the effects of technology on the loss of jobs, work environment and work association (Farrell & Greig, 2016).

The scepticism in the procedures, devices, prospects and dangers that are attributable to the digital economy, especially on the costs of digital technologies on labour, manufacturing processes and environment, are more drastic in the modern representations of Industry 4.0 by institutions (Popkova &

Sergi, 2020). In addition, literature on digital entrepreneurship and techno-optimist chronicles on the Industry 4.0 explained the possibility of mankind becoming fundamentally free from the weight of tough labour-intensive work, and independent and ingenuity of labour will be unbundled as the first industrial revolution, which might build a set of technological slaves (Diermeier & Goecke, 2017). That is, devices and robots proficient in responding to instructions or executing unexpected behaviour concerned with useful purpose. Thus, the aptitude to influence codes based on logic and computations would become the controlling value behind the new specialised workshops. The cumulative interaction of human, machine and environment and the attendant real-time-oriented communication will substantially validate modifications in the business model (Müller, Buliga & Voigt, 2018).

GLOBAL LEADERSHIP IN THE FOURTH INDUSTRIAL REVOLUTION

The race to become a global brand in the fourth industrial revolution has become a national policy in some countries. For instance, China decided to centralise its global relevance on innovative exports at highly competitive cost, thereby carving a niche for itself on the world stage. There are many pointers to this fact as there are close to one hundred national high-tech industrial zones and several technology explicit groups such as Zhangjiang, Donghu, Wuhan (optoelectronics), Zhongshan (health instruments and microelectronics), Shanghai (integrated circuits and medications), Tianjin (biotech and green energy), and Shenzhen (communications) functioning in the country with widespread research and development (R&D) spending, amounting to 34 percent of all commercial R&D spending in 2010 (Blank, 2013; MOST, 2010). However, it is interesting to know that China is ostensibly lagging in engineering and science-related innovative manufacturing, notwithstanding the policies and infrastructures in support of the target by government and the private sector to improve high-tech industries. Balogh (2017) argues that time is the principal thing to show efforts put in by China's government and private sector pay off, since technological-oriented businesses such as pharmaceuticals habitually need time, sometimes a decade or more of progress and analysis, before introducing a product to the market. Bearing this in mind shows it is a matter of time before China's R&D hard work results in globally viable ground-breaking output in terms of marketable products and amplified income avenue. Nevertheless, the erstwhile observation and slow regulatory process are the other challenges and issues relating to intellectual property security. However, ineffective apportionment of government research funds could also constitute underlying challenge that defers accomplishment. Xie and Li-Hua (2008) posit there are other identified challenges confronting China such as solidification of intellectual property rights, security, building of inventive cultures and rewarding systems, and advancement of human resources (Blank, 2013). Also, one can assume that since the Chinese market is so large, local companies might not see the need to expand abroad due to the fact that some local benefits might not necessarily be available abroad, in addition to the understanding of the local environment (McKinsey, 2012).

The EU strategically focused on advancing digital infrastructure and consolidating a single market by decreasing obstacles preventing borderless trade in goods and services by employing open policies in education, such as lifelong learning processes (Barkemeyer, Holt, Preuss & Tsang, 2014; Garetti & Taisch, 2012). However, it would have been better if EU policy was designed to support European technology, an area that policymakers have previously underrated. As a result, it is profitable to establish a policy that builds a market network in which the use of new technologies is part of what the state organises. This method necessitates that the public sector openly enhance its own role as supplier, consumer, cus-

tomers and users of technology. It is essential to adopt this method if it becomes apparent that purchase and use of technology by the public sector will benefit the private sector (Barkemeyer et al., 2014). For instance, if public spending on R&D in defence leads to the development of technologies which private establishments employ to compete effectively on global markets, then solidification of the demand side of EU technology policy would boost market effects.

Another way to reinforce public acceptance for technologies that have path-breaking aptitudes is imbedded in the ability to develop a joint EU defence policy (European Commission, 2016). Proficient monetary outlay on joint defence competences and on reinforcement of citizens' safety is directly connected to a technology policy that helps to raise shared economical and inventive base for production and industrialised prosperity formation which is the benchmark of a single market.

The fourth industrial revolution has the capacity to create wealth and socio-political solidity. The EU is counselled to balance its existing policy mix of borderless markets, member countries business synergy, entrepreneurship and learning. It should form its R&D policy through a harmonised technology policy that relates to all member states. It is also essential that a technology policy should play a decisive role in an EU-wide advancement and application of the hard work to generate an innovative ecosystem that embraces academic, business and constitutional associates. This will change the public spending pattern to become more significant and translate into successful innovations that succeed in the market.

CHALLENGES OF GLOBAL LEADERSHIP AND GREEN WORK-LIFE BALANCE

While global leadership has been showcased to offer several benefits such as improvement in global human cooperation and strategies towards a common objective, it is interesting to know that it also comes with its challenges. Ajarimah (2001) submitted that the challenges of global leadership can better be understood if examined from "globalisation, population explosion, nationalism and ethnocentrism, and conflict". According to the author, the world is now a global village where distance or physical borders are no longer considered barriers to business tractions. However, globalisation becomes a challenge when global leaders have to balance between global and national interest. This may constitute a major challenge to green work-life balance agenda in terms of the balance between national and international policy. Although the world is considered a global village, inculcating a green attitude may be a Herculean task for global leadership. On the other hand, population explosion is seen as a challenge where there is an astronomical increase in population. The projected increase in world population from 7.7 billion in 2019 to 9.7 billion in 2050 will put pressure on the available resource resulting in problems such as high unemployment and high crime rates (Faddy, Gosden & Gosden, 2018; Gerland, Raftery, Ševčíková, Li, Gu, Spoorenberg & Bay). Hence, the global green agenda cannot be sustained. Similarly, nationalism and ethnocentrism are opposing ideas to the ideals of globalisation. While globalisation seeks togetherness and pushes for a common front, nationalism and ethnocentrism project national patriotism and ethnic superiority. The ideals pose to be a spanner in the works for global leadership as well as green work-life balance. Furthermore, conflict in a lay-man's definition is the absence of peace. Wherever there is no peace, globalisation agenda cannot thrive. Conflict may deteriorate into a full-blown war if not well managed, and in a war situation lives are lost. This is a great challenge to global leadership and green work-life balance agenda.

ENVIRONMENTAL SUSTAINABILITY

Sustainable development is the ability to meet present day challenges without jeopardising future generations' ability to meet their unique needs by consciously preserving the environment. This appears to be a dilemma for global leadership as frantic efforts are made to balance between technology usage and environmental protection (Ajarimah, 2001). Environmental sustainability for the improvement of employees in and out of the workplace should form the focus of global leadership.

The need for environmental sustainability is of utmost importance. Agriculture is one sector with increasingly global impact both on the environment (Edenhofer et al., 2014; Tubielle et al., 2014) and human health, frequently motivated by nutritional changes (Popkin, Adair & Ng, 2012; Hu, 2011; FAO, 2013). Agriculture contributes over 25 percent of all greenhouse gases (GHGs) by contaminating fresh and aquatic elements with agrochemicals in the process of crop production and animal husbandry thereby using about half of the available arable land space of the world (FAO, 2013).

Goodland (1995) substantiated this assumption by supporting the proponents from Morelli (2011) to Verstegen (2005) and puts forward an explanation that environmental sustainability is the preservation of natural capital and as a notion separately from, but linked to, both societal sustainability and pecuniary sustainability.

An increasing number of present day (Americans) shoppers are searching to purchase ecologically pleasant, "green" merchandises, from recycled paper to recyclable garbage stacks. Businesses have reacted with "green" advertising publicising the environmental gains of their products. However, occasionally there is an obvious mismatch between customers' expectations and the products offered by these businesses, and sometimes the reason for the mismatch is as a result of the difference between what firms consider what their green claims meant and what clients really understand these to be. The Federal Trade Commission (FTC) therefore enacted "Green Guides" which has witnessed modifications at different intervals up until 2012. The relevance of the guidelines is to help businesses to avoid making environmental assertions that misinform customers.

Green Guides were initially enacted in 1992 and were reviewed in 1996, 1998, and 2012 respectively. The highlight of the guidelines includes (a) broad principles that address all environmental marketing assertions by companies; b) by what means customers can understand specific claims and how sellers can validate these claims; and c) how sellers can certify these claims to avoid misleading customers. However, the broad relevance of Green Guides is to ensure environmental sustainability, what Morelli (2011) termed Sustainable Consumption. In conclusion it is essential to replicate these checks and balances in the global business model to ensure conscious environmental sustainability by all and sundry.

SUGGESTION FOR FURTHER STUDY

The concept of green work-life balance in environmental sustainability plays a vital role. The consciousness of green work-life balance in order to achieve the desired global eco-friendly and hazard-free environment has been placed on the stable of the workforce as a rational and ideal lifestyle and behavioural pattern. Also, organisational policies that enshrine a green attitude in the workplace were established as a pivot for this agenda. Similarly, the ingenuity of global leadership to bring about positive global policy and deployment of innovative technology to advance environmental sustainability was also pointed out. In all, environmental sustainability must be seen as a priority for all stakeholders.

This study serves as a springboard for further study in institutionalising green behaviour to achieve the goal of global preservation and protection on the environment for the future generation. Also, the introduction of eco-friendly technology for agriculture, renewable energy and pollution control are research areas that can further be explored. In light of this, it is believed that this chapter has contributed to scholarly inputs on green work-life balance and the impact of global leadership in the fourth industrial revolution era.

CONCLUSION

This chapter examines the concept of green work-life balance and global leadership in the fourth industrial revolution. The consciousness of green work-life balance starts from the stable of the workforce as a rational and ideal lifestyle and behavioural pattern, to the implementation of organisational policies that enshrine a green attitude in the workplace. By extension, the global leadership projection through positive deployment of innovative technological advancement will go a long way to enhance the sustainability of the green work-life balance agenda in the Industry 4.0 era.

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Chapter 15

Future of Work: Skill Obsolescence, Acquisition of New Skills, and Upskilling in the 4IR

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ABSTRACT

Work as we know it has changed with the emergence of the Fourth Industrial Revolution (4IR). Prior to the advent of the 4IR, skill gaps have been widening. Though the 4IR comes with bright projections, it also will predict the way things are done and the requisite skills to have. Clearly, not everyone will be up to date with the needed skills in the future work environment. Intricate underlying factors about the future of work have fuelled debates bothering on the issues of digitization on work and professions, artificial intelligence (AI), and the uncertainty of work and careers left after automation. The changing patterns of work and work arrangements, the gig economy, as well as fissured jobs (involving employment as outsourced services) are of great concern. Also rife are matters around work-skill misalignment expected in the 4IR as the presentation skills that employees have may not be relevant in the new world of work. Therefore, skill obsolescence and the need to reskill and/or upskill is expected.

INTRODUCTION

This chapter examines the unclear impact of technological digitisation and automation of work processes on the cultivation of new skills by the workforce and the future of work in various sectors. Since the 20th century advancement in technology and machine automation which it brought with it, a reduction

DOI: 10.4018/978-1-7998-3347-5.ch015

in the economic value of applied knowledge and skill sets previously acquired by machine operators, artisans, and various highly skilled workers (Braverman, 1974), while also compelling the acquisition of new skills in various engineering and professional careers.

Discussions around the future of work concept centre around the issues embedded therein, namely the impact of digitisation on work and professions, artificial intelligence (AI), and the uncertainty of work and careers left after automation. The second point of discussion centres around the changing patterns of work and work arrangements, the gig economy, as well as *fissured* jobs (involving employment as outsourced services). There is also the concern about these emerging patterns of work becoming the new normal of the future, possibility of engaging effectively and sustainably with work, with living wages and assistance in the world where work is typically varied.

Thirdly, the matter of income is also of topical discussion and concern. In the past decade, wage freezes have been recorded in developed countries. This has naturally flowed into the discussions about wage inequality, where questions are being asked about the possibility of individuals being able to work and be paid decent wages which they can survive on. The concern is whether digitisation and new technologies will worsen the situation. These questions underlie the concept of future of work and discussions surrounding it (McKinsey Global Institute, 2020).

THE FUTURE OF WORK ACROSS SOME SECTORS

The future of work is not singular. It will vary along sector and industrial axis and is impacted by initial situations surrounding the distribution of roles, various financial outlays for adopting new technology, access to skills, and the adaptability of employees. In this context, dissimilar experiences will accompany the structure of new functions and the characteristics of the functions that will no longer be in high demand. The World Economic Forum (2018) (WEF) reports that within the period 2018-2022, development in internet as accessed by smart phones and other mobile gadgets will possibly influence the financial services and investment sector, aviation, consumer commerce, and travel and tourism sector.

Digital technologies (e.g. 3D printers) can speedily execute a variety of operations and produce products while robots and *nanotechnology*, *genetic engineering*, and *biotechnology* can distribute goods and services cheaply and significantly alter production procedures and their outcomes (Prisecaru, 2016). These will have implication on job losses and create the need for upskilling. Magyar (2016) agrees that these digital technologies offering exceptional possibilities for industrial expansion could also pose major challenges. She submitted various forecasts for the year 2025 in the *Technology Tipping Points and Societal Impact Report* published in September 2015. Clearly, as technological advancement supports the decrease in manufacturing wastes and reshaping of manufacturing and consumption techniques towards better efficiency in resource use, it will also endanger jobs due to the engagement of robotics, humanoids, and other innovations. Additionally, the Internet will allow fast learning and interaction and open up several opportunities for broadening information and best practices, however developed countries will derive the most benefit.

Speedy adoption of recent technologies by consumers and the developments in cloud computing will propel fast growth in the information and communication technology (ICT) sector, while big data availability will widely influence the financial services and investors, energy use and technological sectors respectively. Also, the range of need and type of sector will push the adoption of specific technologies. As reported in WEF (2018), businesses in every sector will possibly implement the use of immobile

robots as opposed to humanoid, floating or subaquatic robots. However leading organisations in the oil and gas sector relatively demand a similar level of immobile, floating, and subaquatic robots, and the financial services and investment sector will most likely adopt humanoid AIs. Spreadsheet technologies will significantly influence the financial services sector and the global health and healthcare sector, with the former looking very likely to be an early leader in the adoption of the technology. Risk prediction could be easily done by machine learning, thus making it a major disrupter in risk prediction, and positioning this technology as an attractive tool for the banking and insurance subsectors, as well as the consumer sector. Machine learning could lead to predictive maintenance and demand modelling in the consumer sector.

Furthermore, many industries will face disruption and changing demand structures from non-technological issues, like the consequences of ageing in the global health & healthcare sector. Competences in healthcare technologies could therefore become essential innovations to address the demographic changes occurring, releasing the time usually spent in management and administrative duties for caregiving occupations (Bughin, Hazan, Lund, Dahlström, Wiesinger & Subramaniam, 2018).

Skills gaps in the local job market are among the vastly given hinderances to suitable technology adoption for some sectors, especially among corporate leaders in the aviation, travel and tourism, ICT, financial services and investment, and mining and metals sectors. Global health and healthcare as well as infrastructural businesses often quote leadership skills gaps as their most notable barriers, while the chemical, advanced materials and biotechnology, and ICT sectors report extensive worldwide labour market skills deficiencies.

Every sector expects substantial skills gaps and reskilling of some duration. In the forefront of this is the *aviation, travel and tourism, financial services and investors, chemistry, advanced materials and biotechnology, and global health and healthcare* industries will require some reskilling. Organisations in these sectors propose that their employees will need reskilling for periods lasting for at least one year. Most organisations believe that they will equally increase and reduce some portion of their present staff, with the increase possibly counterbalancing the reduction (WEF, 2018). However, this position seems dissimilar across diverse sectors. Mining and metals, consumer, and ICT industries assume that the reduction in their workforce will rise automation, while professional services sector employers assume that the ongoing changes will probably lead to an increase in the number of their employees.

TRENDS AND TECHNOLOGICAL CHANGES

A digital transformation study conducted in 2014 reported that 88 per cent of the organisations that participated in the study declared that they were embarking on a digital transformation endeavour (Solis & Szymanski, 2014). Big data analytics, digitisation, and robotics are imposing the computerisation and replacement of human personnel in careers such as logistics, law, accounting, transportation, manufacturing, housework, healthcare, and several very skilled medical jobs (Pérez Alonso & Frutos Rodríguez, 2017). Conversely, jobs demanding creativity (for example industrial design), negotiations, insight, and manipulation (for example surgery) stand a low chance of being automated. Nevertheless, several jobs as are presently known will vanish or change significantly.

McKinsey (2011) concurs that the world is currently undergoing a significant transition resulting from four basic disruptive factors, namely development, rapid technological advancement, aging population, and globalisation. These factors seem to be intricately interconnected, and this chapter briefly discusses

demographics, aging and technological advancement in the context of rising influence of technology on the use of information communication technology (ICT), and globalisation (Dobbs, Manyika & Woetzel, 2016).

Generally, social and demographical developments significantly influence the labour market. As employees demand flexible work arrangements, work characteristics will change. According to the World Economic Forum (2016), the middle class in developing countries will increase, supplying more skilled young people. However advanced nations are currently faced with progressively aging populations (Dunne, 2016). According to Lulu (2015), five generations in the labour market have been identified in civilised nations, as follows:

Traditionalist (born mid 1920 - 1945)

Baby Boomers (born 1946 - early 1960s)

Generation X (born early 1960s - early 1980s)

Generation Y (born early 1980s - mid 1990s also known as millennials)

Generation Z (born mid 1990x - present).

Morgan (2014) posits that by 2020, half of the workforce will be individuals in Generation Y and Generation Z, those who grew up amid new technologies. Surveys conducted by reputable organisations such as *Cisco*, *Pew Research*, *Time*, *Bentley University* and *Deloitte*, suggest that millennials (Generation Y) are presumed to have dissimilar manners and expectations about their potential work. Most millennials feel that working in the office environment on a consistent basis is not needed. However, 20% believe that they have trust in leadership, and 40% were convinced that they should be granted promotion at least once in two years. Moreover, 84% of the millennials surveyed felt that it is important to make a difference on the planet, while 92% feel that company ventures should be assessed by other factors apart from only profits (Apfelthaler, 2016). Furthermore, most millennials would shift from one job to another many times and pick up lifelong learning to comply with requirements of future employment. These millennials are believed to accept an intrapreneurial form of work. Organisations that encourage intrapreneurship support creativity and autonomy among their employees. Intrapreneurs often are self-inspired, proactive, and action-based individuals, comfortable with blazing trails even within the limits of an institution. They play key roles in anticipated organisational success (Investopia, 2016).

Therefore, in the future, it is expected that war of talents will increase among skilled individuals who offer entrepreneurial thinking and other talents which add significantly to the success of future organisational performances (McKinsey, 2011). According to McKinsey, the world is facing a rapid technological effect on social life based on information and technology (Dobbs et al., 2015). To Frost and Sullivan, this effect is resultant in a linked living comprising a related home, a related work, and a related city. The outcome is a world where ICT services offer admittance and pervasive connectivity always and everywhere (Frost & Sullivan Consulting, 2015). Accordingly, technological advancement affects almost every facet of human life on earth. Individuals are almost permanently connected with digitisation through their *smart phones, tablets, computers, and other mobile devices*.

Conversely these new technologies permit individuals' access to a wide range of services such as *chats, online shopping, online banking, flight and holiday bookings, and e-tickets*, which makes personal shopping very comfortable. They also provide opportunities, innovations, and possibilities for organisations to aid their operations regarding *human-to-human, machine-to-machine and machine-to-human* interaction and collaboration (Siepmann & Roth, 2016). In as much as technological advancement offers opportunities for novel business processes, it will also bring about several challenges for existing busi-

nesses who will try to ensure that their future competitiveness is secured. Therefore, organisations must redesign their strategic approaches to the evolving trend and make ready their systems and personnel for new and upcoming technologies.

SKILL OBSOLESCENCE

Developing technologies deeply reshaped workplace and human practices around the world; the economic, socio-cultural, environmental, political, and physiological consequences of which the workforce still struggles to comprehend. Scholars and practitioners in the area of psychology, sociology, philosophy, and economics, in a bid to understand the emerging changes, conceptualised the term “deskilling” to describe the way in which the 20th century technological advancement resulted in the reduction of the value placed on hands-on knowledge and skill sets traditionally required of machine operators, technicians, and professional employees (Braverman, 1974).

Based on a Marxist consideration of skilled labour as a tool for reducing costs and improving performance and managerial hegemony (Marx, 1990), Braverman’s seminal deskilling theory has been criticised considerably (Friedman, 1978). Nevertheless, technological advancement continues to generate fresh causes for worry regarding deskilling as the value for the core aspects of skill sets of lawyers, teachers, doctors, nurses, pharmacists, machinists, and even librarians, who are reduced to redundancy status (Roberts, 2010; Davis, 2008; Carey, 2007; Rinard, 1996).

The mental, socio-cultural, and economic effects of deskilling on the workforce, their dependants and communities, could be overwhelming. Also, the effect on their mind and body could be taxing on their well-being. Still, industrial skill obsolescence is a very disputed and severely *unclear* phenomenon (Spencer, 2000; Wood, 1987), when considering the freedom that computer transformation offered employees charged with monotonous duties like filing, copying, and collating. Chances of reskilling and/or upskilling to gain employment in careers in the services and information sectors erstwhile assumed to be the prerogative of skilled and knowledgeable individuals (OECD, 2001; Gallie, 1991; Addler, 1990).

The 4IR faces its peculiar challenges with respect to technological deskilling, just like the previous (1st, 2nd, and 3rd) industrial revolutions. Developments in neurotechnology, biotechnology, nanotechnology, AI, and robotics are exerting new pressures on established professions and the skill sets that are linked with them. For example, the duties of human surgeons are likely to be further changed by their robotic counterparts. The question is, how will this impact the skills of human surgeons - will it make them redundant or free them to acquire new and advanced capabilities to give better care to patients? Also, will the advancement in software algorithms lead to the redundancy of skilled humans in the areas of forecasting, actuarial science, and market trading, or will it simultaneously assist humans to both predict and better comprehend upcoming events as well as their intricate causes?

Teaching is also at risk because of the efforts to develop automated methods for delivering instructional content, marking essays, and regulating dialogues in the classroom. If robots or humanoids are created to perform these duties, what would the future role of a human teacher in a classroom be? Will teaching become an extra role consigned to supporting robots and AIs, or would they be afforded additional time to inspire and create curricula, or give more care to the mental, growth and emotional needs of individual learners? Scholars in relevant fields are doing their best to trace and ponder on these issues and the vague potentials they create (Heisig, 2009; Ritzer, 2008).

The emergence of the Coronavirus pandemic in 2020 with its associated disease known as Covid-19, brought to the fore what was not thought to be possible. It impacted the way people live, relate, learn, and work. As a result of the recommendations made by the World Health Organisation (WHO) to contain the spread of the Covid-19 pandemic, governments globally implemented national and regional lockdowns, social distancing, and wearing of face masks, among others. These led to the closure of schools and workplaces. Within a short time, higher educational institutions as well as forward looking primary and post primary institutions, have migrated their teaching and learning activities to cyberspace. Over time, learning materials prepared by teachers for learners to use remotely will all be in the cloud. When the majority of learning becomes permanently virtual, what would become of the teachers whose face-to-face teaching will not be necessary anymore since their learners can access their materials remotely?

Although extant literature has not verbalised the physiological impacts of technological advancement on the workforce with respect to skill obsolescence, the potential in various professional and technological contexts for an automation-driven deskilling to impact employees positively and/or negatively cannot be ignored. The impact is negative where the human being is extracted from the workforce and not allowed to upskill or reskill, and positive where the reverse is the case (i.e. where the individual remains in the organisation and upskills to fit into the new organisational requirement).

Hypothetically, the potential for deskilling in an era of massive automation is significant, and irrespective of the optimism surrounding this, deskilling is likely to present serious wellness problems in many areas of human living if the present trends persist. Where technological tools completely replace the human beings in the performance of traditional functions that humans used to do, the human employee could be said to have been deskilled. This act is costly in financial terms expressed by loss of earning expectations, cost of reskilling (where the organisation does not bear it), time and energy expended in acquiring new skills, and physiologically, stress and strain on the body.

Summarily, for some reason, the idea of deskilling due to obsolescence has declined in scholarly circles. Primarily, the communication (ICT) revolution has created a problem regarding efforts to find the simple causal connection among mechanisation of human tasks and the loss or devaluation of human skill. Advanced technology, especially computerisation, has liberated most employees from comparatively low-skilled employment (OECD, 2001). In this way, upskilling and reskilling address the ambiguity in deskilling by additionally developing human skills needed for the future workplace.

The secondary reason for the decline in the use of deskilling by academics is its strong association with past debates about employment, commerce, and socio-economic justice, connoting the concept as politically and ethically biased. Because of this, present day sociologists shy away from using the concept, not willing to stain their work with extreme or normative nuances; deskilling therefore lost some acceptance as an unbiased tool of scientific analysis.

In conclusion, since retraining, commonly known as reskilling, is required for effective performance and earning of wages, and the various costs of deskilling on an employee's finances, time, energy and health may not be in sync with the future shape of technological developments, a concerted effort by practitioners and scholars to systematically appraise these developments, and possibly design active and plausible interventions in support of deskilled employees, is called for.

ACQUISITION OF NEW SKILL

There are complicated response rings around new technology, careers, and skills. Technological advancement can push growth in businesses, drive job creation and increase demand for expert skills, yet depose entire functions when some duties become outdated or automated. Skills gaps between employees and among the management of organisations could both hasten the trends towards automation in some cases and create hinderances to the adoption of new technologies thereby hampering business growth (WEF, 2018).

The vital retraining of employees will displace some staff and simultaneously make new opportunities available for others. However, exploiting the gains and diminishing the losses demands the thoughtfulness of not only the policymakers (organisational leadership), but also rational reactions from organisations to discover winning strategies for employees and organisational bottom line.

Employees need to develop a mindset that is alert to learning while shifting from their traditional roles that were limited, to the emerging, erstwhile unthinkable future. Lastly, organisational leadership, government and academia need to collaborate to find ways of assisting disengaged employees to refocus their skills or reskill to acquire new capabilities, and finance sizable investment in the creation of new learners who are alert in future human resources by addressing enhancements to learning and training structures, modernising employment policies to align to the actualities of the 4IR. Extant literature presents the different effects of technological advancements leading to the digitisation of work processes, showcasing how jobs are designed and employees' ownership (or absence thereof) of skills harmonise with recently launched technologies to influence organisational and individual performance (Autor, Levy & Murnane, 2000).

The acquisition of new skills will avail employees with highly in-demand skills capable of being improved upon, the opportunity to earn more, and work in more excellent jobs. On the other hand, employees who do not possess the requisite skills to adjust to new technologies and be promoted to more value-adding roles could have their salaries and work quality repressed by technology consistently devaluing their work, as it intrudes into their roles (WEF, 2018). These categories of employees need to be augmented to be motivated, alert and armed with compact skills to exploit new opportunities in the future via constant reskilling and upskilling (Shook & Knickrehm, 2017).

The WEF (2018) identified a major downward trend in the demand for physical skills and manual capabilities as well as a decline in the need for skills associated with managing financial resources and fundamental *installation* and *maintenance skills*. Conversely, logical thinking, creativity and innovation, dynamic learning and training strategies, technology design and programming are gaining rising prominence. Competency in emerging technologies is one side of the skills coin, while person-related skills such as social influence, hardiness, ability to solve complicated problems, and flexibility, mindfulness and attention to specifics will remain or grow in value. Leadership, networking, emotional intelligence (EI), and service inclination are experiencing enormous rise in demand compared to their present importance. Hence, organisations will have to follow various corporate strategies to remain competitive in the face of fast changing human resource skills needs. To achieve this, top management and human resource practitioners will need to transform their skills to successfully be in the forefront of the workplace revolution.

It is important that organisations, where employees are confronted with unstable skills, consider the need for reskilling and upskilling, their cost on bottom line, and the opportunities that could be harnessed through this approach. The time required, costs to organisation and individuals, delivery mode

and success/failure cases may not be the same for categories of employee, and job functions of various organisations undertaking reskilling and upskilling. For instance, some organisations may experience a good increase in their employee performance, retaining of talented experts, empowerment of frontline employees to maximise the use of recent technologies in performing their duties, and improved worker satisfaction through reskilling and upskilling programmes.

Notably smaller size businesses could see reskilling as a way of reducing hiring costs, posting workers in disrupted work functions, or as a means of increasing the skills source of their middle- and lower-skilled staff. Summarily, employers have perceived reskilling as a slim approach targeted at specific subcategories of workers, not as an all-inclusive approach to propel staff transformation.

Lastly, while it is incumbent on businesses to be in the forefront of creating capability within their organisations necessary to sustain their conversion to the workforce of the future, the challenges arising from the financial and societal nature of these disruptions demand that they progressively become strategic in partnering with other stakeholders to organise the massive reskilling and upskilling needs of the future. Viable partnership opportunities exist in creating alliances with academics to reform learning curricula, collaboration within and among industry players on developing skill pipelines, and partnering with organised labour to stimulate cross-industry skill movement. Governmental partnership could be harnessed through the creation of incentives for lifelong education, guaranteeing of standards sharing for reskilling and consolidation of protection (security) for mobile employees (Bughin et al., 2018). Nevertheless, there is still need for additional guide and good training opportunities.

In order to avoid a situation of overwhelming and undesirable loss occasioned by technological advancement attended by skills shortage, mass job loss and escalating inequality, it is vital that organisations participate actively in assisting their current employees through reskilling, that employees personally take a pragmatically practical route towards their lifelong education, while governments quickly and innovatively provide a supportive environment to help all these endeavours.

Reskilling, although generally necessary, should be prioritised among employees presently executing high-value functions to strengthen organisations' strategic capabilities. Additionally, employees performing major and frontline duties who will be utilising new technologies in their work should be reskilled. Also, highly productive employees, employees performing duties that are mostly going to be affected by new technologies and are at risk of losing their jobs, should be prioritised for reskilling.

WEF (2018) suggests that there is a need to comprehensively augment employee potentials in the face of transformation by using automation of certain roles to balance and boost human employees' relative strengths in order to empower them to exploit their full potentials in the long run. Instead of the narrow focus on cost savings through cutting labour cost, the augmentation tactic considers the bigger picture of value-creating events that could be undertaken by human employees usually in harmony to AIs, robotics, and possibly humanoids, when they utilise the freedom created for them from performing routinised and monotonous duties for human-centric activities. To derive these benefits, employees need to acquire the relevant skills to enable them to succeed in the future workplace as well as the capability to reskill for as long as they are in the workforce.

The key business imperatives of vibrant organisations are to design an in-house permanent training system, finance human resource development, and collaborate with all stakeholders in crafting human resource essential to organisations' medium- to long-term development and contribute meaningfully to humanity and social stability.

UPSKILLING

The level of skill needed to perform work is becoming higher among industries and within distinct professions. Upskilling, both in relation to the average level of employees' education and the kinds of work that they do, is required. Gallie (1991) reports that work with developed technology had connections with higher skill levels when examined with the experience employees had with changes needed in the skill to perform their jobs. Additionally, the skill changes are around those needed to perform the job, instead of changes in the expertise and experience that individuals brought to the same job.

The rapid advancement in technology, among other factors including globalisation and emergence of knowledge economy, has brought wide ranging argument about the need for advanced levels of skills. Although there is a growing consensus about the importance of skills as vital to economic development (OECD, 2000a) and the extension of the knowledge economy, there is far less consensus on which capabilities and skills make the difference. Inside and outside academia, discussions centre on the attainment of higher academic qualification in general, concentrated on the attainment of broad-based capabilities supportive of lifelong learning.

From the job market opinions, a heightened attention is being given to skills such as the capacity to use *ICT* to address challenges, participate in teamwork, oversee, lead, and engage in continuous learning. Presently, workplace skills in the public discourse is differentiated from the regular or traditional courses given and received in schools and universities.

In the foundation of the perception that knowledge and information are the core of advancement and progress is the idea of "knowledge economy" and "knowledge worker". Hence, the capability to effectively create and use information in the digital era has become the important source of skills for potential employees (OECD, 2000b). Change and advancement push the growth of the knowledge-based economy because of their impacts on the manufacturing processes, spending patterns, and economic structures. This implies that certain transformations in the processes of advancement may not have happened without ICTs and similarly, some of the effect of ICTs may not have been perceived outside of systemic transformations (OECD, 2000c). These transformations have impacted the establishments - economy interface, making networking, synergising, and the liquid flow of knowledge in and around national borders to come to prominence.

Knowledge-based organisations comprising the superior-ranking technology product manufacturers, high- and medium-high technology factories, and those service organisations that mainly use technology such as banks and other finance institutions, insurance companies, corporations, communication, social and individual services greatly contribute to national GDP and are developing speedily (OECD, 2000d).

Indicators of Upskilling

To adjust and sustain effectiveness while responding to rapidly changing consumer consumption patterns and preferences in an era of technological transformation, corporations require relevant systems, skilled employees, and competent management. With the changes is a need to restructure the workforce and modify the kind of labour needed. This has highlighted the increasing human capital levels shown by the academic accomplishment and as inferred from the rising demand for more vastly educated and expertly skilled employees. The sign that upskilling is going on is indicated by a preference of more educated people in the job market, evidenced by the proportion of people with university degrees in the workforce and the variations in the distribution of their share in the overall working-age population.

The accounting profession has experienced tremendous upskilling. Empirical data shows that in the past two decades, development in the expert, technical, managerial, and executive professions, known as “white-collar, high-skilled jobs,” has risen higher than employment in other working groups. Comprehensive analyses of hiring trends within businesses corroborate a true upskilling process (Steedman, 1998; Berman, Bound & Machin, 1997; Machin, Ryan & Van Reenan, 1996). Those scholars propose that work-engagement moves within organisations rather than between organisations, and represents an actual shift towards higher skills. This is a generalised reflection of the occurrence of upskilling procedure in individual organisations in opposition to a mere shift from sectors typified by low-skilled work to sectors typified by high-skilled work.

The evolution of ‘white-collar’, expert skilled jobs in the services and manufacturing sectors respectively showcases upskilling rather than a mere rise in the activities of the service sector. Really, the decline in manufacturing activities in various countries has in fact raised the need for white collar, high-skilled professionals in the manufacturing sector. From a different perspective, there seems to be upskilling within professions.

In fact, although total manufacturing employment has decreased in most countries, it has increased for white-collar, high-skilled occupations within the sector. From another angle, there appears to be upskilling within occupations (Moore, Haines, Drudik, Arter & Foley, 2020; Burke, Modestino, Sadighi, Sederberg & Taska, 2019).

According to Osterman ((1995), jobs within careers now require higher skill levels in the United States’ workplace than they did before especially in the technological and professional careers. In addition to upskilling of the workforce in the academic and professional qualification, is a new and clear need for a set of “workplace competencies” and “interpersonal skills” commonly identified with the emergence of ICT and recent work practices (OECD, 2001). Some of these proficiencies and skills include basic computing skills, problem solving, critical thinking, team-working and communication (Smith, 2016; Fong, Sidhu & Fook, 2014; Green et al., 2000). Hence, upskilling and a rising demand for various proficiencies are the main characteristics of the future workplaces ingrained in knowledge economy.

CONCLUSION

Technological advancement in the 4IR presents an uncharted course that nations, organisations, societies, and individuals are learning to navigate. The arrival of the Covid-19 pandemic on the scene further complicated issues that were already complex. Work as was known before has now changed as the way people work, live, and even learn. The future of work in various sectors, skills gaps, and need to reskill and upskill were examined in this chapter. The trends indicate that development, rapid technological advancement, aging population, and globalisation, will interface to influence disruption in all sectors. These disruptions will cause skill obsolescence, lead to employees losing their jobs, and/or reskill, and upskill to be relevant in the future workplaces and jobs. Recommendations made in the chapter speak to policy discussions about employee development and associated learning policies.

RECOMMENDATIONS

Following the Covid-19 pandemic in the 4IR, job descriptions in some sectors will be further revised to incorporate new responsibilities that need more innovative skills, either in response to new rules or transformations in technology. For instance, new regulations guiding interpersonal relationships have reduced the face-to-face interactions among colleagues and have allegedly raised the skill requirements for paramedics, nurses and doctors' assistants, since social distancing must be observed and the use of more sophisticated personal protective equipment (PPE) has been introduced. Forward looking organisations should proactively design strategies to address upskilling needs of their employees and ensure the prevention of persistence in upskilling. As much as organisations and employees strive to avoid skill obsolescence, persistent upskilling could also become a problem.

Persistent upskilling in the manufacturing sector, for instance, could be the outcome of new technology, such as 3D printing, which requires employees to be experts in computer-aided design software used in the production of parts formerly made with analogue technologies. Persistent upskilling may introduce the phenomenon known as 'labour market polarisation' which leads to loss of transformation in the middle-skill professions and a boost in the demand for high-skill and low-skill jobs simultaneously. Increased demand for expert skills and education could also cause mismatch in efficiency in the labour market. To appraise this further, the extent of occupational mismatch at various levels of employment could be evaluated separately among each level of employment to test whether patterns in upskilling by leading professions predict movements in the labour market mismatch indices by major professions.

Furthermore, this chapter recommends that lifelong strategy to proactively identify and prepare employees whose skills will not be relevant in the future workplace be urgently crafted and adopted by organisations in every sector. There is no way to downplay the psychological effect of skill obsolescence or deskilling on affected employees. However, appropriate preparation and care in providing support for the displaced employees should mitigate their physiological and mental suffering. Some of the strategies include displacement and post-career counselling, financial management counselling, stress and time management training, and mindset reorientation.

Additionally, those to be reskilled and/or upskilled should be afforded relevant timing to acquire and test the new skills through patient guidance and support. Time should be given to assist employees in planning their self, family, and work relationships while they undergo the required reskilling and/or upskilling processes.

Finally, Smith (2014) states that history offers many lessons which the contemporary should learn from to avoid the repeat of mistakes that humans made in the past. She proffered five pillars for sustainable society namely, Food, Security, Health, Prosperity, and Knowledge. From one industrial revolution to another, there is a period of transition in between and the Prosperity pillar is often threatened at the end of each transition because it associates with increased levels of unemployment. This could lead to a global war as was reported after the first and second industrial revolutions. The Prosperity pillar of human society as it was in the post Covid-19 era, is in grave danger now that humanity is confronted with acute loss of jobs, food crisis, health challenges, and safety issues. The fall of the Prosperity pillar will surely spark off another industrial revolution. Sceptics and alarmists are touting the idea of a 3rd Global War, and in heeding to Smith (2014), such a war must be avoided to give room for the new industrial revolution and sustainable economic development based on the Knowledge pillar, because, without solid information concerning the past, the stability of the future may not be guaranteed.

GUIDE FOR FURTHER RESEARCH

The future of work, deskilling, reskilling, and upskilling in the 4IR are topical issues widely discussed among experts, professionals, and policy regulators in present times. However, there is a need to research the extent to which the future of work is impacted by the skill needs and the levels of stress generated among employees by the need to reskill and/or upskill. Additionally, scholars should explore the effect of these new skills modification needs and how they impact on employee well-being and design strategies to address the emerging health issues resulting from automation and new technologies.

Reskilling and upskilling are necessary in the workplace of the future but are very costly undertakings. Empirical studies to determine the ways of reducing and/or subsidising the cost of these ventures to exploit the benefits that accrue from the process is recommended.

The 4IR brings with it bright prospects, changes to the way things are done, changes to the way relationships are forged and sustained, changes to the way goods are produced and services rendered. It comes with vision of good things. Nevertheless, to tap into this positive vision, the workforce needs to possess the suitable skills that should empower them to both work and thrive in the future workplace. They need to be enabled to continue to reskill and upskill throughout their lives. Proactive organisations should be able to craft vibrant in-house lifelong knowledge systems, invest in human capital development, and massively partner with other stakeholders on human resource strategy as an important business prerogative, vital to organisations' mid- to long-term development, for meaningful and significant contribution to people and social cohesion.

Employees need an alert attitude towards learning as they transit from the monotonous traditional work practices to emerging and awe-inspiring futures. Lastly, governments, top management of organisations and academia need to basically find ways of assisting displaced employees to refocus their skills or reskill to acquire new ones. They also need to commit large financial contributions towards the development of a new alert mindset for learning among employees through undertakings to improve learning and training systems, revising workforce policies to align to the actual events of the 4IR.

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Chapter 16

Developing Global Relevant Skills in the Fourth Industrial Revolution

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ABSTRACT

This chapter carries out extensive review of literature on the 4th Industrial Revolution. In the last decades, many stakeholders such as industries, governments, employers and employers' organisations, workers and their unions, and academics have expressed divergent opinion of the 4th Industrial Revolution. The 4th industrial revolution is the 4th stage of a mechanical movement process that began towards the end of the 18th century where mechanised production replaced manual production process. Research shows that the 4th Industrial Revolution brought about 'disruptive technologies' such as artificial intelligence, robotics, blockchain, and 3D printing, which transforms social, economic, and political systems, often in unpredictable ways.

DOI: 10.4018/978-1-7998-3347-5.ch016

INTRODUCTION

In the last decade, there has been expressions of anxiety from various quarters on the 4th industrial revolution. There are insinuations of job losses both from business owners and employees as a result of improved production process and hi-technology, especially in the areas of digital automations and the robotics. This is because it is believed that both the robotics and digital automations are the drivers of the 4th industrial revolution. However, the 4th industrial revolution will be handicapped and hampered without the repositioning of human capital to provide the prerequisite and required skills, knowledge, intellectual capital and the basic structures on which it will stand.

The 4th industrial revolution is the 4th stage of a mechanical movement process that began towards the end of the 18th century where mechanised production replaced manual production process. The second stage started towards the beginning of the 20th century with the era of mass production due to improved technology. That stage was followed by the digital automation era, where productions were based on electrical electronics and information technologies. The era is gradually fading into the 4th era which according to Bahrin, Othman, Azli and Talib (2016), is a SMART dispensation (smart phone, smart TV, smart home gadget and appliances, among many others are the other of the day). The production process is smart driven through cyber physical systems, smart factory, smart production and advance manufacturing (Zhou, Li, Zhou, Wang, Zang & Meng, 2018).

Seeing that smart human intelligence, knowledge and skills are required to fit into the scope of the 4th industrial revolution, there is the need to develop special skill-set and high level of intellectual capital to aid the production process. There is also the need to develop a business mind and orientation for this era (Falola, 2017). The focus is expected to be more on how to develop special skills that will place human capital at the cutting edge of the innovations. More so, according to the Chartered Institute of Personnel Development Technical Report (2017), a paradigm shift from production-based economy to a knowledge- based economy is inevitable.

The purpose of this chapter is to explain the need to develop global relevant skills and knowledge needed for the 4th Industrial revolution because the impact of the revolution both positively and negatively will depend on the type of skill, knowledge and the career path an individual has chosen. For instance, jobs that are based on physical strength and replications may be the first casualties of the revolution while jobs that involve skills and creativity thinking were affected. Also, there will be creation of new jobs that require specialised skills and creativity to handle. The robotics may be available and programmed to carry out lots of jobs, especially those that involve physicality and speed; however, it cannot be as creative as human beings (Gray, 2016).

HISTORICAL BACKGROUND OF THE 4th INDUSTRIAL REVOLUTION

Since the emergence of the capital firm, historical events have revealed that there was paradigm shift in the firm which coincides with Industrial Revolutions. Additionally, in today's information communication technology (ICT) many firms have witnessed another important shift in information communication technology. According to More (2002), since Toynbee in 1884, historians had difficulty in unraveling the Gordian knot of the British Industrial Revolution. While some have tried to unpick it, others on the other hand tried to cut through it. However, if the knot has been loosened here or there it remains largely

secure (More, 2002). The perspectives on the evolution of the Fourth Industrial Revolution have rarely had a long life. Given the increased in most economies it has proved very difficult to link the Industrial Revolution and economy together in an exploratory framework (More, 2002).

The 4th Fourth Industrial revolution started 30 years ago and is ongoing. Also known as the ‘digital revolution’, it combines technological and human capacities in an unprecedented way through self-learning algorithms, self-driving cars, human–machine interconnection and big-data analytics. The 4th Industrial Revolution is the fusion of technologies across physical, digital and biological realms, which is transforming the way of life in the society. Menon and Fink (2019) postulated that the 4th Industrial Revolution brought about ‘disruptive technologies’ such as artificial intelligence, robotics, blockchain and 3D printing which transforms social, economic and political systems, often in unpredictable ways. Schwab (2016) suggests that these changes are revolutionary not only because of the breadth of the sectors impacted but also due to the speed.

The evolution of new technologies is emerging faster and being adopted more quickly by individuals as well as organisations. For instance, fixed-line telephones took almost 75 years to reach 100 million users, while the Apple App Store, unveiled in 2008, took not more than three years to reach 100 million users worldwide (Schwab, 2016). However, Schwab (2016) claims that the single most important challenge facing humanity today is how to understand and shape the new technology revolution. The Fourth Industrial Revolution focuses on the idea of the influence of new technologies and their cumulative impact on the world economy.

CONCEPTUALISATION OF THE TERM INDUSTRIAL REVOLUTION

There exist different perspectives on the concept “Industrial Revolution”. It has been argued that capitalism brought about capital firm into being, and the first manifestation of this was the factory (Kapás, 2008). The conceptualisation of the term Industrial Revolution remains very problematic, especially among scholars. The lack of consensus among scholars has arisen from more than just the multiplicity of perspectives, concerns and definitions. Most scholars, particularly the historians, still find it very difficult to conceptualise the term Industrial Revolution, not just because of the flow of new evidence but also because of continuing uncertainty with the implications of the word ‘revolution. Although the differences, there exists some common grounds in the light of the problems just raised, which offers a way forward with the term. It has been agreed that Industrial Revolution was a ‘great discontinuity’, the transition from one kind of society and economy to another (Crafts, 1980). The scholar suggests that Industrial Revolution had as much to do with the balance of the economy as the novelty of productive techniques. Industrial Revolution has been defined as changes that takes place in a co-evolutionary fashion, involving complex reciprocal interactions between scientific, technological, economic, social and cultural change (Nelson, 2015).

IMPLICATION OF THE 4TH INDUSTRIAL REVOLUTION

Guliwe (2019) is of the opinion that the advent of the 4th Industrial Revolution is envisaged to have serious consequences, particularly in less developed nations, companies, governments and broadly, the welfare system. Although the current sluggish economic growth and the rising unemployment across

the world, the 4th Industrial Revolution has the potential to replace thousands and millions of workers with machines such as robots, 3D printers and artificial intelligence (Guliwe, 2019). Before delving into the discussion, it is important to understand these key concepts, namely: standard of living, per capita income, structural development and economic development.

There is no universal definition of standard of living. The term standard of living has been an omnipresent issue in transition countries for several decades, especially nowadays, when numerous effects of the global crisis are felt all over the world (Cvrlje & Ćorić, 2010). There are different interpretations of the concept of standard of living based on human development. Standard of living has been conceptualised by Cvrlje and Ćorić (2010) as the level of welfare available to individuals or group of people. It is mostly measured in terms goods and services people are able to consume and the amount of resources they have access to (Cvrlje & Ćorić, 2010). Standard of living is normally determined by indicators such as real income per person and poverty rate. Caselli and Michaels (2013) argued that the direct measurement of standard of living are income and consumption. Brewer and O'Dea (2012) concurred that standard of living measures the households' level of access to goods, services and recreational activities. The United States conceptualisation of standard of living has been developed to be an empirically grounded analysis of developmental issues, trends and policies such as policy around education, political participation, healthcare and statistics like lifespan, infant mortality and lifetime morbidity and availability of public facilities such as libraries and recreational activities (United Nations, 2014).

Per capita income is defined as the earnings from productive activities and current transfers (Cvrlje & Ćorić, 2010). It is further seen as comprising claims on goods and services by individuals or households. McKay (2000) concurs that there is, however, some disagreement about what exactly should be considered in the measurement of income. It has been argued that many attempts to measure income have not considered home production, although this can be conceived as a form of income (McKay, 2000). According to Asiedu, Gaekwad, Nanivazo, Nkusu and Jin (2015), per capita may be interpreted as the summary of the economic conditions in a country. To Hassaballa (2017), per capita measures the economic well-being of individuals in a specific period of time. Evidence shows that income per-capita level can indirectly affect sustainable development through its effect on economic development (Cai, Fang & Li, 2012).

Over the years, many countries have witnessed structural development/change in the various sector of their economies. Structural development has been conceptualised as the provision of physical infrastructure or facilities, namely: roads, hospitals and schools (Liu, 2009). Economic development on the other hand is measured in terms of Gross National Product (GNP), its components and their growth (Djapou Fouthe & Ndedi, 2017). It is measured in terms of the percent rate of increase in real gross domestic product (GDP), usually in per capita terms. From the above discussion, it can be argued that the 4IR affects standard of living, per capita income, structural development and economic development in a country.

4TH INDUSTRIAL REVOLUTION, JOBS, EMPLOYMENT AND SKILLS AND WORKFORCE STRATEGY

This section of the chapter explores the effects of the 4th Industrial Revolution on types of jobs that will be available as a common place. A significant volume of research on the theme of the future of work has emerged since the WEF published its initial report on the subject. This chapter will further focus on the Future of Jobs: Employment, Skills and Workforce Strategy for the 4th Industrial Revolution.

Any change is met with fear and trepidation. The 4th Industrial Revolution comes with such change. For instance, not only do artificial intelligence and automation impact on daily life, they are also transforming the entire industries, how things are done, consumed and even how countries are governed (Lemmer, 2019).

4th Industrial Revolution and Future Jobs

As the 4th Industrial Revolution unfolds worldwide, the future of some jobs can be expected to develop with both common and differentiated characteristics across different countries and regions globally. The WEF (2019) indicated that vulnerable jobs that require a high level of physical work and repetitive tasks will be mostly affected by the 4th Industrial Revolution. Several reports revealed that those industries that will be hit by the 4th Industrial Revolution include retail and trade, transportation, agriculture, administration, office and support, accommodation and food services, and production and manufacturing industries (WEF, 2017). It was reported that jobs in the cookery, writing, tourism, design and medical care for example, where human qualities are essential, will be more resistant to change (WEF, 2017).

Conversely, the WEF (2017) report indicates that other areas that will witness a stable demand for years to come include media and entertainment (65% stable), consumer products (73% stable), healthcare (71% stable), energy (70% stable), professional services (67% stable), ICT (65% stable), mobility (61% stable), infrastructure (58%) and financial/investor services (57% stable). The WEF (2017) further discovered that major industries that will buffer against the possibility of unemployment in the future are AI, robotics, 3D printing, nanotechnology, quantum computing, biotechnology, autonomous transport, aerospace and genomics.

It was discovered that installation and maintenance jobs, for example, will see great productivity enhancements and strong growth in green jobs such as the installation, retrofitting, repair and maintenance of smart meters and renewable energy technologies in residential and office buildings (WEF, 2017). Additionally, evidence shows that automation of checkout processes and smart inventory management through sensors and other applications of the Internet of Things are some of the factors expected to lead to a decrease in demand for traditional roles in the Sales and Related job family. Furthermore, it was found that two job families, namely: business and financial operations and management will be affected negatively (Schwab, 2015). However, there will be strong employment growth in the computer and mathematical job family (WEF, 2017).

According to the WEF (2018), advances in mobile internet are likely to have a significant impact on future jobs like the aviation, travel and tourism industry, the financial services and investment industries, and in the consumer industry. It has also been found that the rapid adoption of new technologies by consumers as well as advancements in cloud technology are set to drive growth in the ICT industry, while the availability of big data is expected to have an even broader impact on the financial service and investors and the energy utilities and technologies industries (WEF, 2018). However, the WEF (2018) explains that among non-technological drivers of business growth, increasing affluence in developing economies is poised to drive growth in industries such as aviation, travel and tourism; global health & healthcare; and chemistry, advanced materials and biotechnology industries.

Frey and Osborne (2013) claimed that most workers in the transportation and logistics sector, as well as office and administrative support worker and labour in production jobs are at risk. However, business and financial operations supported by computer and mathematical functions are predicted to rise (Dunne, 2016). The WEF (2019) points out that 65% of children entering primary schools today will work in occupations that do not exist yet.

Research reveals that jobs where social, technical and ICT skills are greatly needed will be highly demanded in 2020. Some mentioned that those jobs will have a greater international focus and will deal with more interdisciplinary topics than they do today. However, jobs that do not require specific trainings, jobs that can be substituted by computers and robots, too specific jobs, routine jobs, basic manual assembling jobs in manufacturing and administrative jobs like bookkeeping are stated to be at high risk of substitution in 2020 (WEF, 2019).

Ian (2014) notes that the organisational philosophy in the banking and financing sector will witness a dramatic shift from product-oriented to customer-oriented strategies. Hence, banks and other financial institutions will have to act fast by integrating and adopting new technologies so that they can develop the ability to engage with customers anywhere and anytime. Although most banks still have many branches the digitalization of the industry has already begun. Currently, the banking sector has gone digital in order to diversify their distribution channels as well as increase the customer's satisfaction (Accenture Consulting, 2017). Jobs in the banking and financial industry which are at high risk include loan officers, receptionists and information clerks, and personal financial advisors. Conversely, future jobs related to the banking and financing industry include user experience designer, behavioral psychologist, algorithmic risk specialist, community builder and telematic specialists (Frey & Osborne, 2013).

The future related jobs at the industrial sector may include production supervisors, controller, planners, mechanical/industrial engineers, material scientist/engineers, electronical and electrical engineers. At future job that will be in high demand at the transport and traffic industry will be air traffic controllers (Frey & Osborne, 2013). At the commerce and insurance industry, the kind of future jobs that will be in high demand will include user experience specialists, virtual shopping advisors, risk Analysts (for investments), reputation builders/ image improvers and cyber insurance provider (Frey & Osborne, 2013).

Profita (2016) points out that in the coming year, the demand for jobs dealing with topics like innovation to zero, green innovation and economy will increase. Frost and Sullivan (2012) argued that innovation to zero is a mega vision driven by companies and governments that should enable zero carbon emissions and carbon-neutral cities. However, to achieve such vision, the demand for jobs like environmental scientists and consultants, agricultural engineers, climatologists, bioinformatics and archaeologists, just to name a few, will increase steadily (Profita, 2016).

4th Industrial Revolution and Employment

Several scholars (Morrar, Arman & Mousa, 2017; Pereira & Romero, 2017) are interested in the impact of the 4th Industrial Revolution on job creation. There is no doubt that the emergence of the 4th Industrial Revolution will bring a different impact on employment, which will not be limited to one industry, but all industries. While a lot of jobs may disappear, there will be a lot of new job requirements (Mundial, 2016). It has been observed that approximately 47 percent of the total US employment is in the high-risk category (WEF, 2016). Guliwe (2019) argues that although there is currently sluggish economic growth and low employment levels, the 4th Industrial Revolution is capable of replacing thousands and millions of workers with machines such as robots, 3D printers and artificial intelligence. This means that a major shift from labour-intensive to capital-intensive sectors is imminent. The implication of this is that unemployment will continue to increase (Guliwe, 2019).

According to Anderson (2012), the increasing trends artificial intelligence will result in a significant economic disruption in the coming years. The author explains that artificial systems that rationally solve complex problems pose a threat to many kinds of employment, but also offers new avenues to economic

growth. Lambert (2017) also argues that the 4th Industrial Revolution poses a major threat to job creation. Wolf (2015) points out that low skilled and low wage jobs will be replaced by computers and digitisation. Also, higher paid jobs requiring more skills are less likely to be replaced. This increased dichotomisation could lead to an increase in social tensions.

The Citi and Oxford University joint report in 2016 estimated that approximately 57% of jobs across the Organisation for Economic Co-operation and Development (OECD) are at risk of automation. The Financial Times reported in 2016 also indicates that between 2000 and 2010, of all the jobs lost in the US, over 85% were lost to new technologies, and the Bank of England estimated that two thirds of all jobs are capable of being automated within 20 years (WEF, 2016). The WEF (2017) observes that new industries are only creating fewer jobs, and this requires advanced skills. Furthermore, technologies like artificial intelligence and robotics have disrupted many jobs in the services sector and in labour-intensive industries (WEF, 2017).

Frey and Osborne (2013) in their survey discovered that more than 47% jobs in advanced countries were at high risk of being automated in the coming decades. The scholars further argued that the computerisation of labour markets will cause a decline of employment in routine and intensive task. In the last decades, computerisation was to support routine tasks involving explicit rule-based activities, however new algorithms for big data are now rapidly entering domains reliant upon pattern recognition and will substitute human labour within a great range of non-routine tasks (Frey & Osborne, 2013).

4th Industrial Revolution and Skills Required

The changes brought by the 4th Industrial Revolution required industries to think about the kind of skills that may be relevant to keep with the changing pace. Due to the computerisation and other trends, the labour market is facing drastic changes. This implies that jobs will become obsolete and new work places that require new skill sets will be established. Given the wave of new technologies and trends disrupting business models and the changing division of labour between workers and machines transforming current job profiles, most industries and employers indicated that the skills required to perform most jobs will be shifted significantly (WEF, 2018). The WEF (2016) has identified several skills that will be required for the digital revolution age, namely: cognitive abilities, systems skills; complex problem-solving skills; content skills; process skills; social skills; resource management skills; technical skills and physical skills. Recently, the WEF (2019) has identified ten broad skills required for the 4th Industrial Revolution including:

1. Cognitive skills (i.e cognitive flexibility, creativity, logical reasoning, complex problem solving, mathematical reasoning, visualization, troubleshooting, and analytical skills);
2. Personal/mental abilities (i.e. knowledge in psychology, body language, resilience and intrapreneurial skills),
3. Content skills (i.e. active learning, oral expression, reading comprehension, writing expression and IT literacy),
4. Process skills (i.e. active listening, critical thinking, monitoring self and others and interdisciplinary skills),
5. Social/interpersonal skills (i.e. coordinating with others, emotional intelligence, negotiation, persuasion, service orientation, training and teaching others, ethics and social responsibility, virtual collaboration, and communication skills),

6. System skills (i.e. judgment and decision-making, system analysis, change management and adaptation, governance, risk management, compliance and entrepreneurial skills),
7. Resource management skills (i.e management of financial resource, material of material resource, people management and time management),
8. Technical skills (i.e equipment maintenance and repair, equipment operation and control, programming, quality control, technical and user experience design and new technologies) and
9. Intercultural skills (language skills and open mind-set).

Schwab (2017) has identified nine skills for future jobs, namely: social skills (e.g. negotiations and emotional intelligence), cognitive skills (e.g., creativity and analytics), personal/Mental abilities (e.g. dealing with pressure and persistence), process skills (e.g. critical thinking), system skills (e.g. decision making, entrepreneurial skills), technical skills (e.g. new technologies, programming), content skills (e.g. ICT literacy and active learning), intercultural skills resource management skills (e.g. time management).

Mooney (2016) has also identified ten critical skills to keep pace with the 4IR. These skills are ranked in the order of importance, namely: analytical skills (1st); cognitive skills (2nd); social skills (3rd); emotional intelligence (4th); technical skills (5th); creativity (6th); ICT literacy (7th); intercultural skills (8th); critical thinking (9th) and interdisciplinary skills (10th). It argued that self-evaluation and - development, flexibility and adaptation, critical thinking, creativity, and especially analytical skills will become more important in 2020 than they are today.

4th Industrial Revolution and Workforce Strategy Required

Given the impact of the 4th Industrial Revolution on future jobs, employment and skills, it is important for workers as well as management in various organisations to adopt strategies that will help them to keep pace with the new technologies. To harness the transformative potential of the 4th Industrial Revolution, several business leaders and scholars across all industries and regions were called upon to formulate a comprehensive workforce strategy ready to meet the challenges of this new era of accelerating change and innovation (WEF, 2018). These leaders, Policy-makers, educators, labour unions and individual workers have identified a number of workforce strategies that can be adopted to address the impact of the 4th Industrial Revolution. Some of these workforce strategies are as follows.

- **Personal Training:** During the 2019 WEF it emerged that companies should provide encourage personal training among their workforce. This should include attending seminars, conferences, webinars, read books, articles, papers, maintain a broad social network to other professions, use social media platforms like LinkedIn and conduct own researches to educate themselves to provide the students with the latest knowledge (WEF, 2019).
- **Recruitment of Highly Qualified Persons:** Many companies around the world are faced with skills shortages. However, most of these companies are expected to hire wholly new permanent staff already possessing skills relevant to new technologies. According to the WEF (2018), the likelihood of hiring new permanent staff with relevant skills is nearly twice the likelihood of strategic redundancies of staff lagging behind in new skills adoption. During the recent WEF it was proposed by industries and participants that job-relevant skills is the most critical strategy that can be adopted to meet the new technologies. However, these can only be achieved through

the recruitment of highly qualified personnel. It is estimated that by 2020, the skills required to perform most jobs will have shifted significantly. Therefore, companies must hire new permanent staff with skills relevant to new technologies (Gberevbie, 2010).

- **Reskilling Imperative:** Evidence shows that the current shifts underway in the workforce will displace some workers while at the same time create new opportunities for others (WEF, 2017). However, maximising the gains and minimising the losses requires attention not only from policymakers, but also coherent responses from companies to find win-win solutions for workers and for their bottom line. Therefore, central to success of any workforce augmentation strategy is the buy-in of a motivated and agile workforce, equipped with futureproof skills to take advantage of new opportunities through continuous retraining and upskilling (WEF, 2019).
- **Retrain Existing Employees:** Retention of skilled labour remains one of the most critical challenges facing many industries and companies. According to National Academies of Sciences, Engineering, and Medicine (2017), sustaining skilled technical workforce is a high-priority goal for employers and for policy makers at the local, state, and federal levels. Therefore, in order to retain exiting workforce, companies will need to pursue a range of HRM strategies such as promotion, competitive remuneration and other incentives, employee recognition, establish trust, motivation, employee participation and engagement and fair and equal treatment (James & Mathew, 2012; Yang, Wan & Fu, 2012).
- **Self-Directed Learning:** Schwab (2017) advocates that self-directed learning programmes must be upgraded to enable self-directed education while providing new insights into how people learn. This empowers workers to individualise efforts based on the unique blend of skills needed at any given moment. Many self-directed learning solutions are powered by digital technologies, formats and channels that function at lower cost, more effectively and more broadly.
- **Increase Wages and Salaries:** It has been suggested that wages need to be increased by significantly reducing working hours and allotting money to social economy. In the 4th Industrial Revolution, it is expected that productivity will significantly increase due to the innovative new combination between technology and the market (Schlaile, Müller, Schramm & Pyka, 2017). Therefore, performance of improved productivity should be sufficiently distributed to workers as well as capitalists to continue the 4th Industrial Revolution (Chae, Choi & Huh, 2014).
- **Building/strengthening Institutions:** The institutional system should be significantly strengthened to secure the safety of the 4th Industrial Revolution, contrasting with the systems for the safety of the internal combustion engine based on the 4th Industrial Revolution, such as automobile, airplane, and power grid safety (Mazzucato, 2015). It has been argued that the 3rd Industrial Revolution, that is, IT-based vertical revolution, has only institutional security problems, such as privacy. However, the 4th Industrial Revolution requires similar or much more diverse safety and security systems compared to those of the 2nd Industrial Revolution (Valenduc & Vendramin, 2017).

TRAINING AND DEVELOPMENT PROGRAMMES REQUIRED IN THE 4TH INDUSTRIAL REVOLUTION

According to the World Economic Forum Report (2018), the future jobs will be skill and creative based. Skills like critical thinking, creativity, complex problem solving, emotional intelligence, cognitive flexibility and so forth will be handy for survival in this dispensation. However, these skills can only

be acquired or developed through HRM strategies such as training and development. Scholars such as Allee (2012) and Blaschke and Hase (2016) proposed that industries must evaluate, invest, and promote workforce training programs that align with their corporate social responsibility goals, talent practices, skill needs, and corporate culture. It has been argued that training and development must happen at all levels within the organisation, and it must be timely, on the job and at the point of need.

Manda and Backhouse (2017) postulated that 4th Industrial Revolution is expected to bring disruptive changes to the labour market worldwide. Demand for highly skilled labour is expected to increase. The digital transformation and innovations in the 4th Industrial Revolution demand a new breed of worker, one that is skilled, innovative and technological savvy. This has led to a call for the need to focus on training and developing the so-called “future skills,” some of which do not exist. According to WEF (2018), South Africa, however, continues to face a shortage of skills critical in the 4th industrial revolution due to inefficiencies in the post-schooling education and training system. Science, Engineering, and Technology (SET) for example, only constitute 29% of the total enrolments in the majority of Higher Education Institutions. This is still relatively low compared to some of the countries such as Brazil, Russia, India, China and South Africa (BRICS) India (42.6%) and Brazil (33.9%). However, the South African government through her education policies has committed to developing a skilled and capable workforce to enable the workforce to meet its goals of eradicating poverty, reducing inequality and growing the economy by an average of 5.4 percent (South Africa, 2014).

RECOMMENDATIONS

The 4th Industrial Revolution has brought a major shift from labour-intensive to capital intensive sectors. The key areas of focus in 4IR are machine learning, artificial intelligence, robotics, Data mining technologies/data science, Internet of Things (IoT), 3D printing, and Blockchain or trust technologies. The major shift from labour-intensive to capital sectors implies that machines can now do jobs that were previously the domain of human beings. The 4th Industrial Revolution is distinctive from the preceding revolutions because of its velocity and exponential rate, breadth and depth of convergence and its systems impact on industries, firms, governments and whole societies. The 4th industrial revolution is found to have profound effects on many spheres, not least of which is jobs and employment. Although industries are creating fewer jobs, those jobs require advanced skills. This implies that workers who have no advanced skills will become obsolete. Evidence shows that technologies such as artificial intelligence and robotics may destroy or disrupt many jobs in the services sector and in labour-intensive industries. For examples, approximately 47 per cent of total US employment is in the high-risk category. Additionally, evidence suggests that increased digitalisation will also necessitate more attention being paid to associated risks such as cybersecurity, privacy and data security.

Given the pace of new technologies, Africa still grapples with basic facilities or social amenities such as water, electricity, broadband connection and access to internet. Therefore, it will be difficult to adapt to the 4th Industrial Revolution which requires investments in the new technologies. It is an undeniable fact that Africa has smaller markets, hence consumption is likely to drop due to the potential displacement effects. Therefore, for Africa to keep pace with the new technologies, there is need for all governments, industries, firms and workers to invest in skills training and development. Skills training and development should focus on critical areas such as analytical skills, cognitive skills, social skills, emotional intelligence, technical skills, creativity, ICT literacy, intercultural skills, critical thinking, and

interdisciplinary skills. Beside skills training and development, government and industries should invest in technology and infrastructure projects in order to attract investors. Moreover, education institutions must also redesign their curriculum to accommodate the changes brought by the 4th Industrial Revolution. Additionally, governments must create a robust legal framework to regulate areas impacted by new technologies. Lastly, governments, industries and educational institutions should consider setting up new talent and education programmes to adopt to the future of the production workforce.

DIRECTIONS FOR FUTURE RESEARCH

It is foreseen that the 4th Industrial Revolution will lead to a further shift from labour-intensive production to knowledge and skills-intensive production. This implies that governments all over the world will need an adequate pool of available digital, technical, commercial and management expertise to propel the immediate adoption and use of emerging technologies. It is also envisaged that human ingenuity and creativity may become more, not less, important in the future of production. Therefore, future study should explore the drivers of the shift from the labour-intensive production to knowledge and skills-intensive production. Furthermore, further research should focus on the psychological and behavioural factors which impact on the 4th Industrial Revolution in Africa. Also, a further study should focus on governments readiness to embrace the 4th Industrial Revolution.

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Chapter 17

Reskilling and Upskilling to Develop Global Relevance in the Fourth Industrial Revolution

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ABSTRACT

The chapter identifies factors that influence readiness, acceptance and skill acquisition that are relevant in the Fourth Industrial Revolution (4IR) and to expose the reader to the advantages the 4IR offers. To harness and embrace changes cum strategies that can be adopted to equip individuals across generations with the core skills needed in the workplace. A systematic literature review approach will be adopted to expand on the variables of the activated classroom model, which can create a teaching and learning environment that empower learners with needed creativity and an innovative mindset to better position them for the fourth industrial revolution. This chapter will highlight issues in conventional teaching and learning methods, how they limit creativity in learners and how the activated classroom model solves these issues. It is imperative to focus on teaching and learning methods, as the world is a constantly changing global village and will require individuals to learn, unlearn and relearn concepts to acquire new skills to stay relevant.

DOI: 10.4018/978-1-7998-3347-5.ch017

INTRODUCTION

Currently, a massive change is ongoing in the world and the 4IR has also highly characterized such changes. The way we live, associate, learn and work has assumed a drastic transformation. According to students of history and researchers of several disciplines (Troxler, 2013), one can contend that society has effectively experienced a positive impact of the 1st, 2nd and 3rd Industrial revolution and as such should not be worried about how the 4IR will impact business processes and human interactions in general. However, the 4IR is unique in comparison to the previous industrial revolutions. Undoubtedly, the magnitude and speed of anticipated disruption concerning enterprises, geographies, labour markets, information sharing, knowledge dissemination and technological growth is exceptional and exponential (Pedron, 2018).

The global labour market is more different today than it was twenty years ago. It has been reformed by dramatic events like the Great Recession but also by a quieter ongoing evolution in the mix and location of jobs. In the decade ahead, the next wave of technology may accelerate the pace of change. Millions of jobs could be phased out even as new ones are created. Generally, the daily nature of work could change for nearly everyone as intelligent machines become fixtures in the global workplace (McKinsey report, 2019). The implication of the above is that less-educated workers are most likely to be displaced, while the youngest and oldest workers could face unique challenges. However, those with the least education will be at greater risk (International Labour Organization Report, 2019).

Reskilling is the labour process of learning new skills to approach the job differently from the former mindset. The concept of reskilling is the entire process of a technical and technological approach to learning and skilfulness. Leaders in the workforce are faced with the challenges of restructuring, redesigning and redefining roles, tasks, and responsibility of employees in the workplace (Chong & Gopinathan, 2019).

Globally, the commitment to labour upskilling is on the rise due to the adoption of the digital technological approach. Upskilling is the provision of more advance education or training to employees. Various terminologies have been in use to represent upskilling, these include upside-down cake, upsides, upslon, upslon particle, upsize, up-spin, upspring, upstage, upstairs, upstanding among others (Beaumont, Hinton & Sefronoff, 2018).

BACKGROUND

The nature of numerous occupations is changing, and others will cease to exist because of the 4IR, the workforce as known presently will be replaced by humanoids and artificial intelligence. New jobs and areas of specialization which do not exist will spring forth and be relevant considering the major changes that are underway; a new set of skill is required. About one-third of skills (35%) that are important in today's workforce; in five years would have changed (Gray, 2016). We currently live in an age of high skills instability across all occupations types and industrial sector. The growth in robotics, humanoids, machine learning, genomics artificial intelligence, 3D printing and biotechnology just to name a few are disrupting the current business processes, decreasing the shelf-life of employees' skills.

One major fear of the populace is the view that the 4IR will usher in the dawn of lack of employment. However, Allen (2015) claims that technology has created more jobs than it destroyed. Machines will only take on more repetitive and laborious tasks and seem no closer to eliminating the need for human labour from data gathered in the last 150 years in which the 2nd and the 3rd industrial revolution

took place (Kianian, Tavassoli, & Larsson, 2015). But individuals are not being equipped with the core skill that the Fourth Industrial Revolution demands which is innovation, creative thinking, emotional intelligence, and cognitive flexibility. According to Mikulić (2018); Ogbeibu, Senadjki, & Nee (2018)

(Mikulić, 2018; Ogbeibu, Senadjki, & Nee, 2018), several factors influence acceptance, readiness and relevance in the 4IR, however, one major factor is the structure and curriculum of the education system (Razak, Alakrash, & Sahboun, 2019). The core ideal the 4IR offers is innovation, and creativity, however, what is currently obtainable is the education of individuals to do repetitive tasks in a monotonous way in which robots can execute more effectively. This lacks innovation and creativity which are the key constituents of the 4IR, to ensure readiness, ease acceptance and aid transition.

TRENDS IN THE GLOBAL LABOUR MARKETS AND DIFFERENT ECONOMIC SECTORS

Disruptions are ongoing in the workplace due to technologies such as robotics, artificial intelligence, 3D printing, blockchain, among others. These technologies are transforming the social, economic, and political systems in an unprecedented manner. It is difficult to make a proper assessment of the impact of technology because of its exponential, factorial and high growth rate. However, certain predictions about the trend are possible.

Transformation of the job with global value chains is such that jobs now consist of multiple tasks and same applies for all levels of skills. If the tasks that an employee performs cannot be technically and economically automated, then such employee and job are safe. Many jobs are like that, although on the surface they may not appear so. For example, in the hospitality industry tasks performed by waiters can be automated, but human interaction may be preferred. It is possible for robots to deliver soup for a hotel customer but may struggle to place it on the table without spilling it. It means some of the tasks associated with waiting tables may still require human effort and touch.

Inadvertently, the research discussions on reskilling appear to focus on jobs at gross rather than the net jobs. For example, most of the automation of production processes will require much supervision and quality control. Humans will be needed to carry out these functions. It was observed that the focus on gross neglected the higher-skill jobs that are created directly due to greater automation. For cost-effectiveness, if the cost of adding more supervisors is less than the cost of automation, the reduction in the price of the final product will spur an increase in demand for more supervision. That can increase the number of jobs in factories which also leads to a net increase in jobs.

Despite new occupations and overall job growth, one worrying inclination could continue: the scooping out of middle-wage jobs. McKinsey report (2019) suggested that by 2030, job growth could decline as a share of national employment by 3.4 percentage points. The economic model in the report shows employment in low-wage jobs declining by 0.4 percentage point, while employment in the highest-wage jobs grows by 3.8 percentage points. The growth of high-wage roles can be realized only if employees can obtain the necessary education and skills. Forging career pathways to help people move up and finding sources of future middle-wage jobs will be essential to sustaining the global middle class.

Although technology may displace some workers, it can also be part of the solution for re-engaging them—by identifying career pathways and logical job moves based on the skills possessed by an individual. Already in high-wage countries, low skilled repetitive jobs are being automated, and this is fast spreading to developing countries. Even the high-skilled jobs are altogether immune to the transformation.

To establish and maintain quality teaching and learning requires a process-oriented strategy of sound policies at the macro level and implementation level. High-quality delivery in teaching and learning requires rigorous entry-level requirements, effective evidence-based preparation and continuous professional development and support at the school level. Adequate compensation of the teachers is important with incentives to reskill and upskill teachers. Reskilling and upskilling policies and practices are important for the challenges in the time of reformation of pedagogy. Learning has been evolving and the new roles of teachers as learning designers need to be highlighted in line with the policies to maintain high standards (Chong et al., 2019).

ACT MODEL AND HOW IT CAN POSITIVELY INFLUENCE INDIVIDUALS TO BE CREATIVE THINKERS, INNOVATORS

The Activated Classroom Teaching (ACT) model is a cohesive set of digital-age concepts that leverage the availability of technology to maximize learning while developing key 21st century skills by encouraging a range of cognitive activity (Quilling & Blewett, 2009). Cognitive Learning is a learning process that encourages the active engagement of learners, it is constructive and long-lasting. It teaches learners to use their brains more effectively to make connections when learning new concepts (Adams, 2015).

The distinct skill required to be relevant in the fourth industrial revolution is the ability to learn new skills easily and use existing knowledge to solve problems, however, the educational system does not imbue learners with such skill. This is a major factor that drives panic amongst individuals and employers of labour globally. The question is how you prepare for jobs in which roles are not defined or known. The answer lies in capacity building of learners to allow for fluidity in capacity to learn new concepts which in turn will allow learners to pick up new skills at a faster pace and develop a life-long learning attitude.

CREATIVITY AND INNOVATION (TOOL OF TECHNOLOGY)

Creativity is a function of knowledge, curiosity, imagination, and evaluation. The greater your knowledge base and level of curiosity, the more ideas, patterns, and combinations you can achieve, which then correlates to creating new and innovative products and services (Jones & Pimdee, 2017). But merely knowing does not guarantee the formation of new patterns. The bits and pieces must be shaken up and iterated in new ways. Then the embryonic ideas must be evaluated and developed into usable ideas. In other words, there is a process.

DISCOVERY: The lower level of creativity is discovery. Just as the name implies, it is when you become aware of or stumble upon something—discover it. For example, there is an art called “discovered art.” It might be a rock with a unique shape or a piece of wood with an interesting pattern. If you have ever purchased a piece of natural stone or wood art, that art was discovered art. Many inventions start with discovery (Simonton, 2011).

INVENTION: A higher level of creativity is an invention. For example, Bell invented the telephone (Grosvenor & Wesson, 2016). But you must ask yourself, “Would the telephone have been invented without Bell?” The answer is yes. Eventually, the telephone would have been invented because the science was there. It might have taken longer, but it would have happened. While the invention is higher than discovery, it is something that is going to happen. If you do not invent it, someone else will (Palmisano & Pannofino, 2017).

CREATION: Creation is the highest level of creativity. For example, the stage play Othello is genuinely a creation. The Elizabethan drama would have gone on without Shakespeare, but no one else would have written Othello (Grosvenor & Wesson, 2016). Similarly, there are things that only your organization can create! The key is tapping into what those things are. An example of how this could play out in an organization is, while at a conference one might discover a tool, a technology, or a process that an employer had no prior knowledge of its existence. This tool can be purchased for staff, and the use or process of use of the purchased tool helps other employees work better. After some time, that discovery may also spur an innovative idea of how to apply the discovery. That innovative idea as an inspiration that yields something never seen before, something created by your company that helps the organization and customers. This is an example of how the three levels of creativity can work together.

Innovation is not just represented by introducing or implementing new ideas or methods. The definition of innovation can be defined as a process that involves multiple activities to uncover new ways to do things. It should not be confused with creation since this can be defined as the act of making, inventing, or producing something. However, innovations can be realized with creativity (Schwab, 2017).

The most common type of innovation is evolutionary, which means finding ways of making incremental improvements to your products and services. This type of innovation carries fewer risks, as it is generally easier to establish demand for these improvements and to calculate the likely return on investment.

URGENCY OF CHANGING TEACHING PEDAGOGY TO EQUIP INDIVIDUALS WITH THE ABILITY TO INNOVATE AND THINK CREATIVELY

The changes in employment requirement and job description in readiness for the Fourth Industrial Revolution requires a total overhauling of educational curriculum and teaching methods to imbue learners with advance cognitive abilities, adaptability to change, ability to think creatively and ease to innovate. Which are the skills needed to stay relevant and indispensable.

CHANGES IN EMPLOYMENT

Artificial intelligence is paving the way for a unique set of productivity and augmenting our lives in many ways. As in previous industrial revolutions, it can also be a disruptive force, reshaping jobs and surfacing questions about the interactions between humans and machines.

Jobs are inevitably going to be impacted as artificial intelligence automates a variety of processes. However, just as the Internet did 20 years ago, the artificial intelligence revolution is going to transform many jobs—and spawn new kinds of jobs that drive economic growth. Employees can spend more time on creative, collaborative, and complex problem-solving tasks that machine automation is not well suited to handle.

However, employees with less education and fewer skills are at a disadvantage as the Fourth Industrial Revolution progresses. Businesses and governments need to adapt to the changing nature of work by focusing on training people for the jobs of tomorrow. Talent development, lifelong learning, and career reinvention are going to be critical to the future workforce.

CHANGES IN EQUALITY

Change brings about redistribution of wealth, power and resources this leads to changes in equality. As some jobs and profession will become redundant or non-existent, awareness of how this affects individuals through the skills they possess or will acquire is worthy of note. These uncertainties are some of the reasons for a review of curriculum review and extensive research into better teaching and learning methods.

Individuals are unsure, if the Fourth Industrial Revolution is the road to a better future for all. The power of technology is increasing rapidly and facilitating extraordinary levels of innovation. And as we know, more people and things in the world are becoming connected. But that does not necessarily pave the way for a more open, diverse, and inclusive global society. The lessons of previous industrial revolutions include the realization that technology and its wealth generation can serve the interests of small, powerful groups above the rest. Powerful new technologies built on global digital networks can be used to keep societies under undue surveillance while making us vulnerable to physical and cyberattacks. These are the challenges we can face to make sure the combination of technology and politics together do not create disparities that hinder people.

According to Gap (2017), the World Economic Forum Global Risks Report 2017, “the Fourth Industrial Revolution has the potential to raise income levels and improve the quality of life for all people. But today, the economic benefits of the Fourth Industrial Revolution are becoming more concentrated among a small group. This increasing inequality can lead to political polarization, social fragmentation, and lack of trust in institutions. To address these challenges, leaders in the public and private sectors need to have a deeper commitment to more inclusive development and equitable growth that lifts all people.”

Many people around the world have not yet benefited from previous industrial revolutions. As Schwab and Davis (2018) point out, at least 600 million people live on smallholder farms without access to any mechanization, living lives largely untouched by the first industrial revolution. Around one-third of the world’s population (2.4 billion) lack clean drinking water and safe sanitation, around one-sixth (1.2 billion) have no electricity—both systems developed in the second industrial revolution. And while the digital revolution means that more than 3 billion people now have access to the Internet, that still leaves more than 4 billion out of a core aspect of the third industrial revolution.

The means that as we appreciate and engage with the exciting technologies of the Fourth Industrial Revolution, we must work to ensure that the opportunities they bring are well-distributed around the world and across our communities. We must help those who missed out on the huge increases in quality of life that the first, second, and third industrial revolutions provided.

CHANGES IN PRIVACY

We value the ability to control what is known about us, and yet we are living in a world where tracking every individual’s personal information is key to delivering more intelligent, personalized services and security. The only way to have control is not to use the online platforms available such as social media or not have online presence. This is almost impossible in the 20th Century as digital footprint is now becoming a part of human existence.

For example:

- Facebook tracks what you do so that it knows which content and advertisements are most relevant to you.
- Smartphones track your location, and you can share that information with apps that recommend places to eat or shop.
- Retailers analyze your purchase history to recommend products and offer coupons to stimulate more sales.

In the future, individuals walk into a store and the salesperson will immediately have your name, credit rating, marital status, and past purchases flashed to their augmented-reality virtual screen.

Technological advances are also broadening the scope of surveillance. In the UK today, an estimated 6 million CCTV cameras are recording activity all over the country. Advances in computing power and artificial intelligence can potentially enable law enforcement agencies to track suspected terrorists by analysing social networks, government records, and other data (Roy, Chan, Czanner, Wallace, & Vallabhaneni, 2018).

In the future, billions of 3D-printed “smart dust” cameras floating in the air can monitor the activities of humans. From traffic reports to natural disasters, such technology can keep us safer. But it also can watch us when we do not want to be watched (Tan & Lemrini, 2018). For consumers, businesses that are transparent about their data collection practices and that prioritize consumer privacy can win our loyalty.

CHANGES IN TRUST

Public trust in business, government, media, and technology are falling. This is a crisis that is dividing societies and creating instability around the world as even these institutions cannot guarantee total security. The technologies of the Fourth Industrial Revolution themselves are neutral, but are they being applied in ways that build trust? Are consumers going to trust that new artificial intelligence and robotic systems can make their lives better, or are they going to be fearful of the machines and those who control them? Are citizens going to trust the institutions and service providers who collect and maintain their data?

For the Fourth Industrial Revolution to generate trust, everyone contributing to it must collaborate and feel a connection to common objectives. More transparency into how we govern and manage this technology is key, as are security models that boost our confidence that these systems will not be hacked, run amok, or become tools of oppression by those who control this information.

BRINGING IT ALL TOGETHER

The innovations in artificial intelligence, biotechnology, robotics, and other emerging technologies are going to redefine what it means to be human and how we engage with one another and the planet. Our capabilities, our identities, and our potential will all evolve along with the technologies we create.

In the coming decades, we must establish guardrails that keep the advances of the Fourth Industrial Revolution on a track to benefit all humanity. We must recognize and manage the potential negative impacts technology can present, especially in the areas of education, equality, employment, privacy, and

trust. We must consciously build positive values into the technologies that we create, think about how they are to be used, and design them with ethical application in mind and in support of collaborative ways of preserving what's important to us.

This effort requires all stakeholders' governments, policymakers, international organizations, regulators, business organizations, academia, and civil society to work together to steer the powerful emerging technologies in ways that limit risk and create a world that aligns with common goals for the future.

IMPLICATION OF THE 4IR FOR JOB CREATION, JOB SECURITY, SKILLS DEVELOPMENT AND EDUCATION,

Education and access to information can improve the lives of billions of people. Through increasingly powerful computing devices and networks, digital services, and mobile devices, this can become a reality for people around the world, including those in underdeveloped countries. The social media revolution embodied by Facebook, Twitter, and Tencent has given everyone a voice and a way to communicate instantly across the planet.

Today, more than 30% of the people in the world use social media services to communicate and stay on top of world events, these innovations can create a true global integration and interconnectedness, bringing billions of more people into the global economy. They can bring access to products and services to entirely new markets. and can give people opportunities to learn and earn in new ways, and they can give people new identities as they see the potential for themselves that was not previously available.

However, while the Fourth Industrial Revolution has the power to change the world positively, we must be aware that the technologies can have negative results if we do not think about how they can change us, we build what we value. This means we need to remember our values as we are building with these new technologies. For example, if we value money over family time, we can build technologies that help us make money at the expense of family time. In turn, these technologies can create incentives that make it difficult to change that underlying value.

CURRENT CHALLENGES WITH EMPHASIS ON EDUCATION AND SKILL DEVELOPMENT

According to Chung and Kim (2016), "we stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before. We do not yet know how it will unfold, but one thing is clear: the response to it must be integrated and comprehensive, involving all stakeholders of the global polity, from the public and private sectors to academic and civil society" (WEF, 2015). This provides insight into some of the challenges surrounding the Fourth Industrial Revolution. The enormity of the challenges and the breadth required of the response is reinforced by Peters (2017) when he argues that the evolution of global industries in this era of the fourth industrial revolution is both exciting and scary. Life will change with the 3D printing, the Internet of Things, and the blend of technologies. Industry 4.0 can raise income levels by allowing entrepreneurs to "run" with their new ideas. It will improve the quality of life of many around the world. While there are many benefits of the 4.0, there are numerous key challenges that lie ahead.

To begin with, the revolution could lead to greater inequality, especially given its potential to disrupt labour markets. As labour is replaced by automation across the entire economy, then the net displacement of workers by machines might aggravate the gap between returns to capital and returns to labour. The most valuable and scarcest resource in this digital technology-driven era will neither be ordinary labour nor ordinary capital. Individuals with the ability to come up with new and innovative ideas will be in higher demand. Talent, more than capital, in the future, will represent the critical factor of production. Engineers with ideas, not investors or workers, will be the scarcest resource. (Brynjolfsson, McAfee, & Spence, 2014).

The quest for talent will give rise to a job market that may become increasingly segregated. Computers and digitization will replace low skilled and low wage jobs. The higher-paid jobs requiring more skills are less likely to be replaced.

This increased dichotomization can increase social tensions. The speed at which technology is evolving during this Fourth Industrial Revolution era makes it challenging for schools to keep up the same pace. Butler-Adam (2018) opines that there is a pessimistic view that artificial intelligence will replace modern jobs than it will create, as half of today's jobs will become automated. There will be competition amongst employees who have the required skills to cope with the new technology, therefore educators will have to adjust the teaching and learning process to reflect these skills (Xu, David, & Kim, 2018).

Training students to be experts will require institutions to have highly talented and trained faculties, this will require a lot of funding. As a result, if policymakers are not smart in making the right decisions with the will to have them implemented, there will be a disruption in the labour market as students will not be well equipped to face it. Hence, it is important that students be taught how to work with machines and not compete with them, to programme machines rather than be programmed by them. Responding to this would be one of the major challenges of education since it would have to reconceptualize teaching approaches and pedagogical idiosyncrasies within higher education.

In addition to the threat of massive job displacement under industry 4.0, there are a host of other challenges such as risk resentment, hacking, cybersecurity, among others (Lambert & Glenn, 2017). This challenge will equally affect schools who will constantly have to update their curriculum to be able to deal with cybersecurity challenges in which graduates might encounter in organizations they will work for. Mitigating risks and eliminating vulnerability. Dependence on technology is growing with availability of technology making our lives and routines extensively connected to various devices such as mobile phones, cars and light switches to our home security cameras and smart speaker. This raises a higher level of alert as the safety of this technology becomes very important. In 2018, Consumer Electronics one of the biggest trends was that everything is connected and there is no going back (Goode, Levy, Hovav, & Smith, 2018).

Data analysis and automation help companies not only to survive but also to thrive in the future. Similarly, higher education institutions should embrace data mining to gain a better understanding of student performance and deliver "Education for you" that is tailored to meet the demand of the job markets in the Fourth Industrial Revolution while considering the students' needs (Bernhardt, 2017).

Blinder (2006) argues that for students to adapt to the information age, a great focus should be of the type of education students receive rather than the quantity they receive. Education is increasingly becoming "just in time" rather than "just in case" ;(Soriano, 2017) it is more about what you need to know for a certain time than compiling knowledge that may never be needed. Data regarding student performance, behaviour, development, and interaction inside classrooms and on the online platforms using the ACT

model would create diverse and fast-changing data (O'Neill et al., 2018). The ability of Higher Education institutions to integrate this information into smart data would result in intelligent decisions regarding the delivery of customized education and personalized learning experience for students.

IDENTIFICATION OF PROPER ALIGNMENT OF TECHNOLOGY TO TEACHING AND LEARNING PROCESS

The ACT model allows for proper alignment of technology to optimize the learning process and give learners skills required not only to fit into the current standards of technology but an adaptive learning ability to acquire new skills with ease. The ACT approach highlights 5 major variables tabled as follows:

CURATION: This is the process where learners brain is engaged by finding, selecting, arranging, and amplifying. It stimulates critical thinking, curiosity, contextualization, and visualization. It also allows for collaboration which increases accuracy and speed.

CONVERSATION: This is the process where learners engage to discuss concepts, dispute, and refute answers until a consensus is met at a generally accepted answer or explanation to a problem. It increases learners' confidence and learning also takes place in the process. This imbues learners with critical thinking, flexibility, curiosity, and metacognition. It also amplifies learners' ability to collaborate.

CORRECTION: This is the process of giving solutions to problems, failing, evaluating proffered solutions, and adjusting solutions until the correct answer is reached. This increases problem-solving skills, flexibility, and metacognition. This increases collaboration, productivity, communication skills and persistence.

CREATION: This is the process of conceptualizing, designing, constructing, and managing possible solutions to problems. It stimulates creativity, critical thinking, the problem-solving capability of learners', curiosity, metacognition, and visualization in learners.

CHAOS: This is the process of sifting through a large amount of data to allow for synthesizing, recognition, connection, and generation of solutions to the problem. It stimulates creativity, critical thinking, flexibility, curiosity, contextualization, metacognition, and visualization.

The use of technology in education to teach learners using these concepts will not only increase the knowledge base of learners if integrated into the learning process but will teach learners how to learn thereby giving them the flexibility required to learn new skills as needed or required by the revolution the fourth industrial revolution brings.

RECOMMENDATIONS

Interventions are required to catalyse a transformation within the education sector. Interventions that support inclusive teaching approaches and continual learning experiences relevant to the challenges that we can identify today and the ones that we can anticipate for tomorrow. Lifelong inclusive and equitable quality education; formal and informal, physical, and digital, will be vital in preparing our populations and society to thrive in this uncertain future. The 20th century model of education that inculcates standardized facts and procedures designed to output a workforce for jobs that no longer exist will be insufficient to meet the challenges ahead. The jobs of the future are the ones that machines cannot do, they will rely on creative expression, social interaction, physical dexterity, empathy, ingenuity, and collaboration. We

will need scientists, mathematicians, engineers, and artists to design and invent solutions to our most pressing problems and we will need to learn how to co-exist with our neighbours. We will need to equip our people with the skills and knowledge to reimagine society to meet the challenges that they face.

FUTURE RESEARCH

Responsibilities and Job roles are yet to be defined; this limits the effectiveness of curriculum change in universities to prepare learners for the fourth industrial revolution. This will change as more countries accept and integrate the elements of the fourth industrial revolution in its processes. A constant review of the education curriculum to allow for learner's specialization in their chosen field of study rather than a generic approach to learning.

Also, employees will be expected to play a more active and involved role in their places of work, the Fourth Industrial Revolution requires that people become more entrepreneurial in their approach to employment, and this new spirit can be exercised indirectly by being an intrapreneur an employee who works for someone else but embodies the entrepreneurial spirit of being innovative and seeking continuous improvement of the things around them or directly as an entrepreneur. This will imbue employees with a lifelong learning mentality as they will see value in continuous learning to establish organizations of their own.

CONCLUSION

The Fourth Industrial Revolution urges us to think creatively about the manufacturing process, value chain, distribution, and customer service processes. Meanwhile, the future of education emphasizes the immense need to look beyond these areas and strategically utilize the better teaching and learning approach to prepare the coming workforce for the challenges ahead.

Universities emphasize their role in shaping future technology by being the testbeds for innovation and educating future generations. Traditional education has contributed greatly to the current levels of the industrial revolution and technological advancement. However, for higher education to deliver future generations with the right set of skills and knowledge; an imperative question must be asked regarding how higher education institutions would be affected by the Fourth Industrial Revolution and how the delivery of education will be transformed.

There are different opportunities available that will shape the role which can be undertaken by higher education in the Fourth Industrial Revolution. Combining the strength of the traditional higher education with the ACT model represents necessary steps to scale quality education.

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Chapter 18

Fourth Industrial Revolution (4IR) in the Global South: The Future of Work in Tourism – Challenges, Opportunities, and Future Prospects

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ABSTRACT

Future trends within the field of tourism research vary, whilst the predictions continue to be at the forefront of the discussions among the tourism practitioners and researchers. The change is so evident and continues to accelerate at a tremendous speed while at the same time the tourism industry remains fragmented and interdisciplinary. This chapter intends to present the view from the global south on the fourth industrial revolution concept in the tourism industry. Reviewing the literature on tourism and the 4IR as a research method is more relevant than ever because literature reviews play an important role as a foundation for all types of research. The future trends in the tourism industry are highlighted in this chapter, together with the common pitfalls and advantages of the 4IR in the tourism industry.

INTRODUCTION

Tourism planning is critical for the long-term success of any destination. If done well, it can ensure the longevity of the tourism industry in the area. This is reflected through the history of the first, second and the third industrial revolutions. There has been a paucity of academic gaze on tourism and the 4IR

DOI: 10.4018/978-1-7998-3347-5.ch018

literature. Therefore, it is critical to contribute towards the body of knowledge of the tourism sector and the 4IR, particularly in the developing context such as South Africa. Change in one place affects the pace on how to deal with the change. We live in a connected society with several disruptions ranging from the technological connection, globalization, risks associated with climate change and the epidemics such as CORVID 19 (just to name a few). Consequently, organization are at a point where they have to cope with the major shifts in the technological, social, economic and environmental changes of this era. This paper presents a strategic outlook on the future of the tourism industry in the context of the 4IR from a global South perspective. Perhaps a background on the different types of industrial revolutions is important.

Background of the First, Second, Third Industrial Revolutions

“The first Industrial Revolution was characterized by the substitution of water/ coal/ steam power, it all started in Britain’s textile industry in the mid-18th century, it was sparked by the mechanization of spinning and weaving. Over the subsequent 100 years, the first industrial revolution transformed every existing industry, from machines tools to steel manufacturing, the steam engine and railways” Schwab (2018: 7). Mpofu & Nicolaides (2019) noted that water and steam engine were key aspects which ultimately made possible the convention of the farming and feudal society to a manufacturing society. According to Sudhakar (2018), the Second Industrial Revolution was from the 1940s to the 1970s. There was a scientific-technical revolution in which there was a rapid industrialization by means of oil, petroleum and electricity to power mass production processes and the mechanization of manufacturing. Electric energy was used to generate mass production processes” Mpofu & Nicolaides (2019:3). “The second industrial revolution began in 1900 with the invention of the internal combustion engine” Xi et al. (2018: 90).

The Third Industrial Revolution started in 1960 and was characterized with the implementation of electronics and information technology to automate production” Xi et al. (2018: 90). The third industrial revolution involved the application of electronics and information technology, and was moulded by the post Second World War (Mpofu & Nicolaides, 2019). The 4IR is building on the Third Industrial Revolution characterized by a fusion of technologies blurring the lines between physical, digital and biological spheres (Xi et al., 2018). The 4IR is changing how we live, work, and communicate. The transformation of the industrial revolution has transformed the ability to store, process and transmit information in digital form; reformatted almost every industry, and dramatically changed the working and social lives of billions of people. The cumulative impact of these three industrial revolutions has been an incredible increase in wealth and opportunity” Schwab (2018: 8). It is reshaping government, education, healthcare and commerce-almost every aspect of life” Trailhead (2019:1). The Caribbean Council (2019) noted that it means increased competition, reduce prices and restructure a market in ways that often result in changing the behaviour patterns of an existing market and how and where individuals are employed. However, the focus of this paper is on the 4IR.

The Fourth Industrial Revolution

The impact of the 4IR has become topical, as it is associated with the Internet of Things, computerization, robotisation and smart networks and smart cities. Panfiluk et al. (2019) noted that such concepts are based on four groups of new technological systems: nanotechnology, biotechnology, computerization and communication as well as cognitive technologies. Schwab (2015) noted that the 4IR is associated with breakthroughs in fields such as artificial intelligence, robotics, the Internet of Things, autonomous

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vehicles, 3D printing, nanotechnology, biotechnology, material science, energy storage and quantum computing. Levin (2018) noted the new catchphrases describing the 4IR as the “industry 4.0”, “smart industries”, “intelligence industry”, “smart factory” or “smart manufacturing”.

These catch phrases are based on megatrends of the following technological drivers:

Physical-autonomous vehicles, 3D printing, advanced robotics, new materials; Digital-internet of things, distributed ledger technologies/block chains, technology-based platforms, and; Biological-genetics” Korze (2019: 30). 4IR describes the exponential changes to the way we live, work and relate to one another due to adoption of cyber-physical systems, the Internet of Things and the Internet of Systems. Smart technologies are implemented in the factories and workplaces are connected machines that interact, visualize the entire production chain and make decisions autonomously. This revolution is “expected to impact all disciplines, industries and economies” (Marr, 2017: 2). Some jobs will be deemed obsolete and will require that government and companies become the early adopters, which comes at a capital premium for companies. The early investment in technology would bear greater efficiency and allow companies to be more agile in the new environment presented by automation and robotics.

The Fourth Industrial Revolution and the Future of Jobs

There has been a lot of fear mongering around the future of jobs, and how the 4IR is threatening jobs. Tourism employers must embrace the 4IR, instead of fearing it, particularly the small medium enterprises. The 4IR presents humans with immense opportunities for growth, connecting more people, and reducing the global challenges of poverty, and underdevelopment. The costs of development will be greatly reduced when the full benefits are derived from technological innovation, heralded by the 4IR. Therefore, fearing the 4IR could be better harnessed through increasing labour opportunities that emanate from the 4IR. Hence, tourism companies must undertake a skills inventory to identify critical skills needed in the sector. According to Biswas (2019), performing a skills inventory will help a company to recruit better. This is informed by the reality that the 4IR era or phenomenon would lead to a skills shortage and a war for talent between companies and amongst countries could intensify.

Accenture (2018) noted that occupations that allocated more time to human-like activities have a lower probability to automation, while workers involved in occupations such as production, office administration, farming, food processing, construction, mining, transportation, installation and maintenance are at the highest risk. This means that tourism jobs will remain important, as the service industry would be a buffer for other industries, whose jobs would be destroyed by automation. For example, The Black Business Quarterly (2019) noted that by 2037, South Africa will need 3 589 pilots, 887 air traffic controllers and 4 053 ground personnel. This will become possible, as global tourism will spur global aviation to continue its upward trajectory in growth rates. The 4IR take the spotlight and drive economic and commercial growth while de-prioritizing other industries that can be automated, thereby causing some jobs to disappear. Like the previous industrial revolutions, the 4IR is expected to disrupt the current industries mainly technology, healthcare, and transportation. In 2020, about 5 million jobs will disappear due to automation (World Economic Forum, 2016). As a worker in the future, the only way to survive and thrive is to identify which skills will matter for the industries that will experience unprecedented growth” Guthrie-Jensen Consultants (2018: 2).

The Benefits of the Fourth Industrial Revolution

There are still some doubts between researchers and the society around the concept of the 4IR (Sifolo, 2020). Perhaps highlighting the benefits associated with 4IR is critical. Verevka (2019) indicated that “transformation” is essential to adapt to the change process that the business must go through in order to function in a digital economy. Morgan (2019) noted that organizations would adopt technology that will give them market retaining or dominating advantage, organizations must buy into the 4IR as early adopters. Whilst, Schwab (2018: 13) maintains that the “new approaches to govern technologies in ways that serve the public interest must be embraced to meet human needs and ultimately make the society feel part of a true globalization civilization”. The benefits of 4IR includes:

- Improve the Quality-of-Life for the world’s population and raise income levels according to Marr (2017).
- “Artificial intelligence is unleashing a completely new level of productivity and augmenting our lives in many ways” Trailhead (2019:4).
- “The 4IR is entirely within our power, and we are still at its very early stages” Schwab (2018: 4).
- Companies will increase their training and reskilling budgets, increasing the human capital of employees.
- “Advances in computing power and artificial intelligence can potentially enhance law enforcement agencies to track suspected terrorists by analysing social networks, government records and other data” Trailhead (2019:6).
- Artificial Intelligence, which will replace certain jobs, does not have employment rights, no paid wages, and does not get sick or partake in a strike.
- This revolution may further weaken the national state to become more e-government policies and mechanisms that would lead to greater liberalization that would spur more entrepreneurial activity.
- According to National Science Technology and Innovation Information Portal (2019) the rapid technological advances in renewable energy, fuel efficiency and energy storage not only make in these fields increasingly profitable, boosting GDP growth, but also mitigating climate change.
- Levin (2018) noted that technology could make the remaining jobs more productive and even create new jobs.
- Trailhead (2019) noted that the education and access to information could improve the lives of billions of people, through computing devices and networks.
- Trailhead (2019) noted that online shopping and delivery services including by drones are already redefining convenience and retail experiences, could jumpstart small and rural areas.
- Automation and efficiencies would increase leisure time for people.
- Reduced carbon emissions can be achieved through autonomous vehicles and driver-less cars that use batteries.
- Human longevity must be achieved through advances in medicine and science.
- “Artificial intelligence, robotics, bioengineering, programming tools, and other technologies can all be used to create and deploy weapons” Trailhead (2019:4).
- Skills instead of tertiary education would unleash more opportunities for the world’s population to acquire skills training, and lifelong learning opportunities that would make it possible to adapt to jobs of the future.

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- If education institutions adapt to the jobs of the future as early adopters to develop the skills required for a disrupted world according to The Caribbean Council (2019).
- Countries that promote research and development and innovation (Research & Development) will adapt to the 4IR.
- Top digital talent can be produced by the first adopters may meet the needs of the 4IR much faster than the late adopters.
- ‘Human ingenuity and creativity may become more, not less, important in the future of production’ Levin (2018: 11).
- Leisure time will increase for human being as the 4IR may lead to more efficiencies and effectiveness. The Western Cape Government & University of Stellenbosch Business School (2018) noted that the use of digital technologies-including smartphones, tablets, infield sensors and drones and satellites are digitalizing farming and allow for the remote measurement of soil conditions, better water management and livestock and crop monitoring.

The Negative Impacts of the Fourth Industrial Revolution

There are several challenges or negative effects of the 4IR in the tourism sector. The negative effects of the 4IR includes:

- It may lead to more unemployment and poverty for countries and companies that do not adapt immediately to the prospects of opportunities and threats of the 4IR, especially in countries and continents experiencing a demographic dividend.
- Many people are yet to benefit from previous industrial revolutions, and many countries will miss out from the benefits of the 4IR and subject millions of people to a legacy of poverty and underdevelopment.
- Joblessness may be more profound in developing countries that have not moved their economies towards services as noted by National Science Technology and Innovation Information Portal (2019).
- The speed of change, its exponential velocity, breadth and depth is occurring at a speed that may exceed the turnaround time for policymakers, academic and companies.
- ‘The institutions that have traditionally had the responsibility of shaping the societal impacts of these technologies-including governments, companies and civil society organization-are struggling to keep up with the rapid change and exponential impact’ Levin (2018: 13).
- National Science Technology and Innovation Information Portal (2019) noted that new technologies tend to amplify current inequalities, both within and between countries, further concentrating benefits and values in the hands of the already wealthy.
- ‘The largest beneficiaries of innovation tend to be the providers of intellectual and physical capital-the innovators, shareholders and investors-which explains the rising gap in wealth between those depends on capital versus labour. Technology is therefore one of the reasons why incomes have stagnated or even decreased’ Schwab (2015: 3).
- Schwab (2018) noted that the 4IR could exacerbate inequality via monopoly power, for example, Google controls almost 90% of the global market share of search advertising.
- ‘Workers with less education and fewer skills are at a disadvantage as the 4IR progresses’ Trailhead (2019:4).

- Schwab (2015) noted that the demand for less education and lower are decreasing.
- It may destroy many jobs in the service sector and in labour-intensive industries according to Levin (2018).
- More state supervision of citizens that may not be tracked by citizens.
- Citizens and customers may be subjected to changes in privacy as social media platforms, smart devices, and retailers analyse your preferences, tastes, locations and purchase history.
- Manufacturing will become more autonomous due to smart factories and seamless supply chains according to Levin (2018).
- Schwab (2015) noted that constant connection could deprive us off life's most important assets: the time to pause, reflect and engage in meaningful conversations.
- Concerns around cybersecurity will only increase and online espionage and crime may increase during the 4IR.
- 'Advances to quantum computing could render existing online security protocols useless' Schwab (2018: 12).
- 'Cloud technology applications and mass data sharing can present serious threats to the future' Gul (2018: 35).
- People have no control over either technology or the disruption that comes with the 4IR according to Xi et al. (2018).

The Asia-Pacific Economic Cooperation (2017) identified the following possible solutions to address the challenges faced by the tourism industry:

- A growing need for labour and skills: Across all economies, there is an identified skills shortage in 'soft' skills such as customer service.
- Participation by women and young people need to be a focus: Women and young people generally fill tourism jobs that are lower paid. Women and youth tend to experience poorer working conditions.
- Participation requires a shift in perceptions to address some realities of the industry: The attractiveness of the industry to workers is poor due to low wages and difficult working conditions in junior positions.
- Micro, small and medium enterprises (SMMEs) to focus on greatest training needs: In-house training, capacity is essential but generally scarce among tourism MSMEs. Organizations tends to respond to skills shortages by investing more in recruitment rather than aiming to improve internal capacity through training and retention.

Trends Shaping the Future of Work in the Tourism Industry

The tourism industry has for the positive economic impacts it has on a destination area, such as attracting foreign exchange, diversifying the economy, and creating labour intensive jobs. When destinations attract tourists, the intention is to attract "new currency" into the local economy, which is supposed to benefit the destination area, and this is supposed to increase improve the Quality-of-Life and standard of living of the residents and the host community. Tourism is attractive because of the low barriers of entry, which leads to a plethora of small and medium enterprises, which are referred to as engines of jobs and

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employment creation. The tourism industry has caught the attention of governments and policy makers because of the low cost of creating tourism jobs, which would alleviate the challenges of unemployment in many countries, especially in developing countries.

Global Changes in the World of Work

Globally, technology is rapidly changing the world around us; hence, the world of work has changed. The one size fits all approach to the world of work has to change to adopt to new realities. Non-traditional forms of work have now changed the world of work by allowing for a balance in work-life issues. The changes in the world of work mean that there will be losers and winners. For example, tourism destinations must anticipate and plan for the changes in the world of work to retrain staff and seek high levels of employment for economic growth. This also means that governments must adapt the regulatory environment that governs the world of work. The declining power and influence of labour unions is a fact and not fiction, as the world of work has led to a new regiment in labour relations. Labour union membership has experienced a downward spiral for the past 40 years, as the world has changed. Technology has changed how humans and businesses operate, and therefore changed the world of work. The first generation of technology had reduced the cost of doing business, benefiting small business to compete with the major businesses by reducing the barriers of entry. Disruption of jobs is nothing new, as innovation has driven to certain levels of jobs expurgated. In the pursuit of higher productivity at lower cost options, jobs have for many years been cut down. In recent years, many manufacturing and standard business have been outsourcing intensive jobs to countries where labour was cheaper. Those jobs rarely contribute to the GDP of the country of origin of the employee but at least labour benefited from the employment created there.

Today, the same phenomenon occurs, the only difference is that the search for labour arbitrage is no longer between physical geographies; “today, jobs are lost to the digital world and will, in all probability, never to be done by humans again” (Accenture, 2018:3). Robots will destroy certain job, but create opportunities for many more jobs to be created. Therefore, if organizations buy into the idea of a 4IR, then they buy into the imperative to be early adopters or primary innovators. Morgan (2019: 378) calls for the states and governments to be early adopters in foster this trend. According to Ayentimi & Burgess (2019), sub-Saharan Africa there is a ‘double-breasting dilemma’ because the 4IR has deepened fear of jobs dislocation, skills disruption combined with the exiting high levels off unemployed. Investments in Research and Development (R&D) are imperative to ensure that human capacity is increased through reskilling. In the case of South Africa, the 4IR is regarded in the Watch out Segment on the Digital Evolution Index; South Africa is noted to be falling behind its peers. Liao et al. (2018) noted that in Europe, the budget allocation within “Horizon 2020” for the “Factories of the Future” that amounts to 1.15 billion euros over the 7-year period (2014-2020). “Industry 4.0 includes through digitization and integration of the value creation chain data: offer of digital products and services, operation of co-specialized physical and virtual assets, transformation and integration of all business operations, partnerships, as well as customer service optimization” Verevka (2019:2).

Tourism and Technology in the Fourth Industrial Revolution

The 4IR is changing the way people work and communicate in their daily lives. One of the sectors most affected by the 4IR is tourism. An example is that of the adverts for tourism destinations with the bookings information, which is interconnected in such a way that one ends up buying the entire package.

Tourism was one of the first sectors to digitalize business processes on a global scale, bringing flight and hotel booking online to become a digital pioneer. As information and communication technology (ICT) became a global phenomenon, tourism was a consistent early adopter of new technologies and platforms. Tourism stakeholders have always adapted to technology and will embrace the 4IR as a means of using technology to enhance the travel experience. "A digitalized tourism sector must innovate and generate new business opportunities to ensure the continued competitiveness, growth and sustainable development of the sector" (United Nations World Tourism Organisation, 2018: 1b). Tourism is one of the world's transversal sectors; it has witnessed almost all the changes. For both public and private tourism enterprises, ICT has offered indispensable and very powerful tools for management, logistics, distribution and marketing. It has brought about a digital tourists that is more autonomous, hyper connected and increasingly demanding, expecting personalized customer service" United Nations World Tourism Organisation. (2018a).

For example, airports and home security agencies are using biometric technology and data ease the identification of desired and undesired customers, whilst Artificial Intelligence allows for the personalization and tailoring of experiencing to meet the needs of clients and tourists.

According Gul (2018) it is predicted that robots will focus on heavy work such as construction, mine, sewage, while people will focus on information and managerial work in the future; the tourism industry is highly probable that robots will be able to carry about unattractive tourism jobs. This will serve to increase the leisure time that humans have, which can be used for tourism consumption. "Robotics can and will change our lives in the near future. Technically robots are automated motorized tools. They cook food, play our music, record our shows, and even run our cars. Consequently, robots have the potential to improve the quality of our lives at home, work and many other places. Customized robots will create new jobs, improve the quality of existing jobs and give people more time to focus on what they want to do" Xi et al. (2018: 92).

Korze (2019) noted that technology which is the key enabler of the 4IR, and has had a tremendous influence on tourism. According to Korze (2019: 30), the Internet has been contributing to self-organised holidays and independent travellers. In fact, it has shifted 'the balance of power from the providers of tourism services to consumers'-travellers and guests and brought two major advantages. The first one is the cost reduction: there can be fewer intermediaries than before and the second is related to marketing, as markets are not defined by location and geography using the Internet to market. Visa-free countries have increased drastically as almost all countries have jumped on the tourism bandwagon. Visa facilitation has increased the competitiveness of tourism destinations, as the world's appetite for tourism consumption as more tourists enter the realm of tourism consumption. "Travel facilitation measures in particular, including customs and immigration policies and visa requirements for visitor entry are key components in ensuring ease of mobility between destinations. When these processes are made time-consuming, expensive or bureaucratic, they can act as disincentives for travel to that destination. Indeed, a destination can be made more desirable when such processes are instead streamlined and efficient" OECD (2018: 80).

The change in technology will have an impact on both businesses and customers. The emergence of the internet has shifted the power more and more to customers, as competition and substitute competition has increased. "In order to meet new trends, as well as to increase management efficiency and to reduce costs, restaurants have to automate processes and to implement digital solutions. Customers increasingly want to pay bills from their mobile devices. According to the same survey, 27% of restaurant visitors prefer to pay for dinner other than in cash. Gadgets with special software that allow the waiter to accept

an order, to send it for execution and to form a bill in a few taps are becoming a universal solution” Verevka (2019: 8). “Managed effectively, transport and tourism synergies can improve visitor mobility to and within destinations, enhance visitor satisfaction and help to secure the economic viability of local transport systems and services by servicing both residents and tourists” OECD (2018: 83). PriceWaterhouseCoopers (2018) noted that tourism must first, nurture a stable, service-minded workforce, while growing the local talent based needed and secondly build a job-creating industry in the development of entrepreneurs and small business in the tourism and hospitality sector.

New Behaviours and Human Resource Aspect

The growth of the tourism industry is associated with an improvement in tourism employment because of the labour-intensive nature of the tourism industry. The rapid and continued growth of tourism, in the South African context, means that it will create more opportunities. According to Tourism Satellite Account produced by Statistics South Africa (StatsSA) (2018) one in every 23 persons are employed in the tourism industry, the sector employs more people than the mining industry. “South Africa has one of the worst unemployment rate, however, the tourism sector contributed significantly to employment, supporting one in 10 years worldwide and one in 22 locally-representing 46% of the total workforce” BizCommunity (2018:1). Therefore, efficient and effective Human Resources Management (HRM) in tourism is an important ingredient in reducing unemployment, thereby lessening the effects of poverty in South Africa and globally. The character of the tourism industry is that it is dominated by small, medium and micro enterprises (SMMEs).

Only about 10% of employment in tourism are based in large companies and it is thus estimated that about 90% of small and medium size companies employ the bulk of employees in the Tourism industry in South Africa (Dhanah, 2017). A tourism industry that is planned to be pro-poor in nature would source its employees from the local and host community. According to Saayman (2013), the local residents are the people who give the community its human content, and they operate the services and facilities necessary for tourist’s experiences. The tourism industry is associated with delivering of services to people, produced by human actors. The tourism industry is a service intensive industry, and the character of the tourism product offering places humans, as the major actor in delivering services to tourists. The purpose of the chapter is to assist the reader to understand the vital role that HRM plays in Tourism and to be able to identify the most important HRM functions that affects tourism and should be addressed to secure success in the industry. Cook et al. (2006) noted that unlike many other industries, tourism provides a wide variety of job possibilities, such as:

- Entry-level employment for relatively unskilled and semiskilled workers;
- Positions for highly skilled craft persons, such as chefs and artists; and;
- Many professional-level career opportunities for well-educated decision-makers.

Hence, technology has made it possible to personalize service to meet the needs of customers. Verevka (2019) noted that the main task of the digital strategy is to collect, process, analyse and aggregate data in accordance with the privacy policy in order to get better understand and interact with guests.

Training, Upskilling and Reskilling Employees

Employees are the most vital resource within a tourism business, and their continued training, retraining and upskilling is important to ensure that they use the new skills to improve the sustainability of a business. The issue of skills is to ensure that the business achieves optimum business performance that would increase the profits, and therefore safeguard the long-term sustainability of the business. Tourism companies that continually train and upskill their employees would continue to gain a competitive advantage, as these companies would readily respond to changes in business environment. Lee-Ross & Pryce (2010) noted the several reasons could affect training for existing employees, including:

Technological changes, e.g. automation and computerisation:

- Enlargement or changing of jobs;
- Award restructuring;
- Need for multitasking; and
- Jobs being replaced or becoming extinct.

The European Commission (2016) noted that the tourism employers could bolster the resilience of workers through re-skilling and up-skilling opportunities through the workers life. Human Resources Development (HRD) is therefore, tasked with the responsibility of training, developing and reskilling the staff compliment within a tourism business. During the era of big data, Artificial Intelligence and the 4IR, the reskilling project is imperative to reskill the employees so that they can take advantage of the opportunities that will be created by the new era. The World Economic Forum noted that the 4IR would have an impact on skills, as some skills will be no longer needed, whilst there would be ample skills needed for new opportunities. The World Economic Forum (2018) identified the top ten skills that will be needed to thrive during the 4IR.

Table 1. Skills to Thrive in the Fourth Industrial Revolution

2020	2015
1. Complex problem solving 2. Critical thinking 3. Creativity 4. People management 5. Coordination with others 6. Emotional intelligence 7. Judgment and decision making 8. Service orientation 9. Negotiation 10. Cognitive flexibility	Complex problem solving Coordination with others People management Critical thinking Negotiation Quality control Service orientation Judgment and decision making 9. Active listening 10. Creativity

Source: World Economic Forum (2016)

The breath-taking speed of technological change requires employees that will be creative, and understand and embrace change as part of the world of work. This means a greater collaboration between humans and robots, as robots would increase the productivity of companies, and reduce the cost of labour, and need of labour. Tourism companies must understand that robots cannot totally replace humans in the

world of work, and as the era progresses, it has emerged that “human skills” will be the most important. Creative problem solving tops the list of most essential skills in 2020. The ability to look at problems from different perspectives and come up with effective solutions is a valuable skill to have, given the increasing number of technological innovations that could crop up in the next few decades. While half of the skills needed to thrive in the future are related to cognitive functioning, the other half are more connected to making human connections at work. Collaborating with others on huge projects is necessary, as more and more companies will be utilizing agile strategies with their teams to accomplish their goals” Guthrie-Jensen Consultants (2018:2). The world of work is also changing as internet connectivity means employees can work from remote locations, and this would improve their Quality-of-Life as they can spend more time at home. In addition, this reduces the time and cost of commuting between work and places of dwelling as urban areas experience high levels of traffic and congestion. Tourism companies must be pro-active in skilling their employees, as the competition for highly skilled and trained staff would increase during this era.

World Economic Forum. (2017) in its report titled “Accelerating Workforce Reskilling for the 4IR” identified key pathways to reskilling, which include:

- **Take Stock of and Recognize Existing Skills:** Learning occurs throughout our lifetimes and across diverse contexts. People accumulate knowledge, skills and competencies through formal, informal and non-formal avenues. At the same time, without regular maintenance, certain skills may depreciate with time.
- **Understand Skills Demand:** As technology evolves and the skills that are in high demand shift, there is a need for a continuous feedback loop between labour market needs and the education system stakeholders at all levels. This calls for effective skills anticipation that informs and engages the relevant stakeholders. The information gathered on skills shortages then needs to feed into processes for building curricula, occupational skills mapping—as well as career guidance services for informing career choices for all labour market participants by providing insight into which areas are in demand and the rewards for attaining those skills.
- **Adopt the Right Mix of Financing Instruments:** Resources for adult education continue to be scarce and volatile, heavily influenced by business and economic cycles. Government education budgets tend to prioritize foundational education, with only a small share devoted to Adult Education programs. In light of this scarcity, allocating the necessary resources remains a significant challenge in most countries, particularly in moments of economic downturn. In looking to provide resources for the medium term, some countries are setting up learning endowment funds, to help smooth funding cycles and provide medium term certainty for resource planning.
- **Build and Sustain Motivation for Adult Learning Through Active Labour Market Policies and Accessible Resources:** Government actors are best positioned to coordinate all of the actors needed for an inclusive lifelong learning system, including mobilizing civil society engagement in this process. Building motivation for adult learning through campaigns, gamification of learning and peer support groups have also shown positive impact. Integration of learning into the community at large—in order to instil a more inclusive lifelong learning culture—can also help address informational and motivational barriers.
- **Determine the Role of Different Stakeholders:** Disentangling responsibilities and modes of collaboration among diverse stakeholders is critical for success in meeting the needs of diverse learners. In order to serve these needs, individual learners, businesses, community learning cen-

tres, universities, unions, professional associations, boot camps, the public sector broadly and other providers need to work together to harmonize strategies. Each group of stakeholders has an important role to play.

- **Recognize and Promote On-The-Job Training Opportunities and Maximize Informal Learning Opportunities:** A significant share of adult learning is acquired through practical experience, on-the-job training and, especially, interaction with colleagues. Thus, employers are pivotal players in adult education, and their competitiveness is closely linked to their capacity to secure their talent pipeline and maximize the performance of their employees. Better understanding of business training needs and strategies is critically important for building effective public-private partnerships and putting in place the right incentive structure to optimize adult reskilling opportunities. Businesses can support this process by clearly articulating their skill needs and training plans. In addition, companies can also use job rotation programs to bolster adult skills, and governments can help co-finance certain positions to provide additional opportunities. Furthermore, businesses can provide opportunities for adult apprenticeships and benefit from experienced labour at reduced costs. Vocational training and apprenticeship models, such as those
- **Reach Those that Need it Most—SMEs, Lower-Skilled Workers and Older Workers:** The bulk share of global employment in the formal and informal sector works for SMEs. SMEs are constrained in their access to training due to their small size and resource limitations that affect their participating in training activities. Effectively engaging SMEs in reskilling programs is critical for ensuring the success of broad based reskilling, and reaching informal SMEs is crucial in emerging markets and developing economies. Furthermore, the growing share of workers pursuing independent contracting as part of the platform-based gig economy may also have limited opportunities to benefit from work-based training initiatives, and may need training related to entrepreneurship, resilience, small business management and development.
- **Customized Teaching for Adults:** Adult education activities will only be as transformative and insightful as their teachers and the curricula these teachers employ. Policies vary across countries, but successful examples of developing highly qualified teachers include paying competitive salaries, instituting rigorous training and testing to get teaching certification, incentivizing reskilling programs as criteria for further career progression, and facilitating teacher externships in the workforce to raise greater awareness of the skills that are needed in the workplace.
- **Harness the Power and Scalability of Blended Offline and Online Learning, Enhanced with Virtual and Augmented Reality when Relevant:** The power of online courses in reaching learners at no or low costs has created breakthroughs in access to digital learning content and fostering digital citizenship, information management skills and self-directed learning skills. As technological advances continue to expand adult learning opportunities, new frontiers are emerging in technology-enhanced hands-on learning. For instance, virtual reality may be a useful educational medium for professionals who use physical skills in order to solve problems, such as surgeons, nurses, electricians, and firefighters.

Older Tourism Generation (Grey Tourism)

The tourism industry and tourism employers need to develop and cater for the growth of the segment of elderly people, as longevity soars in many societies. The breakthrough in healthcare has meant that infant mortality is reduced, whilst people are living for longer. This presents an opportunity for tourism

employers and tourism destinations to harness tourism consumption from this market, which is time rich and have high disposable income. “The driving force behind Age Agnostic is the fact that people are living for much longer, want to remain active, contribute to society and maintain an ageless attitude towards life. Almost every country in the world is showing growth in the number and the proportion of older persons relative to the general population” Angus & Westbrook (2019: 7). The global increase in the share of older people will result in a decline of the growth rate of potential labour force. In addition, rising educational attainment and longer school careers will also continue to lower participation rates amongst young people, especially in emerging and developing countries where young participation rates are currently still very high” Balliester & Elsheikhi (2018: 5).

As healthcare improvements have occurred in, life expectancy has improved and companies have to adapt their human resources to accommodate the taboo of the retirement age of 65, which is increasingly becoming irrelevant. Companies in most Western have adapted their human resources policies to change the retirement age, and this has meant that the penetration rate of young people has been limited. This will increase youth unemployment. In addition, the female population will increase participation in labour markets. The extent of automation can be used to increase young employment in tourism by reskilling due to their uptake of online technologies and the fact the majority of them are digital natives. Many Western countries are reviewing the retirement age of between 60-65 years as people are living longer. This means that the elderly are staying in employment for longer, giving them additional disposable income that could be directed towards tourism consumption. “New technologies allow for more flexible workplaces, with people working outside the standard core hours and a large number of employees not just leaving the office and their work behind them. People are now more connected and are set up for digital work though home offices, internet connectivity and smart phones” World Employment Confederation (2018: 3). According to World Employment Confederation (2018), the following partners can picture the new reality of work:

- A wide variety of employment situations;
- A rise of new forms of work outside the employment relationship;
- Growing individual expectations and diverse working conditions;
- The end of unified workplaces, times and activities;
- The emergence of multifaceted and discontinuous career paths;
- Increased interconnections between work and private life;
- The end of static and predictable labour markets; and
- Fading boundaries between national labour markets.

Millennials

Millennial travellers would drive the tourism industry’s next growth path. According to Nielsen (2017: 2), “millennials don’t simply represent another generation of travellers; their preferences and lack of predictability make them different from their older counterparts”. This uniqueness means that the travel industry will need to adjust in order to meet the specific needs and desires of the Millennials, particularly when it comes to retail. Millennials are the ones that are going to be a domain workforce in the near future. While the retail travel industry has evolved over time, it has not faced major consumption shifts, yet. In fact, traveller-shopping habits have been somewhat predictable over the last decade. That

predictably ended with this new generation of consumers. Today, millennial travellers have distinct approaches to travel, largely because they want to control their experiences- a notable shift from how older generations were more likely to allow brands to drive their travel experiences’.

Jesus College Cambridge (2018) noted that the employer-employee model of labour relations that flourished in the industrial revolution is no longer the norm. ‘Although members of the millennials generation are not yet the core customers of airlines, hotel and travel companies, they will be in the five to ten years, when they enter their peak earning, spending and travelling years’ Boston Consulting Group (2013: 3). Visiting Friends and Relatives (VFR) is also popular amongst the millennials, who are digital natives who are used to technology. ‘The Millennial generation is one of the largest generations in history-even larger than baby boomers. We know that they are entering their prime spending years’ Expedia (2017:1). This generation is interested in experiences and they are digital natives. This means there is higher rates of social media use and smart phone consumption to meet the need for taking pictures and loading them in the most Instagram able destinations. They are all about experiences that are authentic experiences. Expedia (2017) noted that millennials seek verified authenticity-experiences which have some peer-led precedence to testify for both safety and success-an almost crowdsourced.

Increased Mobility in the Tourism Industry

‘Future hotel guests will have quite different expectations when lodging at a property. They will expect top-notch well-designed experiences and usability of their own device to operate room facilities and other hotel services. Guests will have many options from which to select a hotel at which to stay and will likely use Airbnb’ Mpofu & Nicolaides (2019: 6). Disruption that has been a feature of the sharing economy has led to not just disintermediation but to how numerous websites have displaced travel agencies, whilst Uber and Airbnb use relatively unsophisticated IT driven services to begin significant number of consumers to begin to threaten stakes in hotels and those that operate taxis. As noted by PriceWaterhouseCoopers (2018) disruption is not only caused by technology, but by resource scarcity and climate change.

This can be reflected in day-zero where water shortages in Cape Town led to serious water-restrictions. Xi et al. (2018) noted that new markets were created and product created such as Netflix competing with traditional television, and taxis must compete with Uber and Lyft. The concept of sharing economy has affected the behaviour of a traveller. Before the sharing economy era, tourists would be using their time exploring what is in the destination and engage on the activities. However, with the introduction of Netflix, Uber Eats etc., some travellers would prefer to stay in the area where they can access Netflix and order on line instead of exploring and moving around. According to OECD (2018), the sharing economy has grown quickly in the past five years to capture a sizeable portion of economic activity. The sharing economy has in the tourism industry introduced Uber and Airbnb that have reduced the cost of tourism consumption, stimulating a critical mass of new tourists, and promoting more tourism consumption.

CONCLUSION

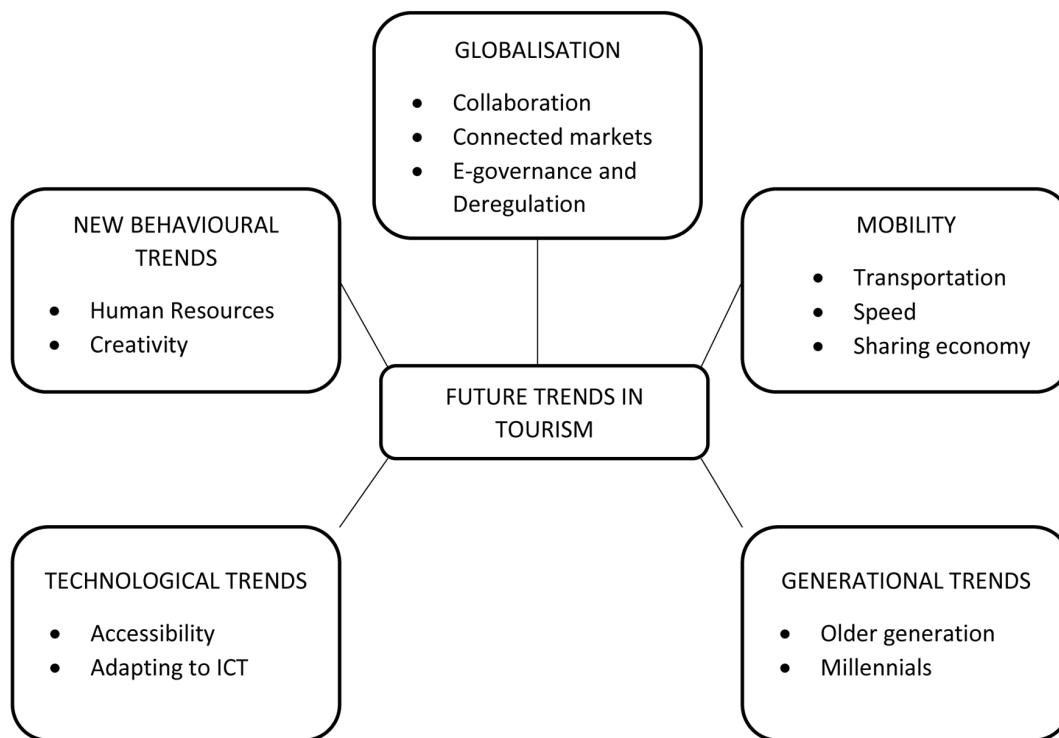
In conclusion, the paper introduced the First, Second, Third Industrial Revolutions and the 4IR. The 4IR and the future of work in the tourism sector was highlighted. The future trends in the tourism industry were critically reviewed together with the common pitfalls and advantages of the FIR in the tourism

industry. What transpired is that although South Africa has a high rate of unemployment, which reflects the reality of many African countries, there is room for growth through the 4IR. The high rate of unemployment has not kept up with economic development, which has created a mismatch with those who are unemployed in the majority, and those that work are in the minority. The tough economic conditions in the continent and in South Africa are likely to be solved through automation and Artificial Intelligence as they present opportunities to drive the next level of human innovation, development, and therefore new jobs. The new frontier of jobs creates opportunities for total employment in countries that embrace technology and its ability to be a force for good. In 2019, 1.5 billion international tourist arrivals were recorded around the world. That's roughly one fifth of the global population, going on vacation. From increased connectivity internationally to the advent of responsible tourism, the world of travel has changed dramatically in the past 20 years, and will continue to change dramatically. Countries that provide free Wi-Fi and an enabling environment for technology to flourish will reap the rewards of innovation and technology-initiated economic growth. Issuing spectrum would decrease the cost of Wi-Fi.

RECOMMENDATIONS

The views on tourism and the 4IR are complex. In this article, we were able to capture the trends affecting the tourism sector as indicated in Figure 1 below.

Figure 1.



The above-mentioned trends have been covered fully under the subtopic of trends shaping the future of work in the tourism industry in this paper. It is evident that the African countries are proactive in adopting new technologies, however, implementing the opportunities presented by the 4IR is moving slowly. Sustainability remains one of the critical issues in the minds of the travellers, hence creativity is critical towards catering for the future generation. The Black Business Quarterly (2019) emphasised that travel and tourism is South Africa's greatest engine for the creation of jobs and alleviation of poverty. Therefore, focusing on empowering both people and organizations by democratizing access to intelligence to help solve our most pressing challenges remains at the core of the revolution (Schwab, 2018). The tourism industry and the society must come together towards realising the future presented by the 4IR. If it means that free-Wi-Fi should be regarded as a basic human right, and government and corporations must spread the reach and access to free-Wi-Fi. Africa already have low levels of investment in education, which is home to the least low-skilled jobs across all industries according to Ayentimi & Burgess (2019).

Therefore, preparing for the future now remains the only solution to Africa's problems. The Fourth Industrial Revolution is nothing new, what is new is that the pace of change and disruption is much more faster. Tourism has always been an early adopter of technology, and this means that the tourism industry must be at the forefront of embracing the changes that 4IR will bring to the tourism industry. What is undeniable is that 4IR will continue in the trajectory of the sharing economy, in reducing the cost of travel, opening up new destinations and further institutionalising the habit of holidays. This means that there shall be an upward trajectory in tourist numbers and tourism consumption, which would match the increase in leisure time that humans would experience due to efficiencies caused by robotics and the automation. The tourism industry must be adapt its marketing outlays to ensure that the habit of holidays means an increased frequency of holidays and local excursions should become the outcome of increased leisure time as a result of robotics and automation.

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Chapter 19

The Relationship Between Technoference, Work–Family Interface, and Telework in the Age of 4IR

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ABSTRACT

In the age of 4IR, working life is generally characterized by penetration of technological devices and online platforms to individuals' social lives through teleworking. There is no consensus about teleworking whether it has negative or positive impacts on work-life balance of employees. Since teleworking is directly related with technological devices, researchers discuss technoference and its effects on teleworkers' lives. So, in terms of its impact, teleworking and work-family interface should be taken into consideration with the concept of technoference. This chapter will analyze the relationship between teleworking and work-family interface in the context of technoference in depth. Due to pervasiveness of teleworking at the age of 4IR, this analysis seems like a necessity for both individuals and companies in terms of teleworkers' work-family satisfaction. Suggestions and protection methods in order to decrease negative impacts of teleworking will also be discussed.

INTRODUCTION

It is noted by researchers that the 21st century is the age of technology and has witnessed many transformations and changes. These changes mostly effect individuals' lives in the context of work models (Sarbu, 2018; Hynes, 2016; Sarker, Sarker, Xiao, and Ahuja, 2012; Tremblay & Thomsin, 2012; Wheatley, 2012; Golden, Veiga, and Şimşek, 2006; Wilson & Greenhill, 2004). Now, the world experience 4IR which is The Fourth Industrial Revolution. The age of 4IR is characterized with the blurring boundaries between the physical, digital, and biological worlds. It's a synthesis and fusion of benefits in artificial

DOI: 10.4018/978-1-7998-3347-5.ch019

intelligence (AI), robotics, the Internet of Things (IoT), 3D printing, genetic engineering, quantum computing, and other technologies. Many products and services which are indispensable to modern life are offered by 4IR. Those products and services are still continuing to change. Undoubtedly, technological changes and transformations are felt in working environments in risky and beneficial ways (Neirotti, Paolucci, and Raguseo, 2013; Golden & Raghuram, 2010; Wilson & Greenhill, 2004). Since, the Information and Communication Technologies (ICTs) diffuse to professional working life, researchers (Wheatley, 2012; Leonardi, Treem, and Jackson, 2010; Hardhill, 2003) have been underlining freedom, flexibility and new opportunities such as Teleworking. Teleworking is basically defined as working model in which workers maintain traditional office, but the firm offers an opportunity to work from home or telecentres remotely up to three days of week (Sarbu, 2018).

It is believed that people feel the consequences of technological era exaggeratedly, because digital devices penetrate in individuals' working environment (Loh & Lim, 2019; Eklund & Roman, 2017; Hodgkinson, 2017). As a result of diffusions of new ICT's to working life, the definitions and boundaries of "working from home" are mostly confused with Teleworking or Telecommuting. It is also not clear since Teleworking depends on different characteristics such as employees' working place or technological devices (Nakrosiene, Buciuniene, and Gostautaitė, 2019; Messenger & Gschwind, 2016; Madsen, 2003). This confusion leads to blurring the line between family- work life and family conflict as a result.

For the age of 4IR, technology use has penetrated and diffused in family life not only with working context but also everyday intrusions and interruptions through technological devices. These interruptions lead to Technoference which is defined as negative impacts and interruptions on interpersonal relationships through using technological devices (McDaniel & Coyne, 2016). People who are subjected to Teleworking have difficulties at their relationships due to Technoference. Not only related with teleworking but also due to the raise of using communication technology devices, family relationships are considered in a danger. As Technoference is raising, it may have a harmful impact on romantic or family relationships. Moreover, technology may interfere with the development of face to face intimacy in family relationships through individual may multitask with technology while interacting with others (McDaniel & Coyne, 2014).

During the period of COVID-19 pandemic remote working was very popular due to necessity and it became more pervasive. As a result of this, couples and families are more likely to report family conflicts and disadvantages of Teleworking. But there is not a consensus about technological devices' effects on family relationship. Some researchers argued that more couples report that extreme communication devices usage is very harmful for relationships (Morey, Gentzler, Creasy, Oberhauser, and Westerman, 2013; Walker et al, 2012); but the others (Appel, Markera, and Gnambs, 2020; Orben, Dienlin, and Przybylski, 2019) showed with the meta-analyses that social media and technological devices usage have small effect on life satisfaction and well-being of couples when combined with different aspects.

In this study, work-family interface and Teleworking will be discussed in depth in terms of Technoference which is very common in family life at digital age. Technoference will be discussed as a risk of relationship because Teleworking is closely related with Technoference. In order to benefit from advantages of 4IR, it is believed that society, individuals, government and companies should have policies about working conditions, effect of Teleworking on quality of family-work and couple-work interface.

BACKGROUND

Technoference and Family Relationship

As technology usage has become more pervasive, researchers tried to deeply investigate the effects of Technoference on family relationships. Before the term of “Technoference” researchers mostly argued about effects of mass media on couples. For example, on symbolic environment of television or soap operas some couples think as if the presented environment is real; for this reason, these couples report more depression, couple conflict, and unsatisfaction about their relationship and lives (McDaniel et al, 2020; Kretz, 2019). As a result of more technology usage, couples more report Technoference which reduces satisfaction and quality of relationships and interrupts their interactions (McDaniel & Drouin, 2019; Kushlev &Heintzelman, 2018; McDaniel & Radesky, 2018; McDaniel & Coyne, 2016).

Technoference is basically defined as negative effects of technological devices due to interruption of communication among couples and families (McDaniel & Coyne, 2016). Unfortunately, Technoference mostly occurs in many families and it is not only related with interruption of communication. According to the findings (Roberts & David, 2016) Technoference is also related with personal well-being and attachment styles which are basic and vital components of healthy relationships and communication. With the raise of Internet and Information technology devices, the way that families’ use media has also changed. When the Information technology devices were not so common, families generally were gathering around the television and watching the movies together. But for 21st century, while sitting around television families can also search social media network sites, read news from Internet or play digital games simultaneously. This multitasking usage habits of media has affected family functions in both positive and negative ways (Padilla-Walker, Coyne, and Fraser, 2012: 426). As researchers noted that (Livinstone, Olafsson, Helsper, Lupinaz-Villanueva, Veltri, and Folkvord, 2017; Baines & Gelder, 2003) media have an impact on family interactions. At this age of technology, media have an integrated role in the family. In order to strengthen family relationships, the “collective memory” which is so important. By media usage, watching movie or listening to music together with family members this collective memory would be promoted (Padilla-Walker et al., 2012). Those are positive effects of technology usage on family relationship. In terms of negative consequences, technology mostly effects leisure times of couples and families. For healthy couple and family relationships “leisure” times mostly seem like a perfect opportunity for chatting, talking about their daily routines, sharing experiences and developing a special language between couples. But, along with Technoference, those leisure times rely on only technology usage (McDaniel et al, 2020). Beside of those negative effect’s other researchers (Kretz, 2019; Gomillion, Gabriel, Kawakami, and Young, 2017) argued about benefits of shared technology use is an opportunity for couples and families in order to increase quality of time that they spend together. But, unfortunately in terms of Teleworking, shared technology usage does not offer an opportunity for time to spend together. So, we should discuss the impact of Technoference not only in the context of couple and family relationship but also Teleworking as well. Findings (Tremblay & Thomsin, 2012) showed that Teleworkers have trouble with blurring of boundaries between working time and leisure time, but Putnam, Myers, and Gaillard (2014) argued just the opposite. We will now discuss such matters.

Teleworking and Family Relationships

Information and communication technologies provide knowledge about how firms' and companies' working life can be at the age of 4IR (Boell et al, 2016; Messenger & Gschwind, 2016; Hynes, 2016; Sarker et al, 2012; Leonardi et al, 2010; Golden et al, 2006). As rise of the Internet and pervasive usage of digital tools, more companies tend to choose "remote working" or Teleworking which is defined as "work that is performed from different locations (such as home) that enables workers to access their labor activities by the use of information and communication technologies" (Nacrosiere, 2012:87). After 90's, widespread of Internet and ICT throughout the world (Golden & Geisler, 2007), individuals also started to gain information and computer literacy. So, companies began to encourage workers for Teleworking with user-friendly, cheap and small technologies and high-speed Internet becomes common (Messenger & Gschwind, 2016; Neirotti et al, 2013). But for the age of 4IR, using technological devices, products or services are indispensable. So, before investigating effects of Teleworking on family life through Technoference, pros and cons of Teleworking should be discussed.

Pros and Cons of Teleworking

Firms and companies evaluate Teleworking as it could reduce accommodation costs and absenteeism while enhancing employee's productivity (Maruyama & Tietze, 2012; Wheatley, 2012). When talking about nature and traditional methods about "working" most people and firms mainly stressed the importance of working hours, teamwork and rules about companies. But, after ICT had become more pervasive and easily accessible, companies began to think about Teleworking (Boell et al, 2016; Leonardi et al, 2010; Clear & Dickson, 2005; Daniels, Lamond, and Standen, 2001).

Teleworking is not only related with reducing cost of employees. Teleworking is the most appropriate working style for some groups such as women who have responsibilities at home and could not leave their home because of children under age 16 or disabled and certain adults with special needs, (BERR 2010, cited in Wheatley, 2012:225; Harting, Kylin, and Johansson 2007; Wilson & Greenhill, 2004; Beasley, Lomo-David, and Seubert, 2001; Goluboff, 2001; Sullivan & Lewis, 2001). Additionally, self-employed workers, part-time workers, Information economy experts, workers at transportation sector, representatives and salespeople who perform telemarketing are also appropriate for Teleworking (Hynes, 2016; Kizza, 2013; Tremblay & Thomsin, 2012; Van Dyne, 2007).

Meanwhile, Boell et al (2016) noted that there is no consensus about advantages of teleworking. Some findings (Kanellopoulos, 2011) showed that teleworking has a positive impact on work-life balance whereas the others argued just the opposite (Donnelly & Proctor-Thomson, 2015; Wheatly, 2012). When discussing about Teleworking, it should be emphasized that telework is not something experienced positive or negative at an equal rate and its' nature and diversity depends on worker's appropriateness to Teleworking (Boell et al, 2016; Jaakson & Kallaste, 2010).

Although Teleworking is mostly presented as an "easy" job which employees can work at different locations even at beaches, airports or railway stations and indefinite time periods, Teleworking needs more careful attention and responsibility than the traditional face to face working (Leonardi et al, 2010; Hislop & Axtell, 2009; Sherry & Salvador, 2002). Most of Teleworkers think that they have enough time for themselves and their family in terms of their responsibilities such as preparing children for schools or other daily obligations at the beginning (Tremblay, 2003). Firms and managers think Teleworking could offer an opportunity for reducing exhaustion and burnout of workers which is strongly related with work

overload and being overwhelmed (Golden, 2012; Golden, 2006; Cropanzano, Rupp, and Byrne, 2003; Bailey & Kurland, 2002). But the outcomes of Teleworking are discussed both positive and negative sides in literature with different and contrary findings.

In terms of positive effect on employees working styles and behaviors, researchers noted that (Boell et al, 2016; Sarker et al, 2012; Pyöriä, 211) Teleworking has positive contributions to employee's autonomy, time management skills and productivity of work and due to absence of time and space limitations, employees have more work satisfaction, pleasure and enjoyment (Harker- Martin & MacDonnell, 2012; Wheatley, 2012; Fonner & Roloff, 2010; Hornung & Glaser, 2009; Sarker & Wells, 2003). But when taking into consideration the firms' and companies' technical and environmental conditions, Teleworking may need higher costs and time than face to face working in terms of underinvested information system and ICT infrastructure (Neirotti et al, 2013).

Positive contributions of Telework also depends on the perception of managers towards Telework. If the managers are hesitant about new ICT's and not open-minded about flexible working hours, they would be reluctant about Teleworking. They can reflect their anxiety to employees, and they would want to control every step which is opposite to the nature of Teleworking (Boell et al, 2016). Additionally, according to findings managers' control and supervision roles can reduce at Teleworking (Pyöriä, 2003; Hardill & Green, 2003). As a result of this, managers' try to control and direct Teleworking employees dominantly which leads to restrict Teleworkers and lacks the benefits of Teleworking (Wheatley, 2012; Pyöriä, 2011).

Disadvantages of Teleworking are also discussed by researchers (Boell et al, 2016; Wheatley, 2012; Tremblay & Thomsin, 2012; Leonardi et al, 2010; Golden & Veiga, 2008; Tremblay & Genin, 2007; Wilson & Greenhil, 2004). When examined disadvantages and drawbacks about Teleworking it could be noted that because, Teleworking weaken face-to-face communication which is vital source for social and informal interaction (Boell et al, 2016) employees and managers mostly reported that Teleworking is not appropriate for teamworking and collaboration (Sarker et al, 2012; Pyöriä, 2011). As noted, companies are like "living organisms" and social interactions feed this organism. But teleworkers report that remote working was difficult to be aware of organizational values and goals. Also, employees were less visible, and they felt weaker management support. As a result, this lower visibility reduces the career opportunities, organizational commitment, professional development, autonomy, identification of employees with their organization and productivity of teleworkers because of social isolation and lack of workplace engagement compared with their counterparts who are face-to-face working (Tramblay & Thomsin, 2012; Pyöriä, 2011; Golden & Raghuram, 2010; Taskin & Birdoux, 2010; Golden, 2009; Butler, Aasheim, and Williams, 2007; Gajendran & Harrison, 2007; Dimitrova, 2003; Khalifa and Davison, 2000). Additionally, for long term consequences of Teleworking, teleworkers' skill development and self-development could be limited, and it negatively impacts their professional career (Maruyama & Tietze, 2012). One of the most difficult dimensions is that both employers and workers could not evaluate the amount of time spent working outside (Neirotti et al, 2013) and have difficulty to handle and abate the conflicts (Hinds & Bailey, 2003). Additionally, Teleworking has some social influences such as individual's adaptation and decision making in emergency situations (Wilton, Paez, and Scott, 2011). Although advantages and disadvantages have been discussed in literature, some findings showed that Teleworking has been disappointing and inconsistent especially in terms of work and family interface (Pyöriä, 2003; Bailey & Kurland, 2002) and the others noted that there is totally no consensus about risks and benefits of Teleworking (Boell et al, 2016; Donnelly & Thomsan, 2015) and its negative effects on work-family conflict (Sarbu, 2018).

The most important point is, unfortunately, that not all the stakeholders could equally benefit from Teleworking. As researchers (Neirotti et al, 2013; Hilbrecht, Shaw,Johnson, and Andrey, 2013; Mahler, 2012; Wheatley, 2012) argued the benefit Teleworking offers depends on gender, family structure, occupational type and situation, technological infrastructure that firms supply and management styles of companies.

All these negative and positive effects have impact on Teleworkers' private lives and perceptions toward their privacy and work-life balance through blurring of home and work (Wheatley, 2012) and extended working hours (Tremblay & Thomsin, 2012). Because Teleworking is not conducted between 9 to 5 like traditional office working, it is flexible and considered as a risk factor for work-family interface (Sardu, 2018; Golden, 2012; Wheatley, 2012). When the line between working life and privacy at home become invisible, there will be family and couple conflicts and contradictions. Moreover, multitasking which is common feature of technology usage is affected by both quality of relationships and Teleworking. Multitasking working encompasses whole lives of the workers and increases control and authority of managers (Golden et al, 2006; Madsen, 2003).

Teleworking and Family-Work Interface

Before discussing the relationship between Teleworking and work-family interface, the definition of work and life balance should be cleared. Work- life balance is a degree that allows individuals' balance and equilibrium between temporal, emotional and behavioral necessities in terms of paid work and family responsibilities (Hill, Hawkins, Ferris, and Weitzman, 2001). Also, other researchers (Netemeyer, Brashear-Alejandro, and Boles, 2004) defined work and life balance in terms of work and life conflict which means role conflict that necessities of jobs and works interfere with performing family responsibilities. This work and life conflict is so related with Teleworking and Technoference due to flexible working hours and staying connected online all the time (Golden & Geisler,2007). Although Teleworking seems beneficial for different and the worst scenarios (Sarker & Wells, 2003) as it is first suggested after oil crisis at USA in 1973 (Sarbu, 2018; Baruch, 2001), it is an option that presented by companies or firms. But after some extraordinary times such as COVID-19 pandemics, natural disasters or terrorist attacks (Alvaro de Assis & Fernando, 2011; Donnelly & Proctor-Thomson, 2015) it became not an option but obligation. Although especially for continuation of public services, Teleworking is vital but also it also leads more stress, lack of work and life balance and more work and life conflict for workers (Donnelly & Proctor-Thomson, 2015).

Teleworking is also reported as enabled employee's work-life balances with characteristic of "flexibility". This part is argued with different aspects on literature (Hilbrecht et al, 2013; Tremblay & Thomsin, 2012; Wheatley, 2012; Golden, 2006; Sullivan & Lewis, 2001). According to Leonardi et al (2010) with this flexibility, teleworkers could arrange their schedules and daily routines to the temporal rhythm of the office. But as a result of this flexibility, interruptions through e-mails, calls, online meetings are more pervasive among Teleworkers and they are more faced with those interruptions due to their flexible working hours which also led to mix up their private and work lives and damage the balance between work and private lives (Boell et al, 2016; Leonardi et al, 2010; Bains&Gelder, 2003; Hylmo & Buzzanell, 2002). Although, Teleworking offers an opportunity to improve work-family interface, benefit from this opportunity totally depends on employee's characteristics. If they try to control everything from home, infiltrate and do not separate home environment, Teleworking can normally damage the work-family interface (Wheatley, 2012). Flexibility is vital while discussing about Teleworking because

it can also lead to challenges related with non-standard forms of employment (Tietze & Musson, 2010; Hoque & Kirkpatrick, 2003). Not only flexibility but also spatialization is reported by Teleworkers as a risk for work and life balance (Tremblay & Thomsin, 2012). Due to connectivity and nature of Teleworking unlike traditional working, their colleagues expect immediate responses and answers to their e-mails or callings (Leonardi et al, 2010). As a consequence of those expectations, Teleworkers are supposed to be online all the time and spaces which is a danger and risk for their work-life interfaces. But on the contrary of those findings, other researchers believed (Maruyama & Tietze, 2012; Golden, 2006; Kossek, Lautsch, and Eaton, 2006) Teleworkers have less family conflict than traditional workers.

Researchers (Sarker et al, 2012; Wheatley, 2012; Golden et al, 2006; Greenhill & Wilson, 2006) noted that Teleworkers report working without time-space limitation and flexibility lead to imbalance between their work and lives. Moreover, because Teleworking is characterized by “temporal servitude” which means being on call all the time, there is a kind of “psychological contact” between workers and employers that employee should be available and able to respond for all callings and e-mails (Sarker et al, 2012). This psychological contract has negative impact on productivity, psychological well-being and mental health of individuals’ such as stress, negative emotions and health issues; it could indirectly affect the quality of couple or family relationship (Sarker et al, 2012; Mann & Holdsworth, 2003; Sarker & Wells, 2003).

Because Teleworkers are not physically at office, when they are at home they are supposed to behave as if they are at office physically (Sherry & Salvador, 2002) which leads more conflict and damage on their work-family interface. Additionally, managers and colleagues expect that Teleworkers should have advanced “adaptation” and management skills for mobility and timeless working (Wheatley, 2012; Halford, 2005) which is also another stress trigger (Mann & Holdsworth, 2003). To manage those stress triggers, researchers (Wheatley, 2012; Sparrowe, Liden, Wayne, and Kraimer, 2001; Ashforth, 2000; Guest, 2002; Green, Strange, and Trache, 2000) recommend employees to handle the blurring of the work-family interface and home- workplace interface through dividing space and time, isolating, being aware of long working hours, and gain perspectives such as compartmentalized, overlapping and encompassing.

There are also some other dimensions of Teleworking which is related with individuals’ directly. As human beings, individuals’ vital anxiety source is “uncertainty” which is very common in Teleworking. While discussing and examining Teleworking, researchers also stated the importance of psychological effect of Teleworking on human beings (Mann & Holdsworth, 2003). Psychological effect of Teleworking generally subject to isolation, blurring boundaries and emotional exhaustion (Mann Varey, and Button, 2000). Although some Teleworkers reported positive effects of working from home, flexible time and spatialization the other negative emotions could raise such as loneliness, frustration, guilt and anxiety. Those negative emotions could easily affect the family life and private life of Teleworker (Maruyama & Tietze, 2012; Mann & Holdsworth, 2003).

MAIN FOCUS OF THE CHAPTER

At 21st century, using social media and technological devices is not a rare action and it is kind of necessity. But, researchers (McDaniel, Galovan, and Drouin, 2020) noted that increasing the rate of technological device usage is an alarm and danger for quality time spent together for couples and families. Moreover, because there are plenty of technological devices such as computers, cell phones, tablets etc., researchers (McDaniel & Coyne, 2016) also defined different interference types for couples like Technoference. For those interferences, the main problem is that couples are physically present and together, but

their interactions are at low quality (Voorveld & Viswanathan, 2015). Moreover, consequences of those interruptions, Teleworkers' dissatisfaction and family-conflict levels become higher due to their obligation to use technological devices. Additionally, couples with children reported more work-life conflict, role demands conflict and interfere not only by their managers but also by their partners and family members (Sarbu, 2018; Tremblay & Thomsin, 2012). It proves that couples also have difficulty to manage their time and work-life balance. They are not capable to separate their working time and spare time with their partners or families. So, controlling work-life conflict is not issue related with managers or companies but employees' digital habits and time management abilities.

Uncertainties which are generally nature of Teleworking indirectly effect the work-family interface because couples do not certainly know the work location, meeting times or interruptions via e-mail and callings for emergency situations (Wheatley, 2012). According to the findings (Bergman & Gustafson, 2008) travelling for work and overnight stays could trigger the work-family conflict, but through Teleworking they could prevent those conflicts. The challenge is that long teleconferences and unexpected e-mail and callings could be replaced with work travels and overnight stays. As researchers argued (Sarbu, 2018; Tremblay & Thomsin, 2012) the vital risk about work and life balance appeared through additional, extended work hours and interruptions. Those dimensions lead to work pressure, stress, exhaustion and even burnout. Unfortunately, this stress is major source of family conflict (Golden, 2012; Breaugh & Frye, 2008). In the context of exhaustion and burnout, their consequences are directly related with absenteeism, physical illness, reduction of job satisfaction as well as life satisfaction and working performance (Golden, 2012; Shirom, 2011; Carson, Baumgartner, Mathews, Tsouloupas 2010; Swider & Zimmerman, 2010; Mann & Holdsworth, 2003). Those tensions, negative emotions and consequences reduce and damage work-family interface and lead to family conflict (Golden, 2012; Felstead, Jewson, and Walters, 2003). In order to improve employees' work-family interface balance and life satisfaction, there should be politics about improving employees' work-family interface balance. Those politics are not only applied by managers or firms but also by Teleworkers.

Issues, Controversies, Problems

Work-family interface is mostly reported as a main problem not only for Teleworkers but also for face-to-face employees. In order to maintain work and family balance, firms and companies should consider psychological and mental well-being of employees. Unfortunately, for Teleworkers this consideration of firms is mostly not enough due to negative effects of Technoference. First, multitasking usage of technological devices such as writing an e-mail while watching television is mostly reported as a risk factor for family communication. But, for Teleworkers because they are mostly supposed to control their e-mail or cell phones, multitasking is a kind of daily routine. Secondly, Teleworking and Technoference are risk on work-family interface. Although some researchers argued the opposite, if couples have relationship issues which is so common especially among new couples, Teleworking and Technoference could lead communication problems and family conflict.

Moreover, Teleworking is not clearly considered as an obligation or option. Most of the companies and society generally evaluate Teleworking more beneficial than the classical and traditional face-to-face working which requires the employee need to be physically at building. Moreover, researchers noted that (Golden, 2006; Madsen, 2003) for both employees and employers' sides it makes possible to choose from different talents, to reduce real estate costs, to motivate and maintain employee work-family balance. Also, other researchers (Fonner & Roloff, 2010; Perez Perez et al, 2003; Morgan, 2004) argued that

Teleworking had a lot of benefits and advantages such as time planning freedom, increased autonomy, reduced informal communication, increased family and leisure time, lower stress, improved productivity, increased job satisfaction, reduced travel and other costs, increased employment opportunities for women with children, students and disabled individuals and reduced traffic congestion and air pollution. But, like any other working styles, Teleworking is not something like fully beneficial or perfect.

As seen, there is a debate about teleworking and its implications, advantages and disadvantages. Some of researchers highly recommend teleworking while the others are critical for it (Boell, Cecez-Kecmanovic, and Campbell 2016; Leonardi et al, 2010) especially in terms of family-work conflict and Technoference (Sarker et al, 2012; Golden et al, 2006).

SOLUTIONS AND RECOMMENDATIONS

For the age of 4IR, technology is not only choice or an option but it is obligatory especially for working life. So, politics and application should be redesigned for technology and human interaction. The key point about harms and risks of Teleworking is Technoference and its impact on work-life balance, family interaction and their private lives. In order to improve employees work-family interface balance, life and work satisfaction, productivity and reduction of their burnout and exhaustion; employees' need to gain awareness about time management, self-help or self-improvement and other skills help to release their stress. In-service-trainings about those skills would be beneficial. Moreover, conscious ICT usage trainings are also beneficial in order to prevent the negative impacts of Technoference which is directly related with Teleworking (Xu, Yang, MacLeod, and Zu, 2019; Laar, Zabatiero, Straker, Mantilla, Edwards, and Danby, 2018; Deursen, Dijk, and Haan, 2017; Livingstone et al, 2017 ;Jonas & Mitchell, 2016; Ribble & Miller, 2016; Ohler, 2011). Along with conscious ICT and Internet usage, employees could have abilities and awareness about multitasking usage of technological devices. This means that employees can control their technology usage time, avoid multitasking and create more time for themselves and their families. Moreover, too much computer or cell- phone usage have negative impact on individuals' health and can lead headaches, neck and shoulder pain, back pain or xerophthalmia which are risk for Teleworkers (Hakala, Rimpela, Saarni, Salminen, 2006; Adedoin, Idowu, Adagunodo, Owoyomi, and Idowu, 2005; Geer, Marcus, and Ensor, 2002). Through conscious technological device usage, employees would be aware of risks of digital tools for their physical health and could limit their computer or cell phone usage.

In- service-trainings about self-help or healthy communication can also be beneficial for balance of work-family interface during Teleworking. With in-service-trainings which could be done virtually, employees gain awareness towards risks and harms of Teleworking and Technoference. Through this awareness they could control their technological device usage, organize their spare times, protect and maintain their employee personal rights which are so important for their work-family interface balance.

When Teleworkers have boundaries and awareness about their private life and relationships, it could be a big step to provide an equilibrium for their work and family life. Moreover, this equilibrium is not only the responsibility of individuals but also the responsibility of firms' and policy makers. They should strength their firm policies and could protect their workers' private life and mental state. In order to provide work-family life balance and maintain it, firms and companies should define Teleworkers' rights and working conditions clearly and respect private lives of their employees. They should have awareness that their Teleworkers are not "nomadic" and not so different from their office workers. Additionally, Teleworkers also must fight with the perception as they are not working due to distance. Because

of this perception managers and counterpart see as if Teleworkers must connect and be reachable all the times and places which is violate their work-life balance. Of course, especially for emergency situations or for the works which are subjected to different time zones or countries, Teleworking could be vital. But if these emergency situations never end or last so long times and extend most of the time of the weekends or evenings, Teleworking is normally considered as a risk for work-family interface and family conflict. Moreover, through conscious ICTs usage, it is believed that harmful effects of Teleworking and Technoference on work-family interface would be minimized.

FUTURE RESEARCH DIRECTIONS

In order to understand relationship between Technoference, Teleworking and work-family interface it would be useful to conduct semi-structured interviews with Teleworkers and managers about their perception about Teleworking. Also, semi-structred interviews about awareness of Teleworkers and managers about Technoference would be beneficial for deeply analyze of Teleworking.

CONCLUSION

Taken together, at the age of 4IR, technology is vital and essential for working life. As result, Teleworking became more pervasive. When used consciously and correctly technology can become an affirmative tool for Teleworking and work-family relationship. But, when Technoference mostly occurs, the line between work- life interface becomes blur, Teleworking would be harmful and dangerous for Teleworkers' mental and physical health. Awareness about negative impacts of Technoference in terms of work-life interface is vital in order to prevent negative consequences of Teleworking.

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Chapter 20

Fourth Industrial Revolution: A Way Forward to Technological Revolution, Disruptive Innovation, and Their Effects on Employees

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ABSTRACT

The Fourth Industrial Revolution is being implemented as technological revolution in every field of life. FIR has not only impacted the employees' behavior, well-being, and future of work but also brought a disruptive innovation everywhere. This chapter is beneficial for the reason that Fourth Industrial Revolution has affected the behavior of employees tremendously. With many opportunities from the fourth industrial revolution, rapid change, and excessive use of technology has stressed the employees. Digital transformation or era of digitalization has changed the future of work by automating the work performed by the human resource manually in the past. Automation of work is decreasing the labor requirement. Pressure of being unemployed and new skills learning after new technological change made employees' toxic. Fear of being unemployed and stress of earning new technologies has decreased the well-being of employees. This Fourth Industrial Revolution also has positive impact on the work and family life satisfaction by providing them the opportunities of remote and gig working.

DOI: 10.4018/978-1-7998-3347-5.ch020

INTRODUCTION

The pace of the advancement is very high, and the world is changing very quickly. It can also be said that the concept of humanity has also changed, after the technological advancement, what it means to be human. This technological advancement or it also called the technological revolution is mostly driven by technological change and by artificial intelligence (Chapra, Khan, & Al Shaikh-Ali, 2008). Artificial intelligence is advancing and making the processes and skills automated in almost every industry today. If we talk about the revolution and artificial intelligence, it is replacing century-old paradigms of all processes. For example, in the field of neurotechnology, the strides are being used to control the brain as the last frontier of human biology (Barroso, Gharachorloo, & Bugnion, 1998). Quality of life also improving, artificial intelligence is performing its role to improve the products' quality and make them purposeful. Similarly, the internet is connecting the people from far off places and it has made the world a global village. Due to changes in technology, there is a huge change is expected in the requirement of human resources. Atomization is decreasing labor work (Buccieri, Javalgi, & Cavusgil, 2020).

The other technologies rather than artificial intelligence such as blockchain (a reorganized, dispersed ledger technology that registers the provenance of the digital asset) and smart materials are redefining and blurring the boundary between the digital and physical worlds. The result of this is a big change in every aspect of life (Gong, Palmer, Gallacher, Marsden, & Fone, 2016). Our way of living, rules, norms, ethics, and economic life have affected. The industrial revolution which is due to automation and artificial intelligence has changed the lifestyle completely. Way of working and relating to others have also been modernized. This revolution is the new contribution to the first, second, and third industrial revolution. This development is considered as the development of the physical, biological, and digital advancement altogether (W. U. Hameed, Nisar, Abbas, Waqas, & Meo, 2019). This revolution is forcing the organizations and countries to think in a new way to develop and to be competitive in the market. This industrial revolution is a journey that has been started from 1760 till now. Below given table shows the main characteristics of the industrial revolution from 1760 to the present.

Table 1. Characteristics of the Industrial Revolution

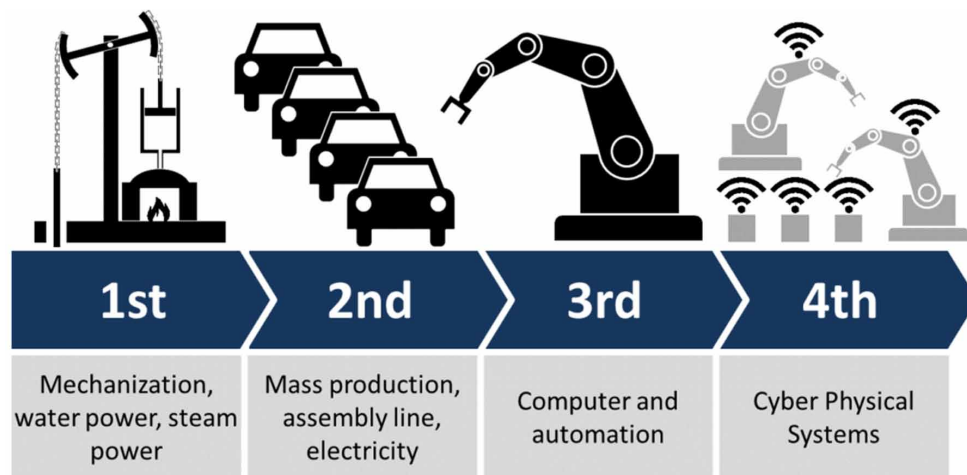
Period	Transition Period	Energy Sources	Main Achievement	Main Industries	Transport Means
I: 1760-1900 II: 1900-1960 III: 1960-2000 IV: 2000-Continue	1860-1900 1940-1960 1980-2000 2000-2020	Coal Electricity, Oil Nuclear Energy Natural Gas Green and hybrid engines	Steam engine Internal combustion Engine Computers, Robots Internet, 3D printing, Genetic engineering	Textile, Steel Metallurgy, Auto, Machine Building Auto, Chemistry Heavy industries	Train Train, Car Car, Plane Flying cars, Ultra-fast train

This revolution first time implemented the technology in the field of industry. The second industrial revolution was based on the use of science for production. Manufacturing started on a large scale; consumption was increased by increasing the supply. The way of living started improving and the income level of the people also increased. The Fourth Industrial Revolution introduced a series of social, political, cultural, and economic upheavals that will unfold in the 21st century. This change is the result of the third revolu-

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tion that was getting extended over the years and would be considered as the base of the fourth industrial revolution (Rojas-Flores, Clements, Hwang Koo, & London, 2017) (Morelli, Bianchi, Baiocco, Pezzuti, & Chirumbolo, 2016). The fourth industrial revolution is converging the widespread technology of digital, biological, and physical innovations. If look back at the three revolutions, the first industrial revolution was establishing the steam-powered factories driven by the heat water. Fourth industrial revolution involve a systematic technological change that completely has changed the way of working.

Figure 1. Fourth industrial revolution



Although the fourth industrial revolution is based on the third revolution it is quite different and showing no prolongation of the Third Industrial Revolution. This revolution is so fast that none of the previous could be exemplified for the current revolution. The fourth industrial revolution is evolving at exponential growth. Things are changing very quickly (Kithae, Nyaga, & Kimani, 2013). Originations, institutions, businesses, and countries are changing their policies and processes and the breadth and depth of these changes herald the transformation of entire systems of production, management, and governance. Leading researchers are arguing that the fourth industrial revolution is shaping the future of human by recently implemented strategies on all types of departments (Turner, Shattuck, Finkelhor, & Hamby, 2017). Now it is impossible to restrict the disruption occurring due to the fourth industrial revolution. However, this disruption can produce many opportunities. Some of the opportunities can be identified as no barriers between the market and customer, artificial intelligence is making the processes too fast and accurate, productivity has increased many times, a fusion of different departments is also a cost-saving step (Batty, Russ, Stamatakis, & Kivimäki, 2017).

According to the report of Mckinsey global institute on Harnessing Automation for a Future that Works measured the likelihood of automation in 54 countries which covered 78% of the global labor market (Roselli, Lorch, & Anderson, 2000), is given as

China has the largest potential (395.3 million) of employees that could be automated than India (235.1) and USA (60.6 million) respectively. This huge number of jobs will go away not completely, but the way of working will be changed (Hendriks, Worrell, De Jager, Blok, & Riemer, 1998). Many new

Table 2. Impact of fourth industrial revolution on the jobs

Sector	Percentage of Automatable Jobs	Number of employees
Agriculture, forestry, fishing, and hunting	50%	328.9 million
Manufacturing	64%	237.4 million
Retail trade	54%	187.4 million

opportunities will be open. This report shows the disruption of jobs that how these could be replaced. Many of the new jobs that will exist even fivers till now we cannot imagine. It indicates that skills are changing for the job (Walumbwa, Hsu, Wu, Misati, & Christensen-Salem, 2019). Now top skills that are needed in priority are Complex problem solving, critical thinking, and creativity, people management, coordination with others, emotional intelligence, judgment and decision making, and cognitive flexibility (Bloem et al., 2014). There will be high job rotation and employees will be needed which could jump between very various tasks. This phenomenon can put the employees in complications or can make them happy if they are equipped with the required skills (Ghislieri, Molino, & Cortese, 2018). This change can be used as an opportunity for all the people including leaders, managers, and executives of different organizations, the common public from all lifestyles and for the different nations as well. Purpose this book chapter want to analyze the impact of fourth industrial revolution on the employees' behavior, well-being and future of work. Objective of this book chapter is.

1. To explain the impact of the Fourth industrial revolution on work-family satisfaction.
2. To explain the impact of the Fourth industrial revolution and Toxic employees' behavior.
3. To explain the impact of the Fourth industrial revolution and employee well-being.
4. To explain the impact of the Fourth industrial revolution and digital transformation.
5. To explain the impact of the Fourth industrial revolution and the future of work.

Now, this is the real opportunity that we should think every possible best option to utilize this technology for the greatest number of people to utilize this technology to benefit their families, communities, and organizations. Now our responsibility is to involve with the fourth industrial revolution in a way that we can create opportunities and can use it for the benefit of communities and humanity.

LITERATURE REVIEW

The Fourth Industrial Revolution and Work-Family Satisfaction

In the recent era of the fourth industrial revolution, technology is bringing considerable change in every field of life (Dean & Spoehr, 2018). These changes are obvious in the activities of where and how people do work, how the ways of business are changing to capture and create value, how the interaction and communication have changed among people (Romero et al., 2016). Other shifts in the environment are causing to affect the well-being and satisfaction of the family and work life of people. The increasing trend of globalization, the shift of people from rural to urban life, increasing population are such changes that can affect the future of employment (Eberhard et al., 2017). These variations can also

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cause a change in physical and psychological well-being as well. In this discussion, many questions are arising that how these changes of the fourth revolution are changing the work-life variables of people that need to be answered.

Apart from the human-robotic relation of interchanging the responsibilities, the interaction of individuals and technology is also increasing. The consequences of this interaction could be the impact on work-life satisfaction (Selamat, Alias, Hikmi, Puteh, & Tapsi, 2017). Recently people have changed the way to organize and experience of their life. Some of the researches have highlighted the negative impacts of technology on human work-life satisfaction (Lee et al., 2018). It has disturbed the leisure time with the use of laptops, smartphones, and other technology gadgets. Excess use of technology also increases stress and anxiety (Oosthuizen, 2016). Moreover, the risks of addiction to work-related technology for workers and their family satisfaction have been demonstrated. Now a day's stress of technology has increased more due to the COVID-19 because most of the organizations are following the policy of "always-on" which means to be available and online all the time (Gleason, 2018). COVID-19 is the attack of coronavirus on individuals, approximately in all countries of the world. This virus spread by close contact, that's why the government of all countries impose lockdown for avoiding the close contact. Universities, schools, colleges, and offices all are closed, and people are bound in their houses. Due to this COVID-19 lockdown, many organization demands to work online, this type of technology increases the stress and anxiety in employees (Crawford, Butler-Henderson, Rudolph, & Glowatz, 2020).

Technology is also supporting humans in various fields. It has made life easy for people. As Fourth industrial revolution paradigm is making the use of robots and supportive tool for industries (Zhao et al., 2020). The use of technology at the workplace can cause safety, a healthy environment, reduction of risk, and timesaving for the workers. These positive impacts of technology are increasing the work-life satisfaction for workers. Since robots and automated machines are now integrated into workplaces so it is better to adopt the technology and be friendly to use and learn the new skills to accommodate the fourth industrial revolution properly (Kohtamäki, Parida, Patel, & Gebauer, 2020).

The Fourth Industrial Revolution and Toxic Employees' Behavior

The fourth industrial revolution increases automation and digitalization in the workplace. This extensive use of technology and innovation at the workplace give a significant impact on employees (Tolkachev, Bykov, Morkovkin, Borisov, & Gavrilin, 2020). These new innovative technologies alter or update the whole processes, production, and management of the organization. With these advantages, this revolution of technology harms employees' behavior and also on organizations in the way of employee redundancy and low well-being (Tolstykh, Kretova, Logun, Popikov, & Kuznetsov, 2020). This fourth industrial revolution has a high impact on the behaviors of employees by creating unemployment.

Fourth industrial revolution creates unemployment in countries or organizations as automation take place of human resource. Many middle class low ranked employees' jobs become automated and they feel unemployed (Kim, Eisenberger, & Baik, 2016). This feeling of unemployment creates stress in employees. These uncertainties of being employed and meeting livelihoods harm the mental state of employees and employees become toxic (Mai, Ellis, Christian, & Porter, 2016). Toxic employees' behavior creates by the pressure of the Fourth industrial revolution as this revolution made them unemployed (Mai et al., 2016). Toxic employees are harmful not only for their mental state but also for others. Toxic employees' behaviors may change the well-being of others and create an environment of stress (Dichter, 2007; Garikipati, 2008; Ghalib, Malki, & Imai, 2015; Roy, 2011).

Employees that do not face unemployment by this technological revolution, face the pressure of learning the automated process of machinery and new innovative technology (WUL Hameed, Mohammad, & Shahar, 2018; Singh & Padhi, 2017). The wide use of automated technology at the workplace and change in this automation daily creates pressure on the employees that are not skillful in operating a new type of technology or machinery. Technological change in processes and production procedure of organization, pressurize the employees that worked in the production department of organization ventures. Studies conclude that learning of technological change is stressful for employees, this new technological process also made them unemployed if employees did not learn the new technologies and if not learn the new skills on the demand for new technologies (Brune, Giné, Goldberg, & Yang, 2016).

The pressure of the 4TH industrial revolution made employees' toxic (Cheston & Kuhn, 2002; Kuzilwa, 2005). The pressure of new technologies are in the way of employee redundancy, erosion of healthy work/life balances, and problems of mental health, have generated toxic employee citizenship behavior and increase in organizational entropy (entropy means a disorder in the system or organization) (Duvendack, 2011; Razzaq, Maqbool, & Hameed, 2019; Ul-Hameed, Mohammad, & Shahar, 2018). Toxic employees and organizations can rise after numerous causes but unfair types of leadership that drive biased employee behavior and a toxic organizational culture are becoming more predominant with the increase in adoption of the technological revolution. Toxic employees and organizations arise from contextual stressors caused by risky situations such as economic and socio-political disorder arising from, for example, a rapid industrial change like (fourth industrial revolution) and war of unemployment (Kessy, Msuya, Mushi, Stray-Pedersen, & Botten, 2016).

The Fourth Industrial Revolution and Employee Well-Being

The fourth industrial revolution blurs the line between the real-life working environment and automation at the workplace. This technological revolution relates to the all-encompassing acceptance of new technologies at the workplace by organizations (Pahi, Hamid, & Khalid, 2016). Numerous advantages are linked to technological innovation in the workplace. Consequently, studies argued that the 4th industrial revolution at the workplace creates the redundancy in employees and harms the employee well-being (Marston, Brown, Rainey-Smith, & Peiffer, 2019; Prasad, Vaidya, & Anil Kumar, 2015). Employee well-being constructed on two bases like happiness and self-actualization (self-actualization means the highest level of self-development, full actualization of personal potential). Studies proved that employee well-being maintains by providing happiness and self-actualization to employees (Hussain, Rizwan, Nawaz, & ul Hameed, 2013).

In the fourth industrial revolution, competition depends on the skillful and best talents which companies acquire for performing their workplace' tasks. Companies that have the many skillful employees who cop up with the technological revolution, gain a competitive advantage on others (Chiu, Chien, Lin, & Yun Hsiao, 2005). Studies conclude that many organizations give extra benefits and perks to their skillful and best talents employees and overcome employee redundancy from the workplace (Gaspar, Wizner, Morrison, & Dewa, 2020). But some studies argued that the adoption of automation or using technology like robots instead of humans or labor, it creates the employee redundancy (Conway et al., 2006). This increase in employee redundancy due to the extensive use of technology decreases employee well-being (Gaspar et al., 2020).

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Studies conclude that well-being is related to the happiness of employees which they perceive from their job performance, benefits, perks, good employees' relationships, and satisfaction (Hodges, Moore, Lockee, Trust, & Bond, 2020). Employees are happy and high well-binged when positive outputs and outcome are increased and negative gradually decrease (Huber, Jenkins, Li, & Nathanielsz, 2020). Employee well-being is simply the feeling of pleasure and displeasure at the workplace. But more than this happiness, the self-actualization of employees also has a major impact on the well-being. Self-actualization is simply the fulfillment of indicators. Well-being is not the feeling of happiness but it's the accomplishment of those indicators which are the attempts to achieve a better life (Gaspar et al., 2020).

Studies conclude that automation and the adoption of new technologies, cause redundancy and unemployment (Hodges et al., 2020). This redundancy of employees gave the feeling of displeasure and also not giving the chance to achieve a better life. This redundancy decreases the well-being of employees not only those who left or switch the job, but also to their coworkers. Previous studies argued that this 4th industrial revolution harms the employee well-being by increasing the redundancy of employees at the workplace (Iftikhar, Khadim, Munir, & Amir, 2018; Sinha, Mahapatra, Dutta, & Sengupta, 2019).

The Fourth Industrial Revolution and Digital Transformation

As discussed, fourth industrial revolution is the age of technology. The world is now digitalizing the business and organizations. The consumer is adopting new and advanced technology. It very important for businesses to succeed by meeting the requirements of the customer. Broadband networking, cloud base computing and storage, sensor technology, and many more are examples of digital transformation. This change in technology is the digital disruption of the fourth industrial revolution. As the internet of things has become the trend. Businesses need to rethink to thrive their products and services as per new standards of digital business formation (Kessy et al., 2016). Digital transformation should be taken as an opportunity. Many successful businesses have digitalized their systems at the start of the fourth industrial revolution. Now they are operating very successfully. As Bill Gates has said that for the existence of business in the fourth industrial revolution the online presence will be compulsory. As previous Deloitte publications have laid out, Industry 4.0 is transforming how organizations run by bringing real-time data and intelligence to operations. Similarly, this era is transferring the process from manual to digital and functions (Brune et al., 2016).

Some of the organizations have planned well to accommodate the change by the agile method. It is implemented as a vital project for digitalization. Product, services, and processes are digitalized step by step. Workers are trained for new skills. They also have conducted many sessions held for customer guidance as well. This practice is not adopted at the government level but privately some institutions have tried well to deliver the information about digitalization.

On the other hand, digitalization of work and too much use of technology also has decreased the interaction of workers with the workplace. This is also reducing the interaction of workers to share information and create good relations at the workplace. Human interaction is very important for creativity and ideas to solve the problem (Hussain et al., 2013). Digitalization may also helpful by using artificial technology to have artificial meetings at home. So new ways should be found for human interaction according to the requirements of the fourth industrial revolution. It seems important to identify and promote new opportunities. However, digitalization also causing the fear of job loss that will remain an important issue among employees. Since robots and automation might be seen and perceived as competitors for humans but it is also making the human to be at ease and fast than the past (Huber et al., 2020).

Fourth Industrial Revolution and Future of Work

The era of digitalization and transformation of work towards new technologies and innovation talk about to fourth industrial revolution (4IR). Economic and technological changes in the future of work in the last three centuries are called the revolution of technology, one from them is the fourth industrial revolution. This fourth industrial revolution is a current and emerging topic. This Fourth industrial revolution improved workplace situations and change the future of work by creating the environment of disruptive innovation and technology likes the internet of Things (IoT), robotics, virtual reality (VR), 3D printing, and artificial intelligence (AI). This disruptive innovation brings the 4th industrial revolution and this revolution transforms the way we live, and we work. With the emergence of this revolution, it expected that automation and robots gradually take over much of the work which humans perform now (Hussain et al., 2013).

Various previous studies conclude that this fourth industrial revolution disappears the work for humans or a human resource that currently works at workplaces (Iivari, Sharma, & Ventä-Olkkonen, 2020). Studies also revealed that 70% of work that is currently performed by humans will be automated soon due to innovation and disruptive technologies (Samsinar, Hamid, & Rasyid, 2019). Studies criticized the emerging revolution that this automation and disruptive innovation does not automate the work of high-level income employees or highly educated staff (Iivari et al., 2020). This revolution only disappears from the work of low income and low educated employees which are the backbone of every strong economy and organization. This automation and disruptive innovation of the Fourth industrial revolution create substantial job loss in the economy and also generate the massive level of unemployment in countries that adopt this 4th industrial revolution (Gaspar et al., 2020). Therefore, innovation has major role among the companies through various aspects (Albassami, Hameed, Naveed, & Moshfegyan, 2019; Altaf, Hameed, Nadeem, & Arfan, 2019; Amir, Ghapar, Jamal, & Ahmad, 2015; W.-U. Hameed, Hashmi, Ali, & Arif, 2017; Waseem Hameed & Altaf, 2019; Iqbal & Hameed, 2020; Naveed, Hameed, Albassami, & Moshfegyan, 2019; Zahra, Hameed, Fiaz, & Basheer, 2019)

Some studies also conclude that this revolution and disruptive innovation create employment soon with the increase in new technology and machines shown in Figure 2. This disruptive innovation of the Fourth industrial revolution changes the structure of work (Samsinar et al., 2019). The new innovative process increases the job polarization at the workplace, which means that middle-class worker should learn the new technology to overcome the fear of unemployed or job burnout because the middle-class worker performs those tasks which easily be automated by machinery because these workers perform tasks in exactly an anticipated way. This revolution does not automate the working of lower-class workers like (cleaning, personal care, and security) and also higher-level employees' job because they do conative work and have high-level problem-solving skills. Another way of changing the future of work is the concept of the GIG economy (Gig workers are independent contractors, online platform workers, contract firm workers, on-call workers, and temporary workers) (Zhu et al., 2020).

Same as previous revolutions, the fourth industrial revolution with their disruptive innovation and technologies change the way of work. It might be possible that this revolution positively impacts the future of work and workforce but many previous studies criticize the huge role of disruptive innovation at workplaces because it disappears the work for humans in near future (Iivari et al., 2020).

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Figure 2. Future of Job

Source: World economic forum (2020)



Top 10 skills

in 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility



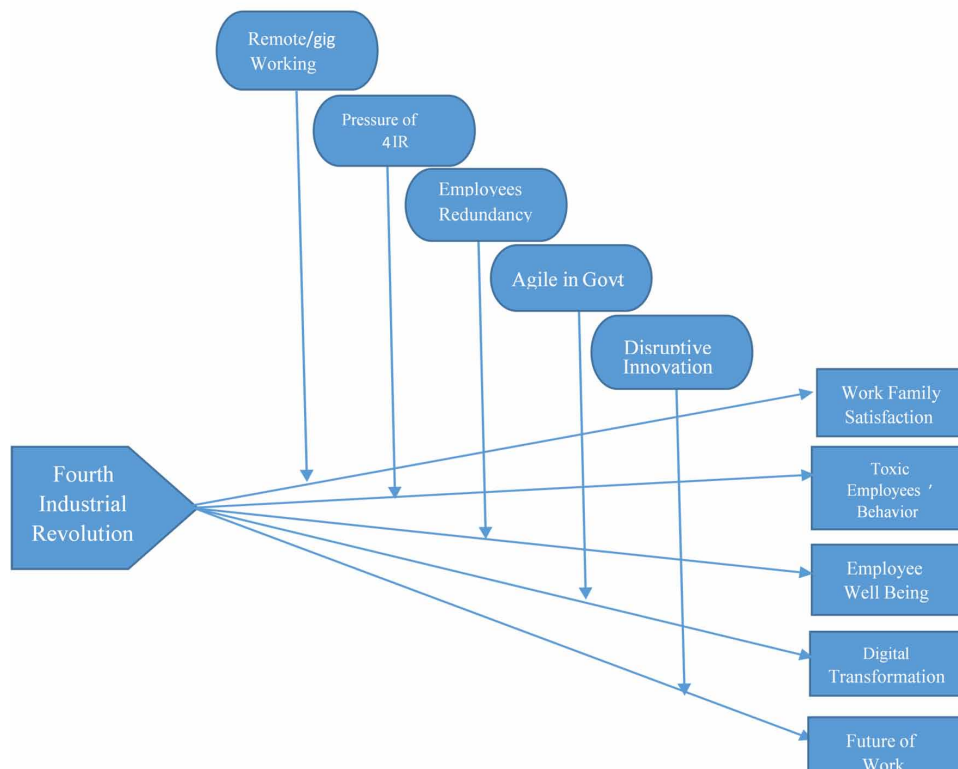
in 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity



Source: Future of Jobs Report, World Economic Forum

Figure 3. Theoretical framework of the chapter showing the relationship of the fourth industrial revolution with disruptive innovation and their effects on employees' behavior



CONCLUSION

From the literature and discussion, it is found that the fourth industrial revolution has revolutionized the world. Organizations, businesses, and the work-life of people have affected in positive and negative both ways. There is a huge disruption occupied in the market and consumers' life. For the implementation fourth industrial revolution, it requires an agenda that can make this disruption smooth and easy for people. Agenda should be followed by the term and techniques to maximize the positive effects for workers, organizations, consumers and minimize the negative effects for all. Despite the negative effects of the Fourth industrial revolution. There are many benefits involve which are necessary to adopt this change on an early basis. The rapid advance of technology has changed the working way people do work and businesses create value. This change is disruptive and creating some spontaneous challenges for workers and organizations. There are some negative effects on the employment and jobs are shifting from manual to atomization. These effects could be minimized by learning new skills related to the fourth industrialization. The fourth industrial revolution has also created many new jobs in the market. A new business also has been started. There are two major changes the Fourth industrial revolution has introduced. The first one is the revolution of technology and the second is the disruption of the previous one. These major changes have created many opportunities and challenges for all. Work-life satisfaction looks decreasing but digital transformation is overcoming by providing the facilities for reducing hard work. Similarly, where the pressure of the Fourth industrial revolution is enhancing the toxic behavior of employees, at the same place workers who are open to the Fourth industrial revolution are more satisfied with the digitalization of processes.

IMPLICATIONS

Theoretical

The literature on the fourth industrial revolution is available in abundance. Most of the studies are an explanation of the Fourth industrial revolution. Some of the authors have worked to find out the impact of the Fourth industrial revolution on different industries (Iivari et al., 2020). Very few studies have provided a solution. The current study is a significant contribution to the existing literature. An updated introduction of the fourth industrialization with the challenges and opportunities has been included. The overall impact of the fourth industrial revolution with introduction and disruption has been included. Information technology has not only determined the impacts for the organization but has individually addressed the work-life behavior of employees and their satisfaction with the other moderating variables. It is a valuable theoretical contribution toward the industrial latest literature

Practical

Different impacts on the workers and organizations have been discussed which are helpful for the practical implications as well. Organizations and institutions can use this study for the implementation of the fourth industrial revolution. Moreover, this is one of the latest studies which has also discussed the relational impact of the Fourth industrial revolution on workers in a situation of COVID-19. The digitalization of business is now more useful in the situation of lockdown. The fourth industrial revolution has helped a

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lot to cope up with the situation. The use of technology for businesses and customer has increased many times. For implementing the fourth industrial revolution with their positive aspects the government needs to work agile and give infrastructure and made policies that overcome the negative impression of the fourth industrial revolution on employees' behavior. This user has also created stress for the employees and small businesses as well. The effects that are expected by studying the literature review of the fourth industrial revolution are very helpful for businesses to manage the stress of employees and trained them for new skills. It is obvious from the study that disruptive innovation that is due to the Fourth industrial revolution, is now compulsory to implementing the fourth industrial revolution.

LIMITATIONS AND FUTURE DIRECTIVES

Although the study has provided important literature and revolutionary insights regarding the fourth industrial revolutions, however, the study has few limitations. This research could be further for more understanding of workers, technology, and organization interaction. Each variable could be explained in detail to understand the real-time impacts of the fourth industrial revolution. A longitudinal study could be more helpful which will also determine the effects of the Fourth industrial revolution on the performance, satisfaction behaviors of employees. This study could be based to further explore the specific context and categories of workers affected by the Fourth industrial revolution. The study has generally discussed the fourth industrial revolution, its impacts could be addressed individually for each industry to give better and specific solutions of implementations.

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KEY TERMS AND DEFINITIONS

Digital Transformation: Digital transformation is the process in which individuals use new technologies in a fast and frequent way for solving problems.

Disruptive Innovation: Disruptive innovation is the innovation that creates a new process and market that disrupts the existing processes and markets.

Employee Redundancy: The redundancy of employees means shorter staff by the employer when job or jobs are no longer needed.

Employee Well-Being: Employee well-being means the state of the employee in which they are happier, comfortable, and healthy. Well-being is the state of mind.

Fourth Industrial Revolution: The fourth industrial revolution is the digitalization of traditional manufacturing and business practices and also automation in the way we live.

GIG Workplace: A gig workplace means a workplace where independent workers are hired for short term contracts. The gig is the free market system.

Toxic Employees' Behavior: The toxic behavior of employees has a direct negative impact on co-workers at workplaces like bullying, harassment, and overall negativity.

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