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Advanced MIS and Digital Transformation for Increased Creativity and Innovation in Business

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Gulay Ekren, Alptekin Erkollar, and Birgit Oberer
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Advanced MIS and Digital Transformation for Increased Creativity and Innovation in Business

Gülay Ekren
ETH Zürich, Switzerland

Alptekin Erkollar
ETCOP, Austria

Birgit Oberer
ETCOP, Austria

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Şule Bozkurt, Graduate School of Educational Science, Gazi University, Turkey

This study was conducted to evaluate the attitudes of the students in a secondary school in Aksaray towards the environment according to some variables. The research group of the study was constituted of 426 students who were attending in the 1st, 2nd, 3rd, and 4th grade at a secondary school in the academic year of 2015-2016. The research done by using environmental attitude scale concluded that the secondary students have a positive attitude towards the environment. It was found that there was a meaningful difference according to gender, age group, father profession status, mother profession status. It was also concluded that students did not differ according to mother education level, father education level, grade level, family income level, and number of siblings variables. Similar evaluations were made with artificial neural networks. In this study, it has been shown that artificial neural networks can be used in the studies conducted in the field of education.

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M. Hanefi Calp, Karadeniz Technical University, Turkey

Knowledge management aims to provide easy access and management of the information resource for the institutions and thus to create value by taking the right decisions. Since knowledge management has a decisive impact on the business performance and innovation process at different stages and requires a different knowledge management concept, enterprises should integrate innovation selection

activities into knowledge management processes. Otherwise, businesses may face problems in the management processes of the information resources they have. The purpose of this chapter is to first specify the definition and tasks of knowledge management, then to examine the knowledge management processes and to correctly identify of the problems encountered in these processes to find and to implement effective solutions and to realize effective management of the knowledge management within the scope of organizational innovation. This study is very important for businesses with a large scale of the budget, human resources, corporate memory, and thus, a data source.

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Sheena Lovia Boateng, Business School, University of Ghana, Ghana

This study examines the mediating role of online trust in enhancing calculative commitment and customer loyalty through online relationship marketing activities (engagement and interactivity). The study draws on signaling theory. Data were gathered from 429 retail bank customers in Ghana and analyzed using confirmatory factor analysis and structural path modelling. Findings suggest that engagement is assessed to be low by Ghanaian bank customers and presently has no influence on customer commitment, online trust, and customer loyalty. However, signals communicated through interactivity online is of great benefit to the banks in influencing customers' online trust, as well as their calculative commitment and loyalty. Further, though, website and email emerged as the most predominant technologies used in online relationship marketing (ORM), customers also expect banks to engage with them through social media, which has the potential to improve upon the current levels of ORM activities.

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The purpose of this chapter is to examine customer perceptions in the affective domain that directly or indirectly influence the shopping process and purchasing decision between the online customer and online shopping sites. This chapter investigates the effects of nine different perceptions as perceived benefit, perceived control, perceived customer services, perceived customization, perceived risk, perceived security, perceived self-efficiency, perceived privacy, and perceived value on the trust, satisfaction, and loyalty of online customers. Revealing the effects of these relationships on online customer trust, satisfaction and loyalty is important for online shopping sites to maintain their existence in the long-run, be able to compete with others, and increase their profitability.

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In the modern era, enterprises are facing a variety of difficulties because of today's emerging technologies. One of the numerous difficulties for a business is to fulfill its employees in order to adapt to the constantly changing business processes and to make progress and stay in competition. In order to build proficiency, viability, efficiency, and occupation responsibility of employees, the business must fulfill the requirements of its employee by giving great working conditions. The target of this chapter is to dissect the effect of workplace on employee work fulfillment. This chapter may profit society by urging individuals to contribute more to their occupations and may help them in their daily work life. Consequently, it is fundamental for an association to support their employee to snap down for accomplishing the hierarchical objectives and goals.

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The Role of Artificial Intelligence Within the Scope of Digital

Transformation in Enterprises..... 122

M. Hanefi Calp, Karadeniz Technical University, Turkey

Digital transformation, which is the beginning of a new era, and performed in order to provide a more effective service, has become a compulsory situation for the enterprises that take into account the increasing corporate volumes. However, the processes and technologies used in this transformation may change according to the enterprise volume and needs. At this point, activities that implement artificial intelligence technologies will make significant contributions to digital transformation. Artificial intelligence technologies serve many purposes such as search, reasoning, problem-solving, perception, learning, estimating, analytical thinking, optimization, and planning. The purpose of this chapter is to demonstrate the effects of artificial intelligence techniques on the processes of digital transformation utilized in enterprises by considering the difficulties experienced in the realization of digital transformation. It is expected that the study will provide a perspective for other studies on digital transformation and thus create an awareness.

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Today, nearly all possible business activities or information systems in enterprises such as sales, marketing, accounting, finance, customer relations, and manufacturing are carried out through traditional relational database management systems. However, technological, social, and competitive pressures in enterprises coming together with the rapid change in technology and then the problems arising from traditional databases force enterprises to adopt new database technologies. This chapter aims to highlight the main differences between traditional relational databases and NoSQL databases and to present an overview of the concepts, features, potential, problems, benefits, and limitations of NoSQL databases for enterprise information management systems, for especially enterprise Resource Planning (ERP) systems, which have a significant role in digital transformation of enterprises.

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Global warming affects everyone, and the effects will be more dangerous all over the world in time. Therefore, it is very important to use our world’s limited resources and to prefer the renewable resources such as solar energy and wind energy. In this study, the authors consider an elevator system, which includes a solar-powered and conventional one with some new Internet-of-Things (IoT) features. The elevator may be operated by both electric energy and solar energy. Solar energy, as being a renewable energy source, leads to various benefits. Internet-of-Things-enabled elevator has a global system for mobile communications (GSM) module to send messages to pre-specified receivers in case of a power failure. The target performance measures are defined, and the advantages of the solar-powered smart elevator are explained.

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Faisal Abubotain, Ministry of Finance, Saudi Arabia
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With the constant development in FinTech globally, Saudi Arabia is a late arrival in the FinTech world. However, the FinTech growth pace in Saudi is fast and not slowing down. This fast pace is confusing stakeholders, including bankers. This chapter unpacks how FinTech is developing in Saudi Arabia, considers the challenges and opportunities that FinTech may be facing in Saudi, and discusses how these changes may affect current bankers and how future bankers can be ready to enter the new market. The study draws on interviews with professionals in the banking and FinTech

industries and makes two contributions: It suggests that FinTech is affecting retail and long-tail clients of banks (i.e., the effect on core banking operations, such as corporate banking and treasury). Findings also highlight that professionals should upgrade their knowledge around matters necessary to retain their jobs in the sector. The study has implications for future bankers (i.e., university students), suggesting that university curricula should be updated to include relevant knowledge and professional placements.

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Preface

Management information system (MIS) is a field that brings people, technology, and system theory and knowledge management together to assist managers in their decision-making process as well as to provide a company for the coordination, control, analysis, and visualization of information by collecting them from various digital environments. In today's digital age, information needs to be managed, and management information systems transfer the information obtained by computer systems to the business operations within the business models, business processes, and management functions. At this point, MIS emphasize business services and applications through digital technology.

Digital transformation is the integration of digital technology into all areas of business, fundamentally changing how organizations operate and deliver value to customers. There are some reasons that a business may undergo a digital transformation, the most likely reason is that they have to since it is a survival issue for many. With the evolving business markets, companies that want to succeed must understand how to apply technology to support strategical decisions and realize the visions. Although digital transformation might vary widely based on organizations' specific challenges and demands, there are a few constants, such as customer experience, culture and leadership, workforce enablement, operational agility and digital technology integration. These developments can be seen as an accelerating transformation concerning models, processes, competencies and business activities, to gain competitive advantages. This book is about the impact of digital technologies in enterprises and their competitive environment on the management information systems, namely the digital transformation that enterprises have been experiencing nowadays.

Nowadays, digital technology trends are forming business applications such as big data and analytics, augmented reality, simulation, additive manufacturing, the cloud, cybersecurity, the (industrial) internet of things, horizontal and vertical system integration, and autonomous robots. These technologies will lead to greater efficiencies and change on traditional relationships among suppliers, producers, and customers, as well as between human and machine. Therefore, keeping up with the

rhythm of technological change is essential for professionals, that requires a focus on lifelong learning approaches and continuous update of learning content, processes and delivery approaches to delivering education and training.

TARGET AUDIENCE OF THE BOOK

This book ideally designed for the system and business application developers, information technology consultants, information system managers, web developers, technical support specialists, database administrators, business and system analysts to broaden their perspectives on digital technology trends that have been using in different shapes within the business field. On the other hand, this book is also useful for academicians, professionals, scholars, researchers as well as students seeking current researches on digital transformation and Management Information Systems (MIS) or business administration. It can also be an essential reference book for courses (titled, e.g., Management Information Systems, Innovation Management, E-Business Management, and Enterprise Management Systems) within MIS or business departments of universities.

ORGANIZATION OF THE BOOK

The book is organized into nine chapters. A brief description of each of the chapters follows:

Chapter 1 aims to be able to make an effective prediction regarding the attitudes of the students in a secondary school in Aksaray towards the environment according to some variables with ANNs which is used as an effective prediction method in various sectors and as an alternative for traditional methods in the field of education.

Chapter 2 focuses on definitions, objectives, and contributions of knowledge management. Related processes and the correct identification or determination of the problems encountered in these processes, the finding and implementing of the efficient solution ways, and knowledge management within the scope of organizational innovation and effective implementation of this management are examined.

Chapter 3 examines the mediating role of online trust in enhancing calculative commitment and customer loyalty through online relationship marketing activities, particularly for engagement and interactivity. The chapter draws on signaling theory to identify signals influencing bank customers' online trust, as well as their calculative commitment and loyalty. According to this study, whereas the websites and e-mail systems are predominant technologies for online relationship marketing, social media has also a great potential to improve these activities.

Preface

Chapter 4 examines customer perceptions in the affective domain that directly or indirectly influence the shopping process and purchasing decision between the online customer and online shopping sites. The author analyses and compares the effects of nine different perceptions as perceived benefit, perceived control, perceived customer services, perceived customization, perceived risk, perceived security, perceived self-efficiency, perceived privacy and perceived value on the trust, satisfaction and loyalty of online customers.

Chapter 5 emphasizes the effect of workplace on employee work fulfillment. A case study has conducted to accomplish the hierarchical objectives and goals of an association.

Chapter 6 presents a review of issues and concerns in artificial intelligence technologies within the context of digital transformation. The chapter aims to demonstrate the effects of artificial intelligence techniques on digital transformation of enterprises by considering the challenges.

Chapter 7 aims to highlight the main differences between traditional relational databases and NoSQL databases, and to present an overview of the concepts, features, potential, problems, benefits and limitations of NoSQL databases for enterprise information management systems, for especially Enterprise Resource Planning (ERP) systems, which have a significant role in digital transformation of enterprises.

Chapter 8 aims to minimize the affects of global warming by proposing a solar-powered elevator system including some new Internet of Things (IoT) features. This system is operated by both electric energy and solar energy and has a Global System for Mobile Communications (GSM) module to send messages to pre-specified receivers in case of a power failure. The chapter also provides the target performance measures and the advantages of the solar-powered smart elevator.

Chapter 9 aims to explore the effects of digitalization on the set of skills of professionals, with an emphasis on adapting to such changes and preparing students to the changing market. While digitalization is impacting numerous industries the authors of this chapter study digitalization in the financial sector by focusing on an under-explored empirical context, that of Fintech in Saudi Arabia. This study is premised on the importance of the banking system in any given economy and the size of the Saudi economy in the region.

HOW THIS BOOK IMPACTS THE FIELD OF MIS

The 'Advanced MIS and Digital Transformation for Increased Creativity and Innovation in Business' book is mainly concern with the impact of digital technologies in enterprises and their competitive environment on the management information systems, namely the digital transformation that enterprises have been experiencing

nowadays. The digital transformation is the usage of digital technologies that enable new types of innovation and creativity in various business domains through artificial intelligence, data mining, machine learning, big data, data analytics, cloud computing, semantic web, social networks, and the internet of things.

In today's digital age, information needs to be managed, and management information systems transfer the data obtained by computer systems to the business operations within the business models, business processes, and management functions. At this point, MIS emphasize business services and applications through digital technology. Therefore, this book especially impacts field MIS since MIS brings people, technology, and system theory and knowledge management together to assist managers in their decision-making process as well as to provide a company for the coordination, control, analysis, and visualization of information by collecting them from various digital environments.

This book is an essential reference book that provides a critical analysis of increased creativity and innovation in business for scholars, researchers, and practitioners in a wide range of disciplines; including computer science, software engineering, operations research, management information systems, business administration, cognitive sciences, and related areas. In this book, interdisciplinary research and practices of digital transformation within business applications are discussed.

Gülay Ekren
ETH Zürich, Switzerland

Alptekin Erkollar
ETCOP, Austria

Birgit Oberer
ETCOP, Austria

Chapter 1

Investigation of the Attitudes for Environment and Evaluation of Artificial Neural Networks

Semra Benzer

Education Faculty, Gazi University, Turkey

Recep Benzer

Cyber Security, Ostim Technical University, Turkey

Şule Bozkurt

Graduate School of Educational Science, Gazi University, Turkey

ABSTRACT

This study was conducted to evaluate the attitudes of the students in a secondary school in Aksaray towards the environment according to some variables. The research group of the study was constituted of 426 students who were attending in the 1st, 2nd, 3rd, and 4th grade at a secondary school in the academic year of 2015-2016. The research done by using environmental attitude scale concluded that the secondary students have a positive attitude towards the environment. It was found that there was a meaningful difference according to gender, age group, father profession status, mother profession status. It was also concluded that students did not differ according to mother education level, father education level, grade level, family income level, and number of siblings variables. Similar evaluations were made with artificial neural networks. In this study, it has been shown that artificial neural networks can be used in the studies conducted in the field of education.

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INTRODUCTION

The concept of environment is a very wide and diverse concept. Keleş and Hamamcı (1998) defined the concept of environment as the total of physical, chemical, biological and social factors which directly or indirectly affect human activities and live assets immediately or in a certain time. Özey (2001) defined the concept of environment as the environment in which human or any other living thing live. In another definition, it is stated that living beings are connected to and affected by vital ties and also affected by various ways (Güney, 2004).

Attitudes are not only a behavioural tendency or a feeling; they are also the integration of cognition, emotion and behaviour tendency. Attitude is a tendency attributed to an individual that regularly forms thoughts, feelings and behaviours about a psychological object (Kağıtçıbaşı, 2010).

The way to use the environment we live in more effectively and efficiently is to reveal a social structure of environmentally conscious individuals. This can be achieved by training in this context; environmental education is of great importance.

The aim of environmental education is to raise awareness of all segments of the society about the environment, to provide positive and lasting behavioural changes and to ensure the active participation of individuals. For this reason, an education method that will enable individuals to participate actively in environmental issues, react to negativity, understand the fact that individual interests cannot be considered apart from social interests, and the education system aiming at public participation will improve the thinking and decision-making power of the masses. Environmental education should not only provide information and a sense of responsibility, but also influence human behaviour. The aim of the efforts to protect, develop and improve the environment is to provide opportunities for living in a healthier and safer environment. The desired and successful results in terms of the environment are directly related to the human element. This is possible by educating and developing people in the environment. Human awareness and development can be achieved by providing the necessary knowledge and skills (Ministry of Environment and Forestry, 2004; Ünlü, 1995).

Secondary education provides the individual with a lot of cognitive skills such as literacy, problem solving and the basis for success in life. These are extremely important skills in the relationship between the environment and the individual. The knowledge, skills and values to be gained in secondary education constitute the basis for upper education steps. The aims of the secondary education were grouped under four headings: Personal, human relations, economic life and social life. When the sub-objectives under these four main topics are examined, it is seen that there are some goals related to ecological culture, environmental awareness, environmental attitudes and behaviours, cleanliness and thriftiness. Education in

secondary education; It is aimed to educate individuals who love and respect the nature, protect plants and animals, are aware of the natural beauty around and endeavours to improve the environment, are sensitive to environmental problems, have environmental awareness (Vural, 2003).

Questionnaires also became useful tools for studies with low budget, helping them plan correctly the next semesters without excessive spending. It was very valuable to predict the next prefer that each student would choose, and it could be achieved by using questionnaires. In that direction the contribution of Artificial Neural Networks (ANNs) was remarkable (Matzavela et al., 2017). ANNs are directed graphs with weights and they are used, apart from education, in weather forecasting, predicting earthquakes, calculating the financial risk of a loan, in automatic pilots, in stock exchange.

The purpose of this research is to be able to make an effective prediction regarding the attitudes of the students in a secondary school in Aksaray towards the environment according to some variables with ANNs which is used as an effective prediction method in various sectors and as an alternative for traditional methods in the field of education.

BACKGROUND

Due to the increasing environmental problems, it has become necessary to identify the attitudes of individuals towards the environment and find solutions to solve the problems. Although the original studies in these areas will increase the sensitivity of the societies to the environment, they will provide important steps in minimizing the time spent on solving the problems and the environment. At the beginning of these steps, determining the attitudes towards the environment and giving the necessary training to the individuals are significant. Some research was conducted to examine the environmental attitudes of students studying in Turkey as secondary school level (Ayhan, 1999; İşyar, 1999; Morgil et al., 2002; Tuncer et al., 2004; Yılmaz et al., 2004; Atasoy, 2005; Kaya and Turan, 2005; Ürey, 2005; Alp et al., 2006; Gökçe et al., 2007; Tecer, 2007; Alp et al., 2008; Aslan et al., 2008; Atasoy and Ertürk 2008; Meydan and Doğu, 2008; Sağır et al., 2008; Ünal, 2009; Özpınar, 2009; Aslanyolu, 2010; Baş, 2010; Yaman et al., 2010, Aydın et al., 2011).

ANNs are mathematical models inspired by biological neural networks contained in human brain. Having similar characteristics to those of biological neural networks, these systems attempt to learn tasks and determine how they will react to new tasks by means of creating their own experiences through the data obtained by using the predetermined samples (Sagiroglu et al., 2003). The implementation of a user-friendly software tool based on neural network classifiers was described

for predicting the student's performance in the course of Mathematics of the first year of Lyceum (Livieris et al., 2012). Neural networks were also used to predict MBA (Master of Business Administration) student success (Naik et al., 2004). The authors classified applicants to MBA program into successful and marginal student pools based on undergraduate GPA (Grade Point Average), undergraduate major, age, GMAT (Graduate Management Admission Test) score using a neural network with three layers. There is some educational research (Naik and Ragothaman, 2004; Lykourantzou et al., 2009; Paliwal et al., 2009; Livieris et al., 2012; Oancea et al., 2013; Kardan et al., 2013; Khan and Kulkarni, 2013; Naser et al., 2015; Yorek and Ugulu, 2015; Bahadır, 2016; Özdemir and Polat, 2017; Matzavela et al., 2017) related to artificial neural networks. The great advantage of neural networks is that they can be used to make predictions in several aspects in education. Using neural networks and analyzing parameters such as student satisfaction, can lead to high prediction accuracy (Kardan et al, 2013).

MAIN FOCUS OF THE CHAPTER

In general, the results obtained from the studies reveal the existence of important problems in environmental education. The disruption of environmental education and its ineffectiveness prevent the steps to be taken to protect the environment and solve the environmental problems. At the basis of raising individuals who have sufficient environmental awareness, individuals are expected to gain positive attitudes towards the environment. It is of great importance to determine the views, sensitivities, awareness and attitudes of the students in Aksaray, in which environmental problems are rare but this does not mean that they will not happen in the future. It is observed that the studies on the views of the students in Aksaray province are very few. As a result of the research, students' positive attitude towards the environment has emerged.

It has been found that there is no study evaluating the environmental attitudes of the secondary students in Aksaray when the literature is examined. The study is the first from this point of view. It has been accepted in the scientific world that the studies which evaluated the environmental attitudes of the students according to various independent variables have made important contributions to the environmental education which has gained importance with the increase in environmental problems.

This research is important in that it sheds light on a less studied subject in Turkey to contribute to increasing the awareness of secondary school students towards environment. This research was conducted to determine the attitudes of the students in a secondary school in the city center of Aksaray.

The purpose of this research is to be able to make an effective prediction regarding the attitudes of the students in a secondary school in Aksaray towards the

environment according to some variables with ANNs which is used as an effective prediction method in various sectors and as an alternative to traditional methods in the field of education.

The following questions were asked in this study: (1) What are the attitudes of secondary school students towards the environment? (2) Do the environmental attitude scores of secondary school students in terms of

- Gender,
- Age group,
- Mother education level,
- Father education level,
- Mother profession status,
- Father profession status,
- Family income level,
- Number of siblings,

change according to its parameters?

METHODOLOGY

In the study, “Environmental Attitude Scale” which was developed by Atasoy (2005) was used to determine the attitudes of primary school students towards the environment. Survey model is based on the quantitative stage and it is convenient to general survey model. The qualitative research is based on the views of the participants or the interests, skills, abilities, attitudes, etc. of a topic or event which are usually based on larger samples than on other studies (Büyüköztürk et al., 2011).

Qualitative data obtained from student answers to open-ended questions were used to train and test the ANNs model. 70% of this data was used for training of the network and the remaining 30% was used for testing the network (Hagan et al., 1996).

Likert-scale survey is usually in a non-numeric form. For neural network training, responses were converted to the range of 0 to 1. The mapping shown in Table 1 was used. It was used for the traditional education approach by 1-5 numerical values for the Likert-scale.

The body of an artificial neuron then sums the weighted inputs, bias and “processes” the sum with a transfer function. In the end, an artificial neuron passes the processed information via output(s). the benefit of artificial neuron model (Krenker et al., 2011) simplicity can be seen in its mathematical description below:

Table 1. Likert-scala value

Value	Normalized for ANNs	Traditional Value
1	0.24	1
2	0.42	2
3	0.58	3
4	0.74	4
5	0.90	5

$$y(k) = F \cdot \left(\sum_{i=0}^m w_i(k) \cdot x_i(k) \right)$$

Where:

$w_i(k)$ is weight value in discrete time k where i goes from 0 to m,

$x_i(k)$ is input value in discrete time k where i goes from 0 to m,

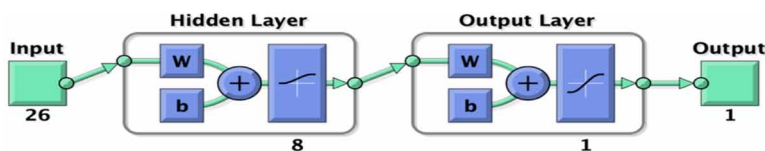
F is a transfer function,

$y_i(k)$ is output value in discrete time k.

Neural network consists of three layers (Figure 1). The first layer has k input neurons which send data via connection links to the second layer of M hidden neurons, and then via more connection links to the third layer of output neurons. The number of neurons in the input layer is usually based on the number of features in a data set. The second layer is also called the hidden layer.

The supervised learning method trained with the network structure (Back-propagation Networks) will be used to solve the problems in this study. The transfer function, (VN is normalized data, VN is data to be normalized, Vmin is the minimum value of the data, Vmax is the maximum value of the data) mostly used as a sigmoid or a logistic function, gives values in the range of [0,1] and can be described as (normalization):

Figure 1. Artificial neural networks model diagram



$$V_N = 0.8 \times \left(\frac{V_R - V_{\min}}{V_{\max} - V_{\min}} \right) + 0.1$$

MATLAB is a multi-paradigm numerical calculation software and fourth generation programming language. Neural Network Toolbox of MATLAB was used for the ANNs calculations. The coefficient correlation (R2) was calculated by MATLAB.

The correlation between two variables numerically describes whether larger and smaller average values of one variable are related to larger or smaller than average values of the other variable. It measures the strength and direction of a linear relationship between two variables and can be described as:

$$r = (R^2) = cor(x, y) = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{(x_i - \bar{x})^2 (y_i - \bar{y})^2}}$$

It has been determined the correlation coefficient into “weak,” “moderate,” or “strong” relationship. While researchers would agree that a coefficient of <0.1 indicates a negligible and >0.9 a very strong relationship. For example, a correlation coefficient of 0.65 could either be interpreted as a “good” or “moderate” correlation, depending on the applied rule of thumb.

Research Sample

The study group of the research consisted of male and female total 426 students who were studying on the 1st, 2nd, 3rd and 4th grade at one of the secondary schools in Aksaray, Turkey in 2015-2016 academic year. Random sampling method was used in the sample selection. The personal information of the students participating in the study is given in Table 2.

Data Collection Tool

In the study, “Environmental Attitude Scale” which was developed by Atasoy (2005) was used to determine the attitudes of primary school students towards the environment. Firstly, the data obtained from this study were checked by the Kaiser Meyer Olkin (KMO) coefficient and Barlett Sphericity test to determine whether the data were suitable for factor analysis (KMO coefficient .85 and Barlett test for

Investigation of the Attitudes for Environment and Evaluation of Artificial Neural Networks

Table 2. Personal information of secondary school students participating in the study

Parameters	Demographic Properties	Number of Student (n=426)	Total (%100)
Gender	Male	204	48.2
	Female	221	51.8
Age Group	9-11 years old	157	37.0
	11-13 years old	163	38.4
	13-15 years old	102	24.0
	15-16 years old	2	0.47
Class	Fifth grade	154	36.2
	Sixth grade	99	23.2
	Seventh grade	79	18.5
	Eighth grade	93	21.8
Mother education level	Primary education	347	92.2
	Secondary education	26	6.9
	University	3	0.7
Father education level	Primary education	293	60.5
	Secondary education	91	23.0
	University	11	2.7
Mother profession status	Officer	4	0.9
	Worker	42	10.0
	Retired	2	0.4
	Housewife	395	94.7
Father profession status	Officer	12	2.9
	Worker	235	57.7
	Self-employment	140	34.3
	Retired	19	4.6
Family income level	< 1000 ₺	137	33.4
	1000 - 2000 ₺	211	51.5
	2000 - 3000 ₺	43	10.5
	> 3000 ₺	17	4.1
Number of siblings	<= 2 sibling	144	34.0
	2-4 sibling	182	43.0
	4-6 sibling	70	16.5
	6-8 sibling	22	5.2
	>= 8 sibling	5	1.18

significance = .000 $p < .001$) and it was concluded that the data were suitable for factor analysis.

When the distribution of the 25 problems in the environmental attitude scale is examined; 5 questions include animals and plants, 5 questions ecological problems and environmental pollution, 5 questions consumption and prudence, 5 questions human - environment relations and environmental sensitivity, and 5 questions include energy resources and energy use. Taking into account the calculation of the range of width of the scale with the formula of “sequence width / number of groups to be performed” (Tekin, 2002), the arithmetic mean intervals used in the evaluation of the research findings; “1.00-1.80 = Strongly Disagree”, “1.81-2.60 = Disagree”, “2.61-3.40 = Unstable”, “3.41-4.20 = Agree” and “4.21-5.00 = Strongly Agree”.

Data Analysis

The data of the study was obtained by applying the environmental attitude scale to the students in a secondary school in the province of Aksaray in the second semester of the 2015/2016 academic year. The application took place in about 20 minutes, taking into account the principle of volunteering. Arithmetic mean and standard deviation values were used in the analysis of environmental attitudes of secondary school students.

It was determined by “t-test for Independent Samples” whether the attitudes of secondary school students towards the environment differed significantly by gender variable. One-Way Variance Analysis (ANOVA) was used to determine whether there is a significant difference between secondary school students’ attitudes towards environment according to variables of age group, class level, mother education level, father education level, mother profession status, father profession status, family income level and number of siblings. Tukey HSD was used to determine the statistical differences between the two groups. The statistical significance of the scale was 0.05.

In this research, an effective prediction is made regarding the research data with ANNs approach. The Correlation (R^2) is any statistical association, though in common usage it most often refers to how close two variables are to having a linear relationship with each other. The correlation values obtained by ANNs will be analysed and the existence of the relationship (R^2) between the variables will be evaluated.

The correlation value (R^2) obtained by the ANNs was compared with the statistical relationship value.

RESULTS

Table 3 shows the arithmetic averages and standard deviations of secondary school students' attitudes towards the environment for item-based scores.

As shown in Table 4, the arithmetic mean of the students' environmental attitude scale was found to be 3.94 (Agree) and the standard deviation was 1.12. According to this finding, students in this secondary school in Aksaray have positive attitudes towards environment.

A significant difference between the attitude scores and gender of secondary school students was determined by t-test for independent samples and the results are shown in Table 4.

There is a difference of 7.37 points between male and female students (Table 4). According to the results of t-test conducted to determine whether this difference is significant, environmental attitudes of secondary school students showed a significant difference by gender [$F_{(426)} = 4.627$; $p < 0.05$]. This result shows that gender is an important variable affecting environmental attitudes. The results of ANOVA according to the age group of the students' attitude towards environment in a middle school in Aksaray are given in Table 4.

It is seen that it is 99.6 in 9-11-year-old students, 96.72 in 11-13 years old students, 91.74 in 13-15 age group students and 96.00 in 15-17 years old students when the environmental attitude point average is examined (Table 5). Secondary school students' attitude towards environment showed a significant difference depending on the grade level [$F_{(3,420)} = 4.633$; $p < 0.05$]. The Tukey-HSD test was applied to determine the source of the difference between group averages. As a result of the analysis, a significant difference was found between the students in the 11-13 age group and 15-17 age group.

It is seen that it is 97.79 in the fifth class, 99.03 in the sixth class, 94.00 in the seventh class and 94.28 in the eighth class when the environmental attitude point average is examined (Table 6). Secondary school students' attitude towards environment showed a significant difference depending on the grade level [$F_{(3,421)} = 2.185$; $p < 0.05$].

It is seen that it is 102.73 in primary education level, 103.59 in secondary education level and 93.02 in university education level when the environmental attitude point average is examined (Table 7). Secondary school students' attitude towards environment showed a significant difference depending on the grade level [$F_{(3,373)} = 1.620$; $p > 0.05$].

It is seen that it is 96.51 in primary education level, 97.70 in secondary education level and 106.36 in university education level when the environmental attitude point average is examined (Table 8). Secondary school students' attitude

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Table 3. Mean and standard deviations of students' attitudes on environmental attitude scale

Id	Expressions in the Environmental Attitude Scale	\bar{X}	SD
1	I turn off the lamps that are unnecessarily open at home or at school	4.30	1.07
2	I do not buy food products that cause harm to my health or the environment when shopping from grocery stores	3.85	1.16
3	When I go shopping with my parents, I tell them not to buy fruits and vegetables with hormones	3.52	1.31
4	One day when I buy my own car, I will buy the one polluting the environment least.	3.70	1.35
5	I would like my family to prefer those who consume less electricity while buying bulbs and household appliances.	3.96	1.24
6	The insensitivity of politicians and managers, to environmental problems worry me	3.78	1.28
7	I have to throw the waste to anywhere in places like picnic areas, beaches, forests where there is no bin.	2.25	1.54
8	I think there should be more flowers and green areas in my neighbourhood.	4.20	1.21
9	I don't burn fire in a woodland or picnic.	3.98	1.31
10	I use water and electricity at school and at home.	4.27	1.11
11	I feel sorry for the dogs that are hungry, injured, derelict on the streets.	4.28	1.06
12	It makes me sad that the camels, dogs, cocks fight, and bears are exploited in playgrounds.	3.98	1.27
13	I am very happy to be a member of an environmental foundation or association to protect plant and animal species.	4.08	1.12
14	Companies that try some food, medicine and weapons on animals should be closed.	4.22	2.65
15	I would be happy to feed and care for one of the animals in my house, such as cats, dogs and birds.	4.09	1.31
16	I think that water, electricity and energy should be saved in all houses and workplaces.	4.05	1.28
17	I do not pay attention to whether the products I buy have damaged the environment.	4.05	1.28
18	Natural gas should be used instead of wood and coal in the heating of houses.	3.67	1.34
19	I do not think that erosion and forest fires will cause serious environmental problems in our country.	4.55	0.68
20	I do not think that sufficient forestation works have been done for burnt, dry and cut forest lands.	4.14	1.09
21	I think people sometimes use energy unnecessarily by using cars.	3.72	1.37
22	The first nuclear power plant, which is expected to be established in our country in the coming years, worries me for the environment.	3.55	1.28
23	The use of energy sources wasted in Turkey worries me in terms of future	3.84	1.33
24	There are enough animals in Turkey, so I do not worry about the extinction of some species.	4.55	0.66
25	I am concerned that some factories work with energy that harms the environment.	3.96	1.28
Total		3.94	1.12

SD: Standard Deviation

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Table 4. T-Test Results of gender in attitudes of environmental attitude scale scores

Parameter	n	\bar{X}	SD	t	p
Female	221	100.14	14.24	4.627	.000*
Male	204	92.77	19.24		

Table 5. ANOVA results of age group in attitudes of environmental attitude scale scores

Parameter	n	\bar{X}	SD
09-11	157	99.61	18.27
11-13	163	96.72	13.83
13-15	102	91.74	17.55
15-17	2	96.00	41.01
	Sum of Variance Squares	Meaning of Variance Squares	F p
Between Group (11-13) - (15-17)	3834.826	1278.2758	4.633 .003*
Within Groups	115889.9466	275.928	

Table 6. ANOVA results of class level in attitudes of environmental attitude scale scores

Parameter	n	\bar{X}	SD
5	154	97.79	19.30
6	99	99.03	12.14
7	79	94.00	17.60
8	93	94.28	15.57
	Sum of Variance Squares	Meaning of Variance Squares	F p
Between Group	1836.022	612.007	2.185 .089
Within Groups	117943.56	680.151	

towards environment showed a significant difference depending on the grade level [$F_{(2,392)}=2.159$; $p>0.05$].

It is seen that it is 89.75 in officer, 89.71 in worker, 97.43 in housewife and 103.50 in retired when the environmental attitude point average is examined (Table 9). Secondary school students' attitude towards environment showed a significant difference depending on the grade level [$F_{(3,413)}=3.067$; $p<0.05$]. The Tukey-HSD

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Table 7. ANOVA results of mother education level in attitudes of environmental attitude scale scores

Parameter	n	\bar{X}	SD
Primary Education	444	102.73	10.94
Secondary Education	268	103.59	11.35
University Education	77	103.02	13.41
	Sum of Variance Squares	Meaning of Variance Squares	F p
Between Group	1417.644	472.548	1.620 .184
Within Groups	108772.727	291.616	

Table 8. ANOVA results of father education level in attitudes of environmental attitude scale scores

Parameter	n	\bar{X}	SD
Primary Education	293	96.51	15.90
Secondary Education	31	97.70	15.80
University Education	11	106.36	12.02
	Sum of Variance Squares	Meaning of Variance Squares	F p
Between Group	1077.799	538.900	2.159 .117
Within Groups	97824.743	249.553	

test was applied to determine the source of the difference between group averages. As a result of the analysis, a significant difference was found between the students in the worker group and retired group.

It is seen that it is 87.25 in officer, 95.46 in worker, 98.93 in self-employment and 100.95 in retired when the environmental attitude point average is examined (Table 10). Secondary school students' attitude towards environment showed a significant difference depending on the grade level [$F_{(3,403)} = 2.934$; $p < 0.05$]. Tukey-HSD test was applied to determine the source of the difference between group averages. As a result of the analysis, a significant difference was found between the students in the worker group and retired group.

It is seen that it is 96.12 in < 1000 ₺ level, 96.83 in 1000 – 2000 ₺ level, 98.64 in 2000 - 3000 ₺ level and 97.06 in > 3000 ₺ level when the environmental attitude point average is examined (Table 11). Secondary school students' attitude

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Table 9. ANOVA results of mother profession status in attitudes of environmental attitude scale scores

Parameter	n	\bar{X}	SD
Officer	4	89.75	20.30
Worker	42	89.71	24.35
Housewife	369	97.43	15.37
Retired	2	103.50	30.40
	Sum of Variance Squares	Meaning of Variance Squares	F p
Between Group (worker-retired)	2527.333	842.444	3.060 .028
Within Groups	113434.168	274.659	

Table 10. ANOVA results of father profession status in attitudes of environmental attitude scale scores

Parameter	n	\bar{X}	SD
Officer	12	87.25	26.95
Worker	235	95.46	17.45
Self-employment	141	98.93	14.87
Retired	19	100.95	12.91
	Sum of Variance Squares	Meaning of Variance Squares	F p
Between Group (worker-retired)	2473.905	824.635	2.934 .033
Within Groups	113286.931	281.109	

towards environment showed a significant difference depending on the grade level [$F_{(3,405)} = .247$; $p > 0.05$].

It is seen that it is 95.43 in 0-2 siblings, 97.32 in 2-4 siblings, 97.84 in 4-6 siblings, 95.82 in 6-8 siblings and 97.20 in > 3000 ₺ level when the environmental attitude point average is examined (Table 12). Secondary school students' attitude towards environment showed a significant difference depending on the grade level [$F_{(4,418)} = .369$; $p > 0.05$].

In that direction, the contribution of ANNs was remarkable. ANNs are graphs directed with weights and they are used, apart from education, in weather forecasting, predicting earthquakes, calculating the financial risk of a loan, in automatic pilots, in stock exchange. The disadvantage of questionnaires is that they are not dynamically

Table 11. ANOVA results of family income level in attitudes of environmental attitude scale scores

Parameter	n	\bar{X}	SD
< 1000 ₺	137	96.12	15.05
1000 - 2000 ₺	211	96.83	17.21
2000 - 3000 ₺	44	98.64	21.03
> 3000 ₺	17	97.06	16.84
	Sum of Variance Squares	Meaning of Variance Squares	F p
Between Group	213.708	71.236	.247 .863
Within Groups	116583.449	287.853	

Table 12. ANOVA results of number of siblings in attitudes of environmental attitude scale scores

Parameter	n	\bar{X}	SD
0-2	144	95.41	17.07
2-4	182	97.32	17.09
4-6	70	97.84	15.67
6-8	22	95.82	16.23
> = 8	5	97.20	20.54
	Sum of Variance Squares	Meaning of Variance Squares	F p
Between Group	418.942	104.735	.369 .831
Within Groups	118789.687	284.186	

adapted to each student. Thus, when someone takes an examination, s/he has to answer all questions, whether s/he is well prepared or not. The capabilities of ANNs can allow us to implement them in complicated problems and eliminate that disadvantage, minimizing time and cost.

Figure 2 depicts graphical presentation of the overlapping between the actual and predicted values for the results of the regression on learning, validation and test clusters in MATLAB for gender, all questions – point (sums the weighted). Performance measurements of ANNs between predicted values for gender, all questions – point (sums the weighted) are shown in Figure 3.

Figure 4 shows the distribution of the actual data with data predicted for the results in MATLAB. Figure 2-4 are drawn with MATLAB coding.

Figure 2. Relationship between observed and forecast values

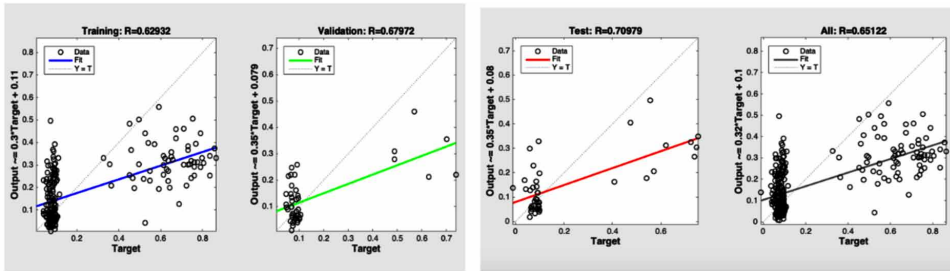


Figure 3. Performance of ANNs between observed and forecast values

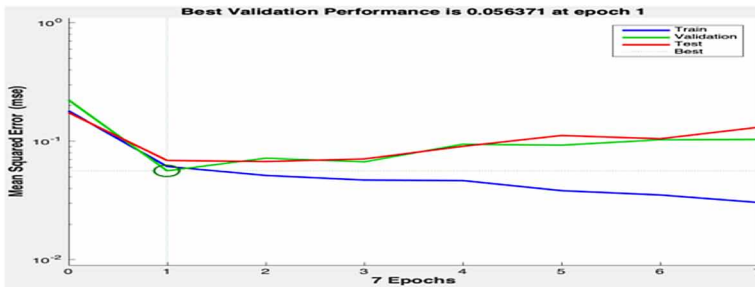
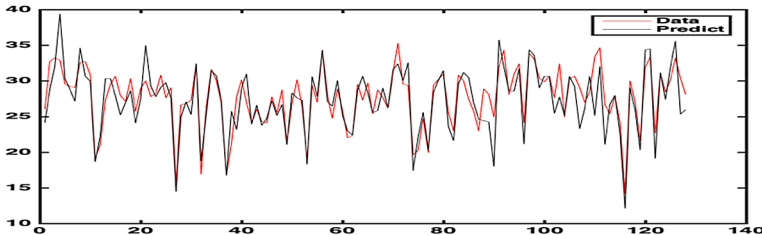


Figure 4. Observed and predicted data



The correlation value (R2) with parameters and of 25 questions of secondary school students' attitudes towards the environment values calculated by ANNs are presented in Table 13. This table is provided for the comparison of ANNs correlation value.

As a result of the analysis with ANNs; it is determined that there is a relationship between gender, age group and father profession status when the correlation values (R2) are examined. No relation was found in other parameters (class, mother education level, father education level, mother profession status, family income level and number of siblings). These findings are similar to the statistical results. Exceptionally; in

Table 13. Comparison results for ANNs and statistical

Parameter	ANNs Correlation Value (R ²)				Statistical Results
	Training	Validation	Test	All	
Gender	0.63	0.68	0.71	0.65	$t_{(426)} = 4.627; p < 0.05$
Age Group	0.51	0.62	0.66	0.56	$F_{(3,420)} = 4.633; p < 0.05$
Class	0.40	0.35	0.45	0.48	$F_{(3,421)} = 2.185; p < 0.05$
Mother education level	0.30	0.17	0.086	0.20	$F_{(3,373)} = 1.620; p > 0.05$
Father education level	0.31	0.32	0.029	0.27	$F_{(2,392)} = 2.159; p > 0.05$
Mother profession status	0.30	0.30	0.45	0.32	$F_{(3,413)} = 3.067; p < 0.05$
Father profession status	0.60	0.54	0.41	0.56	$F_{(3,403)} = 2.934; p < 0.05$
Family income level	0.48	0.07	0.25	0.37	$F_{(3,405)} = 0.247; p > 0.05$
Number of siblings	0.33	0.008	0.11	0.25	$F_{(4,418)} = 0.369; p > 0.05$

the statistical results, the relationship with the ANNs was not determined while the relationship was found in the mother profession. It is considered that this result may be due to the fact that it is at the limit of $p < 0.05$.

DISCUSSION AND CONCLUSION

It was tried to determine the attitudes of students towards environment in a secondary school in Aksaray with this research. In addition, it was examined whether students' environmental attitudes differed according to gender, age group, class level, mother's education level, father's education level, mother's professional status, father's professional status, family income level and number of siblings.

It can be said that the attitudes of the students in a secondary school in the city center of Aksaray towards the environment is positive when the arithmetical average of the attitude towards the environment of the students is examined. Some studies on different student groups support the same result (Kuhlemeier et al., 1999; Bonett & Williams, 1998; Ma & Bateson, 1999; Eagles & Demare, 1999; Jaus, 1982; Aydın & Kaya, 2011; Gökçe et al., 2007; Özpınar, 2009; Alp et al., 2007; Şahin & Erkal, 2010).

It is observed that secondary school students have low attitudes towards environment in their responses to some items (such as items 3, 4, 7, 18). In order to increase the environmental sensitivities of the second level students, it is possible to emphasize the environmental sensitivities in the subjects that the environmental subjects are taught in secondary education (Science, Social Studies etc.).

In this study, it was concluded that the arithmetic averages of female students' environmental attitude scores were higher than the male students. The environmental attitudes of the female students were found to be more positive than the male students. It was concluded that the female students' environmental attitude scores were higher than those of male students in some studies (Paraskevopoulos et al., 2003; Atasoy, 2005; Alp et al. 2006; Yılmaz et al., 2004). In this study, it was found that there was a statistically significant difference between the environmental attitude point averages of female and male students. Some studies on primary school students show that gender is effective on environmental attitudes.

The attitudes of the students in a secondary school in Aksaray towards the environment showed a significant difference according to age groups. The statistical difference shows that the age group is an important variable affecting environmental attitudes. Some studies on primary school students show that the age range is effective on environmental attitudes.

The attitudes towards the environment of secondary school students in Aksaray province did not show a significant difference according to their grade levels. This may be due to the fact that elementary school students are receiving similar courses for environmental education at each class level and there is no practical content for environmental education in the subject.

The attitudes of the students in a secondary school in Aksaray towards the environment showed no significant difference according to mother and father education level.

According to another result obtained in this study; the attitudes towards the environment of secondary students in Aksaray province showed a significant difference when examined in terms of mother professional status. A similar situation was obtained in the case of the father professional status.

Some researches on this subject (Özdemir, 2003; Baş, 2010; Özpınar, 2009) support this result. The professional status of the parents (professional status) shows the positive effect of the student's attitude towards the environment.

The attitudes towards the environment of secondary students in Aksaray province did not show a significant difference according to family income level. This finding shows that family income level is not an important variable affecting environmental attitudes.

The attitudes of secondary school students in Aksaray towards the environment did not show a significant difference according to the number of siblings. The number of siblings in the family indicates that there is no significant variable affecting the environmental attitude.

In general, it is of great importance for a secondary school student in Aksaray (n = 426) to have a positive attitude towards the environment, to prevent environmental problems and to create a liveable environment and point out that a successful

environmental education has been carried out in secondary education. Also, it should be kept in mind that if environmental attitudes of the students are changed in a positive way with a conscious environmental education, environmental problems will decrease significantly. On the contrary, individuals with negative attitudes and behaviours towards the environment should be aware of the fact that their awareness and sensitivity towards the environment and environmental problems will be low. The level of knowledge, consciousness and attitude towards the environment of secondary school students should be determined and then developed. The more positive attitudes the students have towards the environment, the less environmental problems can occur. Therefore, educational practices that will change the attitudes of secondary school students towards their environment should be included.

Based on the research results, the following suggestions are given:

1. In this study, the province of Aksaray was chosen as the sample. The environmental attitudes of students in other settlements where environmental problems are felt in our country can be examined and the findings obtained can be compared.
2. In this study, it is concluded that female students have higher environmental attitudes than male students. The reasons for high environmental attitudes of female students can be investigated. In addition, practices should be included to change the environmental attitudes of male students positively. For example, learning environments where different methods and techniques are applied should be organized and seminars on environmental education should be given.
3. In order to create a society that respects the environmental values, it is necessary to ensure that the individuals who make up the society reach the right information and shape the training to be given accordingly. Environmental education should be shaped in such a way that people can take responsibility for environmental protection by providing information, consciousness, skills and values about the environment.
4. Environmental education is not only an element of the learning process but also an element of the whole life process of the individual. Therefore, environmental education should be considered and evaluated in the lifelong learning model.
5. There is great interest from researchers, in the field of dynamic questionnaires and with the help of ANNs we can predict the results, according to the profile of each student.
6. The design and implementation of the ANNs system can be designed to meet the need for automatic questioning as an expert questionnaire for future technology based measurement and evaluation activities.

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KEY TERMS AND DEFINITIONS

Artificial Neural Network: An artificial neuron network (ANN) is a computational model based on the structure and functions of biological neural networks.

Environment: The sum total of all surroundings of a living organism, including natural forces and other living things, which provide conditions for development and growth as well as of danger and damage.

Environmental Attitude: Environmental attitudes are important because they often, but not always, determine behaviour that either increases or decreases environmental quality.

Environmental Attitude Scale: A crucial construct in environmental psychology, are a psychological tendency expressed by evaluating the natural environment with some degree of favour or disfavour.

Environmental Education: Environmental education is a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment.

Lifelong Learning Model: All learning activity undertaken throughout life, with the aim of improving knowledge, skills and competences within a personal, civic, social, and/or employment-related perspective.

Questionnaire: A set of printed or written questions with a choice of answers, devised for the purposes of a survey or statistical study.

Chapter 2

Knowledge Management Within the Context of Organizational Innovation

M. Hanefi Calp

Karadeniz Technical University, Turkey

ABSTRACT

Knowledge management aims to provide easy access and management of the information resource for the institutions and thus to create value by taking the right decisions. Since knowledge management has a decisive impact on the business performance and innovation process at different stages and requires a different knowledge management concept, enterprises should integrate innovation selection activities into knowledge management processes. Otherwise, businesses may face problems in the management processes of the information resources they have. The purpose of this chapter is to first specify the definition and tasks of knowledge management, then to examine the knowledge management processes and to correctly identify of the problems encountered in these processes to find and to implement effective solutions and to realize effective management of the knowledge management within the scope of organizational innovation. This study is very important for businesses with a large scale of the budget, human resources, corporate memory, and thus, a data source.

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INTRODUCTION

The production capacity of the enterprises is increasing day by day, and so their internal and external knowledge sources are increasing too. At this point, knowledge is a decisive element of social and economic activities, which is very important for all areas (especially for businesses) (Dong, 2017; Lee & Kim, 2001). Considering that knowledge is an important asset for all institutions and organizations, it is understood that Knowledge Management (KM) is also important in growing enterprises. The main purpose of the KM is to provide easy access and management of the information source for the institutions and thus to create value by taking the right decisions. KM is a systematic whole of the human, technology, process and organizational structure of an organization in order to add value. This greatly affects the operation efficiency of the enterprise (Grudin, 2006a; Grudin, 2006b). The American Production and Quality Center define knowledge management as systematic approaches to ensure the spread of knowledge and creation of value at the right time and to the right person (Buckman, 2004: 17). Knowledge management is a discipline that updates the information capacity that is constantly increasing in the organizational environment, makes the information available, identifies the processes necessary to reach the required information and enables the necessary information to be shared with the company employees (Harrison and Kessels, 2004: 39).

Nevertheless, the sustainable competitive advantage of growing enterprises should be ensured. This is only possible through the management of knowledge in the context of organizational innovation by creating technology infrastructure in enterprises and effectively using this technology. Obtaining/collecting, storing, reusing (when it is needed) and managing the information resources of the institutions is very important in terms of managing the institutions more efficient and with high performance. This process significantly increases the efficiency and efficiency of institutions in today's business activities (Zhao et al., 2012; Oun et al., 2016).

KM enables the organization to learn and adapt to its changing environment to minimize time and cost in service production, and consequently to achieve competitive advantage. Since KM has a decisive impact on the business performance and innovation process at different stages and requires a different KM concept, enterprises should integrate innovation selection activities into KM processes (Cormican & O'Sullivan, 2003; Brahma & Mishra, 2015; Jordão & Novas, 2017). Innovation is the development and implementation of a new idea, product or process. The issue of innovation is a wider concept than the invention of any idea. Because the invention refers to the physical output of either a physical product or a physical system and excludes improvements called routine innovations. Therefore, innovation should be understood not only as product and technology innovation but also as a thought accepted by the enterprises in the broad sense. When this idea is adopted, business

processes will be renewed through innovative philosophy within the company, and thus, the emergence of new products will be easier (Iraz, 2004; Topal and Kurt, 2004). Innovation is an issue that can be used or applied in almost all areas, and be allowed to provide new solutions to new demands, needs, and problems. It aims to performance and efficiency for the organization or community. At this point, all technology-based innovations so far can be considered in this context. In addition, innovation at the level of organizational behavior leads to an increase in performance of important factors such as productivity, quality, competition, and market share of an institution/organization (Seker, 2014). In order to maximize profitability in the innovation process, as a central link in the innovation process and to increase the internal growth and competitiveness of enterprises, enterprises with technical infrastructure should base their innovation processes based on KM. However, as a discipline, method, and practice aiming at benefiting from information sources, it can positively affect the production and organizational performance of knowledge, store information at the organizational level, and make it usable and safely shareable if necessary (Cormican & O'Sullivan, 2003; Brahma & Mishra, 2015; Jordão & Novas, 2017).

In light of all this information, institutions may face some problems or risks in the management processes of the information resources they have. At this point, identifying and controlling the problems or risks that may be encountered is one of the important tasks of business management. Managers and researchers should provide effective solutions by looking for ways to eliminate problems/risks in the most accurate way.

In this section, firstly the definition, objectives, and contributions of KM were determined. Later, KM processes and the correct identification or determination of the problems encountered in these processes, the finding and implementing of the efficient solution ways, and knowledge management within the scope of organizational innovation and effective implementation of this management were examined. Finally, some conclusions and suggestions were presented on this issue. This study is especially very important for businesses with a large scale of the budget, human resources, corporate memory and thus a data source.

KNOWLEDGE MANAGEMENT

Knowledge Management has been scientific for many years and has become an indispensable part of organizational life rather than an academic approach. In a conference held in Boston in 1993, Larry Prusak described knowledge management as a good turning point to mark the start of the timeline (Girard & Girard, 2015; Prusak, 2001, p.1003). In fact, it is difficult to define and measure knowledge

management because it is complex, multi-dimensional and process-oriented. Knowledge management is the capacity to define, obtain, store, distribute and use clearly documented information. Knowledge management shows a movement to manage knowledge, emphasize information sharing and create interpersonal interaction (Abdi and AmatSenin, 2014; Gorelick and Tantawy-Monsou, 2005; Kumar and Thondikulam, 2006; Choi and Lee, 2002; Zack, 2002). KM has begun to play an increasingly significant role in enterprises or organizations in various industries. The KM process covers two main processes. These include knowledge management adoption and knowledge management development. The KM deals with the principles of managing the information and is included in the organization. However, KM development consists of all organized activities that the enterprises uses to form, store, transmit, share and implement information (Ceptureanu et al., 2018; Ceptureanu & Ceptureanu, 2015; Ceptureanu et al., 2017; Patil & Kant, 2014a; Patil & Kant, 2014b; Cerchione & Esposito, 2016; Centobelli et al., 2018).

KM is primarily concerned with creating value from all activities, from organization to business information. For similar projects in the future, such issues as the implementation and reuse of previously completed projects are the main subjects of knowledge management. Many researchers believe that KM is necessary for more efficient management of business processes and indicates that KM has many advantages in business asset management. However, although the companies use some knowledge management tools and software in line with their own needs, the problems in the knowledge management processes continue. For example, if users cannot easily find information about the project, or what information is available. This is a big problem for businesses because most users do not know which project information is stored in the organization. In particular, a network information map is recommended to solve this problem. Because this information map plays an important role in ensuring that engineers and experts, easily find their past knowledge and experience on the project or the subject matter (Lin et al., 2006).

KM is the selection, dissemination, production and distillation of the organized and systematic information that is made available for the purpose of creating a unique value and making available the explicit and implicit information available to the organization or business to achieve a strong competitive advantage in the market. KM is an important process that improves organizational efficiency and efficiency by acquiring, sharing, using and storing for reuse when needed. KM enables the organization to learn and adapt to the changing environment, to reduce costs in the production process and to strengthen its competitive advantage. However, by making use of basic information sources and providing a discipline, it positively affects knowledge production and organizational performance, and can make information available and shareable at the organizational level (Hult, 2003; Yilmaz, 2017).

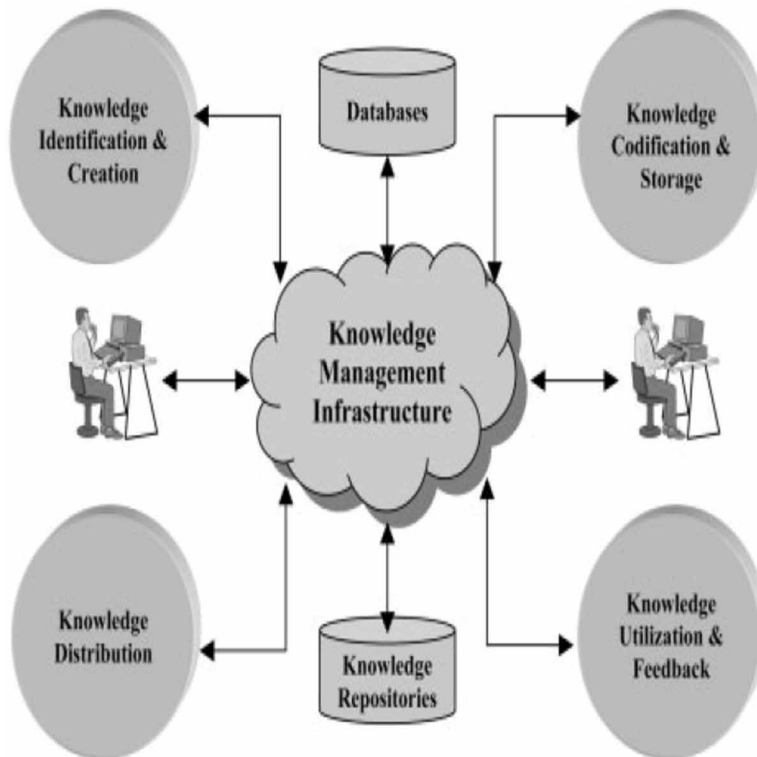
KM includes the analysis and planning of activities to analyze and identify the information required and obtained, and to develop information assets to achieve organizational goals. Information assets are information about organizations, technology, production and market. This information can make the organization a powerful position by enabling organizational activities. KM is not only managing the information assets but also managing the processes that will affect the information assets. This includes the processes of developing, preserving, using and sharing knowledge. After these explanations, the KM can be defined as the acquisition, sharing and use of information within the organization, including management information systems and learning processes (Alavi & Leidner, 2001; Yılmaz, 2017). According to Kim (2009), while providing benefit to the KM organization, it is to improve the ability of the organization to use knowledge to realize its learning and adaptation to its changing environment and to maximize the use of information resources in organizational activities (Kim, 1999). KM can be described as a sequence of strategies and processes for obtaining, recording, sharing and using information to increase the level of competition. In other words, knowledge management is a systematic process about with how to create, obtain, use and manage of information to achieve organizational goals (Iraz, 2005; Özgener, 2002: 485).

KM consists of three components: people, processes, and technology. KM emphasizes individuals and organizational culture to accelerate and increase the sharing, and use of information. It attaches importance to methods or processes for finding, acquiring, creating and sharing information, and focuses on technology to enable people in different locations to work together with information storage and accessibility (Aktan and Vural, 2005: 11). KM is often considered as a process involving various activities. The classification of processes and their uncertainty in terms of numbers, rather than the concepts highlighted in the literature, brought about the diversity and diversity of the KM processes. At the very least, however, four main processes are considered, namely, the use, transfer, acquisition/storage and creation/evaluation of information. These basic processes are divided into sub-sections such as, for example, the creation of internal information, the provision of information from outside the organization, sharing of internal and external information, and the updating of information, as well as the storage of information in documents against routine storage (Civi, 2000; Yılmaz, 2017).

KM is the management of the business processes, corporate information and information assets of an enterprise in order to ensure a more consistent decision by any institution or business. In Figure 2, a general framework of the knowledge management process is given. Businesses can leverage the capabilities of analytical systems by integrating operational data with information from all over the organization and make customer-oriented business decisions with them. For example, businesses can offer goods, products, or services that are tailored to the needs of a particular

Knowledge Management Within the Context of Organizational Innovation

*Figure 1. The framework of knowledge management
(Bose & Sugumaran, 2003)*



customer, or they can dynamically personalize content based on the web visitor's profile, according to the customer's prior purchase status (Probst et al., 2000; Bose & Sugumaran, 2003).

In view of all these definitions, the main objectives of knowledge management in general can be listed as follows:

- To contribute to increasing competitiveness,
- To activate decision making and to avoid wasting time,
- To increase responsibility for customers,
- To encourage employees to share information by preventing confidentiality of information,
- To strengthen support and cooperation among colleagues by increasing the value of knowledge and sharing knowledge,
- To ensure that the employees and the activities carried out are efficient and to increase the quality of products and services,

- To promote innovation and invention (Cakar, Yildiz & Serkan, 2010; Jarrar, 2002).

In summary, knowledge management includes the steps of obtaining or collecting information, converting it into a reusable format, storing it, recalling it when necessary and reusing it. Small organizations often focus on the step of acquiring information; the steps of sharing or reusing information are relatively less applicable. However, large organizations face great challenges in collecting and reusing information. Because it can be quite difficult to determine whether the information exists within the enterprise. Nevertheless, businesses still attach importance to the implementation of these steps (Grudin, 2006a).

PRINCIPLES OF KNOWLEDGE MANAGEMENT

Davenport (1996) proposed ten basic principles regarding knowledge management. While each of these principles is discussed in terms of their content, many enterprises face these principles and seek solutions to the different problems they cause. The ten principles of knowledge management are as follows:

1. Knowledge management is expensive and ignorance is expensive too:

Although knowledge management is expensive, it is necessary to know the cost when the management of knowledge is not available too. For example, what would be the cost of these problems to the enterprise in the event that personnel working in a critical role in an organization forget about what they know, or staff cannot respond quickly to customer problems when they leave their jobs for any reason? Organizations should try to measure the cost of ignorance in the same way (as they attempt to determine the value of information), as well as how they determine the cost of products and services of poor quality when determining the value of quality.

2. Effective knowledge management requires common solutions of people and technologies

Information technologies help to acquire, store, transform, distribute, and stream information largely by interpreting and synthesizing different information in a unique way to make decisions. Data and information can only be interpreted and made meaningful by people.

3. Knowledge management is political

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If knowledge means power, money and success, there will be lobbying, political games and some bargaining to seize information.

4. Knowledge management requires knowledge managers

There are several functional areas for the successful management of basic resources such as labor and capital. Likewise, information cannot be managed well if there is no senior management responsibility for the information.

5. Knowledge management uses information maps rather than models, and information markets rather than hierarchy

Knowledge management, such as a large encyclopedia, collects and categorizes information to create a hierarchical model or structure of knowledge that may appeal to many businesses. However, most organizations create and organize the information market within the organizational structures and organize and organize the information in accordance with the wishes of their users. With the help of information maps, information users can easily find the information they are looking for and in which specific terms they can easily find it.

6. Sharing and using information is often unnatural

There is a tendency for people to hide information and to suspect the knowledge of others. However, as information is used, it will contribute to the organization and new information will be obtained as the information is shared. Therefore, individuals working in the enterprise should be encouraged and motivated by knowledge managers to share and use information.

7. Knowledge management means developing information business processes

Developing a comprehensive knowledge management process is very important. However, the information is intensively produced, used and shared in a number of specific business processes. These specific processes vary in firms and industries, but also include functional processes such as market research, product design and development, order preparation and pricing. In short, these processes, including the creation, use and sharing of information, should be developed or improved.

8. Accessing information is just the beginning

Information users should be more active to redefine the complex issues associated with the information and turn the information into useful formats. Because access to information is important but not sufficient.

9. Knowledge management never ends

Knowledge management is not a one-time initiative. Knowledge management is an ongoing management task, such as financial and human resources management.

10. Knowledge management requires an information contract

The information that most companies have or employees have is not clear. The intellectual property law on the legal aspects of all these issues is developing rapidly (Ipcioglu & Erdogan, 2005; Davenport, 1996).

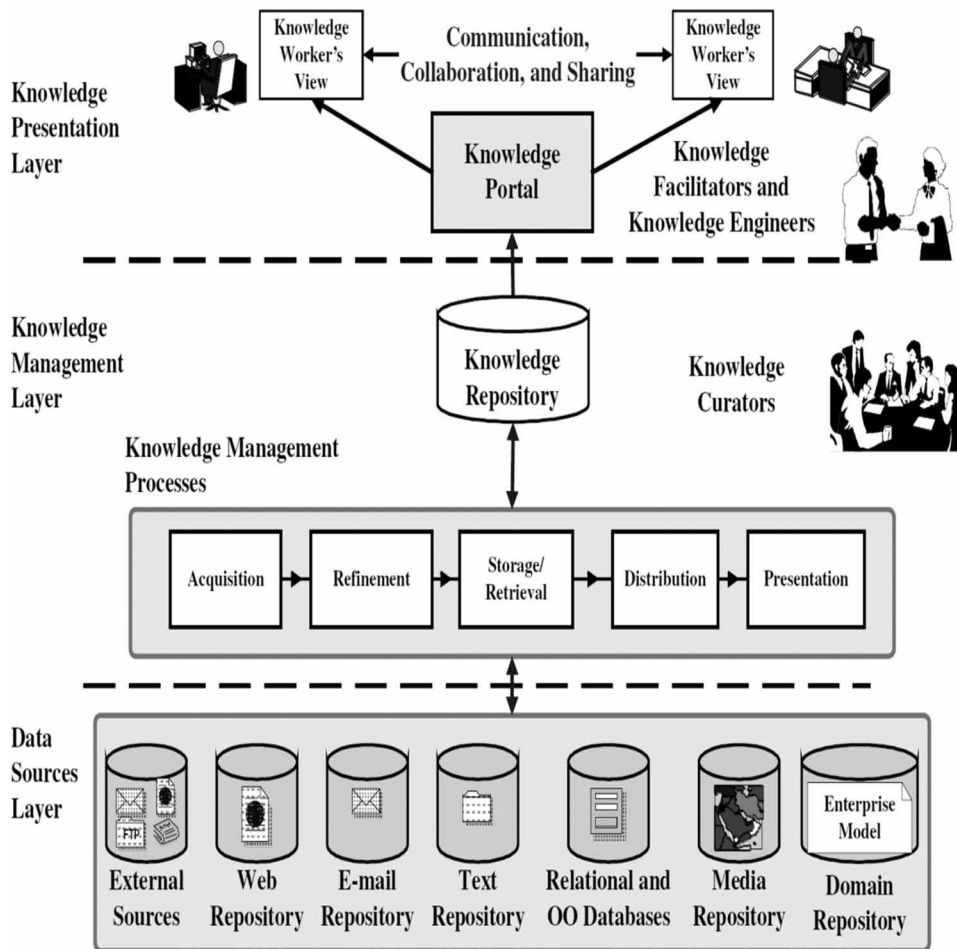
KNOWLEDGE MANAGEMENT MODEL AND ITS ADVANTAGES

Knowledge management covers the processes from creation or coding of information to dissemination and use of information. Previous researches have focused exclusively on knowledge creation or coding processes in businesses (Chen, Huang, 2007). There are several knowledge management models in the literature. For example, Lee and Kim (2001), Malhatro (2004), Lin et al. (2007), Kanapeckiene et al. (2010), Lee and Lan Y (2011). When these models are examined in detail, it is understood that each model focuses on one or two aspects of knowledge management. Some of these take only two criteria such as the use of technology and the production of knowledge, which is the focus, while others include information processes, information culture and leadership, etc. draws attention to issues. A corporate knowledge management model is a set of hierarchical rules that enable the disclosure of events and interaction models. It also represents or models a business's natural knowledge management system (Oztemel et al., 2011; Chen & Huang, 2007; Lee & Kim, 2001; Malhotra, 2005; Lin et al., 2007; Lee & Lan, 2011).

The process model for knowledge management consists of well-defined activities. A knowledge management model helps to preserve the quality of data and information used by information personnel, to help in the acquisition of data and information, to effectively ensure the storage and retrieved of metadata and information, to encourage the dissemination and dissemination of information in a timely manner and to support the specific presentation of information provides such contributions. These contributions or activities are also presented in the sections in Figure 2.

Knowledge Management Within the Context of Organizational Innovation

Figure 2. Three-layer knowledge management architecture (Kerschberg, 2001).



Although some of the current techniques and models take into account of information tactics or strategies, they do not ensure any information about how these will be compatible with enterprise/organizational structures. It should not be overlooked that these skills are essential to effectively achieve a KM.

Knowledge management approaches have several advantages. Öztemel and Arslankaya [Oztemel & Arslankaya, 2012] highlighted the significance of efficient knowledge management and listed the following advantages;

- Provides convenience to maintain expertise within the business/organization,
- Raises the compliance and flexibility of the business,

- Provides higher return on investment,
- Maintains competitive advantage,
- Defends intellectual property rights,
- Promotes the formation of a customer-oriented organization,
- Ensures a unified knowledge manipulation within the general establishment,
- Provides information planning and organization which is generally left to the natural results in available models,
- Provides a standard information framework to be set within the general enterprise,
- Evaluates knowledge management as a section of strategic planning process.

In Table 1, knowledge management models are given comparatively.

There are different perspectives on knowledge management systems in literature. However, almost all researchers think that knowledge management systems have a

Table 1. Comparison of knowledge management models

	Knowledge Management Models							
	SECI	EvEr	8 + 3	E-CKM	Life- Cycle Model	KMS	CEN/ ISSS	EKMM
1. to develop a knowledge infrastructure		+	+	+	+		+	+
2. to design and apply knowledge management processes	+	+	+	+	+	+	+	+
3. to utilize knowledge sharing techniques	+		+					+
4. to plan the knowledge flow and programs	+		+		+			+
5. to create and apply knowledge strategies		+			+	+	+	+
6. to establish knowledge centered organization		+	+				+	+
7. to form an enterprise-wide knowledge culture		+		+		+		+
8. to create enterprise-wide knowledge activities	+			+				+
9. to evaluate of enterprise-wide knowledge management implementations the enterprise		+	+	+	+	+	+	+

(Oztemel & Arslankaya, 2012)

great contribution to the enterprise or to the production organization. At this point, Vukašinović et al. list the benefits of the knowledge management system as follows:

- Improvement of information and resources,
- Ensuring learning as a result of mistakes and continuous improvement of the process,
- Referral to good practices,
- Faster and improved decision making within the enterprise,
- Improved environment of staff and their dedication,
- Reduction of experienced personnel loss,
- Protection against copying information,
- Less time is spent to develop and market a product,
- Improved brand awareness,
- Early detection of possible changes in the market (Vukašinović et al., 2018).

Building an organization-wide knowledge management system is not an easy mission. However, the utilities of a well-designed system are enormous. In general, these benefits can be categorized under four headings:

- **Awareness:** Everyone knows where to look the information of the organization, it provides people time and effort.
- **Accessibility:** All individuals can usage the business's/organization's unified knowledge and practice according to their roles.
- **Usability:** Information can be used wherever needed - from home office, on the road or on the customer's side. This increases the sensitivity to customers, business partners and colleagues.
- **Timeliness:** information is available when needed, eliminating the time-consuming loss of information that people are interested in (Offsey, 1997).

KNOWLEDGE MANAGEMENT IN THE CONTEXT OF TECHNOLOGY AND INNOVATION

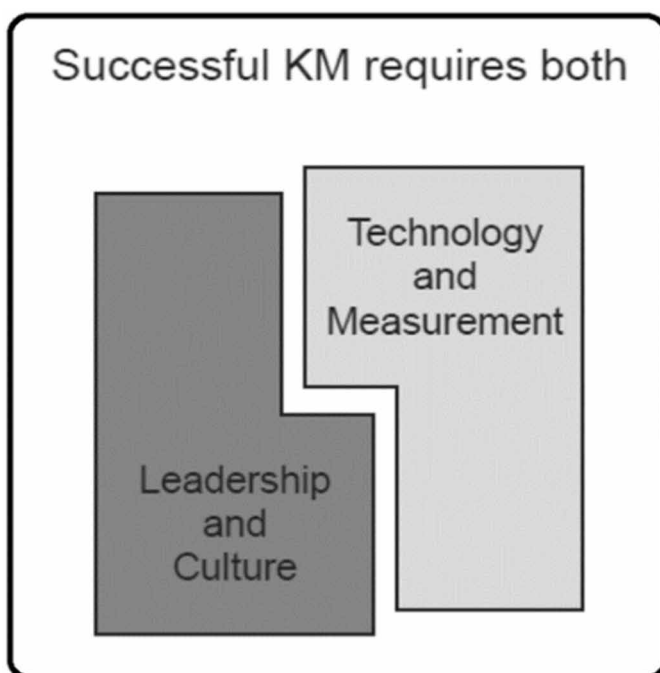
Knowledge management is dominated by two different ideas. The first is to determine how much information is passed between individuals who maintain organizational behavior and protect individual socialization. Those who hold this view believe that technology in general is not the answer and that issues such as change management, culture and leadership are important. The other idea is that information technology focuses on technology as a resolution to the question of knowledge management. However, realized many researches have indicate that a successful knowledge

management program needs a change in institutional attitude, method and technology substructure (see Figure 3). Technology is not a single element for resolution to an enterprise's knowledge management demands, but it is openly necessary to active the enterprise's knowledge management process and operations (Offsey, 1997).

Businesses should have appropriate infrastructures for their activities in order to implement knowledge management processes successfully and to get effective results. Because the technology, innovation, culture, intellectual capital and organizational structure that constitute the infrastructure of the knowledge management system positively affect the success of the knowledge management processes. In addition, information technology not only increases the possibilities of obtaining and reaching information, but also enables the sharing and transfer of information more quickly. However, the use of technology contributes to facilitating business processes, increasing productivity and reducing costs (Türkmen & Yilmaz, 2019; Baykam, 2010:18; Zaim, 2010: 62; Zaim, 2005:295; Davenport & Prusak, 2001:177; O'dell, Jr., & Essaides, 2003:112).

Gold (2001) addressed the entire knowledge management process in four basic dimensions. These are: acquisition, storage, transfer and implementation. All

Figure 3. Knowledge management requirements (Offsey, 1997).



dimensions have major implications for innovation activities and the company's innovation performance. Effective knowledge management is first possible with effective knowledge acquisition. Businesses cannot find all the resources needed for development, so they need to constantly learn from outside to satisfy the demands of information innovation. External information acquisition effectively meets for the constraints of restricted internal resources that hamper the enterprise's improving and innovation activities. This is very important for decreasing product and service investments and abbreviating the innovation cycle. In addition, knowledge obtaining is offered as deeper information mining within the enterprise. In addition, outside the company, it represents a great extent to the search, filtering, identification and organization of information. As an important strategic resource for the development of the company, timely and effective access to information sources directly determines the ability to progress over time. Therefore, it is important that businesses integrate innovative activities into all processes (Cong et al., 2017; Gold et al., 2001). The use of knowledge-based techniques in decision-making processes is an important method for enterprises to realize their business processes effectively. Traditional data storages will transform not only operationally embroidered data, but also knowledge management environments, including semi-structured, heterogeneous information collected from outer resources and unified into decision-oriented information for corporate decision makers (Kerschberg, 2001).

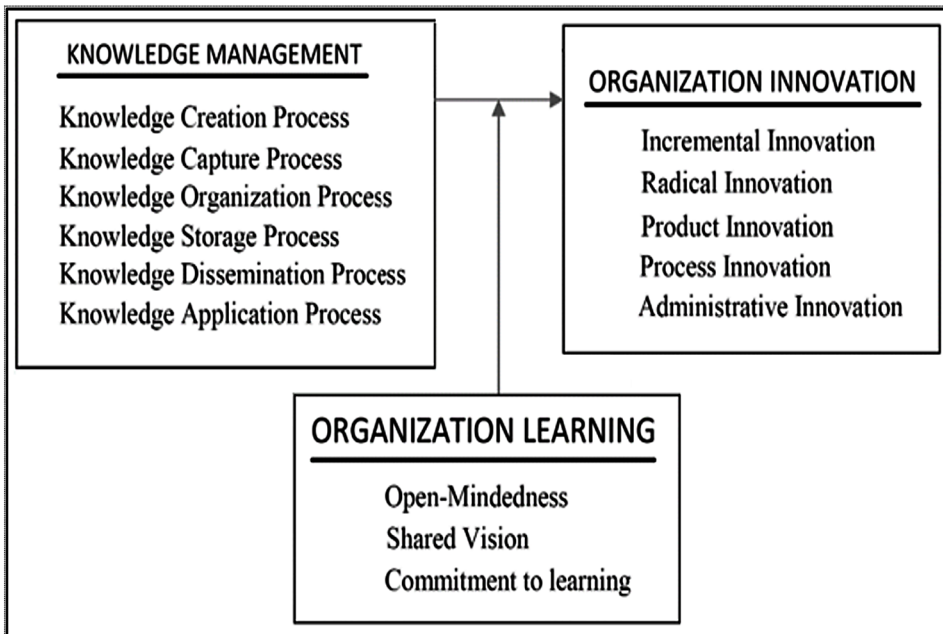
One of the basic requirements of achieving organizational success and standing in a competitive environment is the realization of knowledge management with a technology and innovation support based on needs. Innovative approach ensures customer satisfaction and facilitates organizational behavior. Because there is knowledge in the nature of innovation. The innovative approach of enterprises is the most fundamental element in their successful implementation. If the source of innovation is information, the enterprises will provide a sustainable advantage over their competitors. In other words, innovation should be supported with information to provide benefit. The implementation of innovation-supported knowledge management in enterprises is possible by the widespread use of this process at the organizational level and the dominance of innovative thinking. Innovative culture; it requires a sharing that enables the transfer of information and knowledge into creativity (Demirel & Seçkin, 2008; Barker, 2001, p. 23; Drucker, 2003, p. 130–134).

When the subject of knowledge management is considered within the scope of organizational innovation, it can be determined that there is a powerful relationship between innovation and KM (Figure 4). Because one of the ways in which any business can survive or create competitiveness makes innovation in business processes effective. According to Leal-Rodríguez et al. (2013) organizational innovation, KM assists to protect competitive advantage and form new markets. The information obtained from the outside environment will absolutely lead to

the customer's admission of the produce or services. Plessis (2007) specified that universal economic expansion has altered with the speed of innovation, which is possible with fast developing technology or techniques, less product life cycles and higher new product development rate. He also added that the complexity of innovation increases with the increase for information available to organizations. It is clear that there is a powerful relationship between technology, innovation, novel methods, techniques and KM. In addition, there are components that are very important for innovation as well as technology. Leal-Rodríguez et al. (2013) found that there is a powerful knowledge-innovation relationship in enterprises that have low obstacles to knowledge creativeness, sharing and transfer and those who encourage open cultures. Abdi and AmatSenin (2014) demonstrated the impact of knowledge management on innovation through direct and organizational learning. They conclude that organizational learning has a complete mediatorship impact on KM and organizational innovation. They also specified that the performance level of the business could benefit greatly from experienced business members in the KM. Krstić and Petrović (2012) involved creating an organizational culture based on knowledge and innovation as the role of KM. Moreover, it also means that the organizational culture that promotes information sharing can have a positive effect on innovation. The role of KM will not only make use of these relevant and important data, but will also ensure the most efficient access to those concerned information and communication technologies play a important role in real-time evaluation and in obtaining appropriate information, which is noted to be an important problem. The rise of new technologies is the outcome of innovative developments and, the similar novel technology can lead to various innovative applications. For example, the development of PDAs and smartphone technology. Although the main purpose is communication, there have been numerous innovative and novel practices that cannot be improved without smartphone and internet technology. It is also true that information and communication technologies have a major impact on the KM, and that any innovation in information and communication technologies is directly related to creativity in the KM. The occurrence of novel techniques and technologies has importantly affected tactics of business are willing to advance their existing models/ systems with these new improvements, and even fully modify their old models/ systems with new ones (Rafiq et al., 2014; Leal Rodríguez et al., 2013; Du Plessis, 2007; Abdi & AmatSenin, 2014; Krstić & Petrović, 2012).

In addition, knowledge management within the scope of organizational innovation enables managers to better anticipate and analyze some problems they face and to take more correct measures against these problems. By taking advantage of an effective and efficient knowledge management process, business managers can better evaluate environmental factors and clearly demonstrate the priority objectives of the enterprises in the short and long term. In order to achieve a healthy result in modern

*Figure 4. Relationship between organizational innovation and KM
(Abdi & AmatSenin, 2014)*



business organizations, knowledge management culture should be established within the scope of innovation (Carniero, 2000:92). The main purpose of innovation is to obtain value. In order to do this, it needs to ensure product, service, strategy and process, technical and market improvement. Innovation typically involves creativity, but it is not exactly the same thing. Innovation involves acting on creative ideas in order to make a specific and concrete difference in the field of innovation. Based on Davila et al. (2012), as in many business functions, innovation is a management process that requires special tools, rules and discipline. Innovation refers to the production, acceptance and implementation of novel opinions, processes, products or services. Organizational innovation, product, process and management or marketing systems are defined as the application of new ideas for innovation (Weerawardena et al. 2006). At this point, it is clear that organizational learning is closely related to organizational innovation (Abdi & AmatSenin, 2014; Davila et al., 2012; Weerawardena et al., 2006).

In the advanced knowledge economy, the basic proficiency of the organization is increasingly relying on the use and innovation of knowledge. Without utilizing knowledge management process, businesses cannot reach competitive advantages in the modern market. However, there are very few applications of KM in practical

areas, especially in terms of innovation performance. The KM implementation process requires the appropriate organizational structure, and the innovation performance occurs by the marginalization of the organization. The KM and organization influence the mechanism of influence between innovation performance and the organizational performance of the KM. In order to improve innovation performance, not only the direct impact of the KM should be taken into account, but also the indirect impact of institutional innovation performance should be underlined (Bai & Yu, 2017; Neamtu & Scurtu, 2016; Darestani et al., 2016).

CONCLUSION AND RECOMMENDATIONS

In this study, knowledge management is focused on organizational innovation. In this context, knowledge management, knowledge management models and the importance and contributions of knowledge management in terms of enterprises have been put forward. At this point, it can be said that the two views are the most common in knowledge management. First, technology is not effective in many issues; change management, culture and leadership are more effective. Secondary, it is the need to focus on technology in knowledge management.

Businesses tend to prefer innovative approaches to gain profits from the benefits of information resources. They can effectively control the ways of using and sharing information sources with innovative approaches and provide benefit. Moreover, according to the findings, the applications firstly show that knowledge management plays an important role in innovation and has a direct effect on organizational innovation, especially a full mediation effect. The members of the organization whose information capacity or the information obtained are too large increase the performance of the organization in terms of adherence to learning, shared vision, and openness. Knowledge management within the scope of innovation has been seen as an issue that should be taken into consideration for managers to create and maintain a sustainable competitive advantage. However, in recent years, enterprises that take into account the importance of information and knowledge management have begun to use methods or strategies such as innovation and creativity. The effective use of innovative approaches in the business processes of the company primarily constitutes the business culture and plays an important role in the effective management of knowledge management processes. This ensures that knowledge management is provided within the scope of organizational innovation, thus enabling enterprises to have a more flexible and structured knowledge management culture. In addition, it has been observed that the use of special tools or programs for a successful KM process in organizational innovation is effective. At this point, knowledge-based organizational culture is also an important issue. Organizational factors and KM

applications positively affect and develop each other. This situation also increases organizational innovation performance. On the other hand, studies on knowledge management have become more and more application-based. Businesses focus on the techniques or strategies that will bring maximum value to the information sources they have and the problems encountered in the implementation of these strategies. At this point, businesses are concerned with identifying the most appropriate knowledge management tools for business processes and creating a knowledge management organizational culture that is specific to different regions, sectors and even business departments.

Finally, more research is needed on the likely role of knowledge management in technology and innovation and how to maximize the importance of knowledge management to provide a more influential and powerful innovation model and process. Studies in this field can be very precious, particularly in organizations that have different knowledge management and innovation strategies. Businesses have to implement innovative approaches taking into account the developing techniques and technologies in the world for effective knowledge management. At the same time, successful knowledge management must implement processes such as the acquisition, storage and updating of information and the knowledge management system must have a sound infrastructure. In addition, knowledge management activities should be considered as a lifestyle, which will bring success to businesses. Beyond all, it is need to provide that knowledge management processes are implemented correctly and those problems are identified and corrected by possible updates. Because, businesses in which knowledge management processes are implemented successfully will easily adapt to the changes occurring in their environment and will gain a considerable competitive advantage against their competitors in the global competitive environment where competition has reached a very serious level. Otherwise, it will be very difficult for enterprises to survive in the long term.

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KEY TERMS AND DEFINITIONS

Enterprises: A unit that produces goods or services in a planned and systematic way.

Innovation: New idea, creative thoughts, new imaginations.

Knowledge Management: It is the creation, storage, use, and sharing of knowledge.

Management: The process of using financial resources, tools, materials and time factor in a coherent and effective manner in order to achieve certain objectives.

Organization: People or system who work together in an organized way for a shared purpose.

System: The whole of the interactive parts that are brought together to achieve or achieve a common purpose.

Technology: Skills, methods and processes used in the production of goods or services.

Chapter 3

Enhancing Calculative Commitment and Customer Loyalty Through Online Relationship Marketing: The Mediating Role of Online Trust

Sheena Lovia Boateng

Business School, University of Ghana, Ghana

ABSTRACT

This study examines the mediating role of online trust in enhancing calculative commitment and customer loyalty through online relationship marketing activities (engagement and interactivity). The study draws on signaling theory. Data were gathered from 429 retail bank customers in Ghana and analyzed using confirmatory factor analysis and structural path modelling. Findings suggest that engagement is assessed to be low by Ghanaian bank customers and presently has no influence on customer commitment, online trust, and customer loyalty. However, signals communicated through interactivity online is of great benefit to the banks in influencing customers' online trust, as well as their calculative commitment and loyalty. Further, though, website and email emerged as the most predominant technologies used in online relationship marketing (ORM), customers also expect banks to engage with them through social media, which has the potential to improve upon the current levels of ORM activities.

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INTRODUCTION

Information Technology has been proffered in existing research to play a critical role when it comes to advancing the practice of Relationship Marketing (RM) within firms (Mishra & Li, 2008; Howcroft, Durkin, Armstrong & Emerson, 2007; Shapiro, Romano & Mittal, 2004). This phenomenon is evident in developed economies as well as developing economies (Boateng & Narteh, 2016; Verma, Sharma & Sheth, 2016; Guo, 2014). In a developing economy like Ghana for example, all the 33 commercial banks operating in the country have officially launched some form of presence on the internet, either through a website or at least one of the numerous social media platforms to engage with their customers. There is also evidence to attest that in the banking industry, the internet elevates customer experience in both business and retail banking and enables individual banks to differentiate themselves in their competitive space (Deloitte, 2014). In view of this, industry practitioners are constantly enquiring as to how best they can further leverage new and emerging information technologies to facilitate their relationship development efforts with customers.

RM is an organizational process that involves the creation and maintenance of long-term relations with a firm's existing customers and stakeholders and terminating some of these relationships where necessary in a manner that will be of benefit to all the parties involved (Harker, 1999; Grönroos, 1996). RM fosters partnerships, which ultimately lead to profitable exchanges (Kanagal, 2009); and helps firms, like banks, to acquire, retain and adequately satisfy their customers. Extant research has posited that there is relatively limited research on firms' RM activities online and how it influences other relationship marketing outcomes (Ghazi, Muhammed, Khalil, Fwwaz, & Raed, 2013; Huang & Shyu, 2009). For instance, some scholars have averred that there is a need to explore the complementarities between firms' online relationship building efforts and other relationship marketing outcomes, including the enhancement of customer loyalty (Brun, Rajaobelina & Ricard, 2014). As well, others such as Fam, Foscht and Collins (2004) have postulated the relevance of studying the incorporation of firms' relationship marketing activities online with other organizational practices and outcomes, to the advancement of existing knowledge on the role and potential of internet technology in relationship marketing. Authors such as Mukherjee and Nath (2007) and Kassim and Abdulla (2006), in response to the above issues, have made attempts at utilizing the Commitment-Trust Theory of Relationship Marketing (Morgan & Hunt, 1994) often with some minor modifications, to study the outcomes of firms' relationship marketing activities online. Their contributions, though valuable, tend to culminate in one result that the model can be further extended to measure the various aspects of firm-customer relationships online adequately.

More so, in broadening the appreciation of online relationship marketing practices, some authors have conceptualized and proposed certain activities - engagement and interactivity - which impact firm-customer relationships in the online context (Guo, 2014; Farquhar & Rowley, 2006). However, the relationships between these activities and customer commitment, trust and loyalty are yet to receive attention in Online Relationship Marketing (ORM) research. Also, the three dimensions of customer commitment - affective, calculative and normative - have often been overlooked in online customer relationship studies (see McCallum, Forret & Wolff, 2014). Though existing literature indicates that the ramifications of each of these three dimensions of commitment differ, they have often been lumped together and studied as one construct (see Jones, Fox, Taylor & Fabrigar, 2010). Hence, this study asserts that if online relationships are studied from the specific perspectives of customer commitment, it will arguably yield new insights. Calculative commitment is the focus for this current study since it considers the competitiveness of the firm's value proposition and is a significant predictor of customer churn rates (Gustafsson, Johnson & Roos, 2005).

On the other hand, there is relatively less representation of ORM research from developing economy contexts. Few studies have shared valuable insights that this study builds on (Mahmood, Kastner & Lartey, 2017; Boateng & Narteh, 2016; Lee, Lee, Taylor & Lee, 2011). For example, using the Ghanaian banking sector, Boateng and Narteh (2016) explored the relationships between ORM practices – engagement, interactivity, advocacy and personalization – and affective customer commitment, as well as the mediating role of trust. The study suggested that trust mediates the influence of engagement and personalization on affective commitment; while advocacy and collaboration have a direct relationship with affective commitment. The study calls for more studies exploring other dimensions of commitment and relationship outcomes, including customer loyalty. Then again, Mahmoud *et al.* (2017) explored the practice, challenges, and benefits of Internet-based relationship marketing (RM) within the Ghanaian telecommunication industry. The authors suggest that since ORM practices constantly evolve, more research is needed to compare these practices across industries.

Consequently, the purpose of this study tends to be in response to the above calls. The study seeks to explore the relationship between ORM practices or activities (engagement and interactivity), calculative commitment and customer loyalty; as mediated by online trust within the Ghanaian banking industry. The mediating role of trust in this instance is accentuated due to the key mediating role it is purported to play in successful relational exchanges, based on the Commitment-Trust Theory (Morgan & Hunt, 1994).

The paper is structured as follows. It consists of an introduction presented above, and a section on literature review and hypotheses culminating in a conceptual

framework; followed by the research design. Next, the empirical results are presented, which discusses the findings of the measurement model and the structural model. Finally, the results are discussed, in addition to some managerial implications and future research directions.

LITERATURE REVIEW AND HYPOTHESES

Online Relationship Marketing Activities

ORM refers to the use of multifaceted interactive web features and tools on the internet to support relationship marketing in firms (Gan, Sim, Tan & Tna, 2007; Harker, 1999). Firms perform several activities online, including engaging customers through online content creation, as well as interacting with them online in real time. Online RM activities refer to the relationship activities afforded by internet applications in an online platform. Several different activities have been proposed in extant literature. These activities can be broadly categorized as: engagement, interactivity, personalization and collaboration. Engagement refers to the building of connections between the customer and the organization's offerings and services (Guo, 2014). Interactivity refers to the establishment of dialogue between the customer and the organization, which involves the sharing of information (Gan *et al.*, 2007). Personalization refers to the tailoring of interactions or information to establish transactions which are unique to the customer (Guo, 2014; Farquhar & Rowley, 2006). Collaboration establishes environs where customers become knowledgeable partners in firm value creation processes, feel assured and build bonds with other customers and also with the firm (Guo, 2014; Cobos, Wang & Okumus, 2009). The ORM activities are often conceptualized as antecedents to relationship outcomes – such as customer loyalty and behavioral intention, and they are usually mediated by customer commitment and trust (Bart, Shankar, Sultan & Urban, 2005; Gan *et al.*, 2007; Guo, 2014). It is also argued that since RM activities are uniquely developed, their applicability may differ across online communities, service settings and different industries (Ioannou & Zolkiewski, 2009; Farquhar & Rowley, 2006). As such, more research is needed to better understand the conduct of these activities and the impact on relationship outcomes.

This study contributes to the literature by exploring the conduct of two ORM activities – engagement and interactivity - in the Ghanaian Banking industry. The rationale for the study setting is that the banking industry is arguably relationship oriented, information intensive and primarily affected by internet-oriented technological developments, making it opportune for a study, which will explore the applicability of ORM activities (Proença, Silva & Fernandes, 2010). A previous

study in the Ghanaian Banking industry examined ORM activities of engagement, interactivity, advocacy and personalization and affective customer commitment (Boateng & Narteh, 2016). However, the present study takes a closer look into the impact of two ORM activities on customer loyalty as mediated by online trust and calculative commitment. Worthy of note is that the need for a study exploring the mediating roles of online trust and calculative commitment has been echoed in previous literature (Boateng & Narteh, 2016; Nusair, Bilgihan, Okumus & Cobanoglu, 2013). To recap, to allow for a more thorough examination of ORM activities, mediators and outcomes, only two ORM activities – engagement and interactivity – are explored in this study.

Engagement can be explained as the level of intensity with which individuals participate and connect with a firm's activities online (Vivek, Beatty & Morgan, 2012). Engagement online typically takes place on social media and is demonstrated through specific customer behaviors including 'liking', sharing and commenting on content posted on the firm's social media pages (Kabadayi & Price, 2014). Interactivity, on the other hand, captures the degree to which dialogue is established between firms and their customers online, through the sharing of information (Fang, 2012). Mollen and Wilson (2010) aver that reciprocal or two-way communication plays a pivotal role in the process of interactivity. Interactivity has been found to play a critical role in eliciting positive behavioral intentions among customers online (Jeon, Jang & Barrett, 2016).

The Signaling Effect of ORM Activities

The Signaling Theory (Connelly, Certo, Ireland & Reutzel, 2011) is utilized in this study to explain the signaling role of ORM activities (engagement and interactivity) in influencing firms' customer relationship marketing outcomes. Signaling theory comprises three primary elements, in addition to two other factors, which are presented by Connelly *et al.* (2011) in the form of a timeline. The timeline depicts two main actors - the signaler and the receiver, the signal itself, as well as feedback from the receiver which is sent back to the signaler; all of which co-exist in a signaling environment. A signal refers to an action or artefact that communicates information about the characteristics of an organization, product or person to the customer, which enables them to assess their reliability and legitimacy (Mavlanova, Benbunan-Fich & Koufaris, 2012). It comprises positive information that is purposefully communicated in order to portray the signaler's positive attributes and mask any potential weaknesses (Connelly *et al.*, 2011; Certo, 2003). Well received signals can influence the perceptions of trust, as well as the purchase intentions of the target audience (Mavlanova, Benbunan-Fich & Lang, 2016). A signaler, as explained in terms of consumer research, generally connotes an insider (often the

organization's management) who owns information about the underlying 'quality' of a person, product or firm, which they wish to communicate to their customers (Ho & Wei, 2016; Connelly *et al.*, 2011). The receiver is the primary target of the signaler's output and is continually scanning the environment for signals from firms with which to make accurate purchase decisions (Connelly *et al.*, 2011). For the objectives of the signaler to be achieved, the signals sent need to be received and correctly understood by the receiver for it to have an effect (Mavlanova *et al.*, 2016). Per Connelly *et al.* (2011), signalers and receivers often have somewhat competing interests. Hence, the need for what authors like Durcikova and Gray (2009) refer to as signal honesty, where the underlying quality portrayed through the signal is one that is genuinely possessed by the signaler, so that the receiver is not misled.

Feedback involves the sending of counter signals from the receiver to the sender. It is not enough that the signaler successfully sends a signal to the receiver; the signaler also expects to receive some information back from the receiver to ascertain whether their signals have been interpreted as they intended (Taj, 2016). Hence, the inclusion of the feedback component in the signaling theory. The signaling environment refers to the context within which the signaling process takes place, fostering interaction between the various elements in the process. It is pertinent that the signaling environment is free of any form of 'noise' that could hinder the signaling process (Taj, 2016). Potential sources of 'noise' may include opposing signals from the signaler and competitors, as well as certain characteristics of the receiver. Any of these can bring about distortions in the signaling environment, which can affect how the signal is transmitted, as well as the receiver's interpretation of signals received; all of which is of key importance to the success of the entire signaling process.

Some researchers have used the Signaling Theory to understand information technology (IT) enabled signals sent by firms (the signalers), and the impact that these IT signals have on customer perceptions, as well as their attitudes and behaviors (Mavlanova *et al.*, 2016; Benlian & Hess, 2011). The theory, therefore, provides a framework that depicts how customers rely on informational cues or signals in the form of actions or artefacts that reliably communicate unobservable product or firm quality, when forming judgments on how best their needs may be satisfied (Kirmani & Rao, 2000; Boulding & Kirmani, 1993). It allows for the exploration of ORM activities as informational cues utilized by firms to influence customer perceptions and behavior. In applying the theory, Benlian and Hess (2011) noted that further research was required to investigate which specific online features and activities that are used as signals, have a positive impact on customer perceptions and behavior. Additionally, Mavlanova *et al.* (2016) call for research on online signals to be studied in varied contexts, using diverse online applications; noting that it

will not only help to extend signaling theory research, but also generate interesting insights to inform online business strategy.

In this study, the signaling theory is combined with the Commitment-Trust Theory to examine the complementarities between firms' ORM activities (Engagement and Interactivity) and other relationship marketing outcomes; including Online trust, Calculative commitment and Customer loyalty. The Commitment-Trust Theory by Morgan and Hunt (1994) tends to be the dominant theory in ORM research. The theory espouses that relationship benefits, termination costs, shared values, communication and opportunistic behavior are the five precursors of relationship commitment and trust, which lead to five relationship outcomes: acquiescence, propensity to leave, cooperation, functional conflict and decision-making uncertainty — thereby placing relationship commitment and trust as key mediating variables.

The ensuing sub-sections present the hypotheses and conceptual model of the study.

Hypotheses Development

Online Trust, Engagement and Interactivity

Online trust is a component that contributes significantly to the overall success of firms' marketing activities in the online context (Bleier & Eisenbeiss, 2015). Literature argues that online trust is established mainly through customers' self-perceptions, based on their direct experiences and interactions with the firm online (Bock, Lee, Kuan & Kim, 2012; Kim, Ferrin & Rao, 2008). For instance, Etemad-Sajadi (2016) posits that online interactivity in real-time has a significant positive influence on online trust and customers' intentions to patronize a given brand. Furthermore, Brodie, Ilic, Juric and Hollebeek (2013) found that the customer engagement process often leads to customer commitment and trust. Therefore, it is hypothesized that:

H₁: Engagement directly influences Online trust

H₂: Interactivity directly influences Online trust

Online Trust and Calculative Commitment

Calculative commitment embodies the customers' expectations of immediate or future rewards, as well as the cost contingencies resulting from staying with their current service provider, as compared with available alternatives (Sumaedi, Juniarti, & Bakti, 2015). Thus, in this instance, rationale dominates over emotion when it comes to customers' assessment of their relationship with the firm. Trust has been identified in relationship marketing literature to have a significant impact on customer commitment (Tsao & Hsieh, 2012). Kassim and Abdullah (2010), for instance, assert

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that trust is a critical driver of commitment among customers who are in long-term relationships with their service providers online. Thus, it is hypothesized that:

H₃: Online trust directly influences Calculative commitment

Online Trust and Customer Loyalty

Customer loyalty can be defined as the general attachment of a buyer to a product or service (Wang & Wu, 2012). It is demonstrated through a variety of actions and comprises both attitudinal and behavioral elements. These are usually exhibited through the customer's intention to re-purchase or re-patronize a brand's products and services, as well as their desire to maintain a lasting relationship with the service provider and recommend their brand to others (Picón-Berjoyo, Ruiz-Moreno & Castro, 2016; Srivastava & Kaul, 2016). Although online trust is averred to have a positive effect on customer loyalty, the way trust may be gained online, and the potential effect it may have on firms' outcomes is yet to be fully understood (Fullerton, 2014; Urban, Amyx & Lorenzo, 2009). Hence, this study hypothesizes that:

H₄: Online trust directly influences Customer loyalty

Calculative Commitment and Customer Loyalty

Cater and Zabkar (2009) assert that customer loyalty is a consequence of all the three dimensions of commitment; namely Affective, Normative, and Calculative commitment. However, Bilgihan and Bujisic (2015) found calculative commitment to have a distinct influence on customer loyalty. Thus, the following hypothesis:

H₅: Calculative commitment directly influences Customer loyalty

Mediating Role of Online Trust

Over the years, scholars such as Jeon *et al.* (2016) and Wang, Law, Guillet, Hung and Fong, (2015) have proffered the mediating role of online trust in firm-customer interactions within the online context. Wang *et al.* (2015), for example, as part of their research, statistically established the mediating role of online trust between hotel website quality and customers' intentions to place a booking online. This finding is corroborated by Hsu, Liu and Lee (2010), who determined that the influence of a firm's overall image on customer behavioral intention, must be mediated through customer commitment and trust. However, the mediating effects of trust in relation

to online relationship strategy has not been completely examined. As such, it is hypothesized that:

H_{6a}: Online trust mediates the relationship between Engagement and Calculative commitment

H_{6b}: Online trust mediates the relationship between Engagement and Customer loyalty

H_{7a}: Online trust mediates the relationship between Interactivity and Calculative commitment

H_{7b}: Online trust mediates the relationship between Interactivity and Customer loyalty

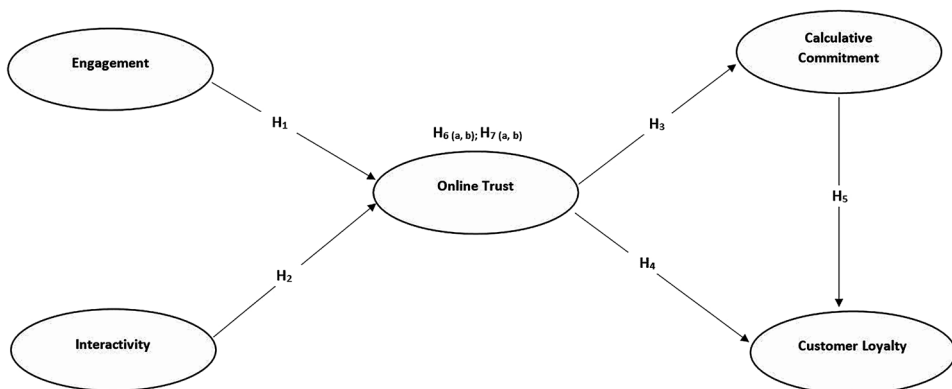
Based on the discussion conducted in the literature review and the hypotheses postulated in the prior sections, Figure 1 presents the conceptual model for the study.

RESEARCH DESIGN

Data Collection and the Sample

A quantitative research design was adopted, using the survey technique for data collection in order to examine the conceptual framework shown in Figure 1. The context of the study was set in the highly competitive Ghanaian banking industry (Boateng & Narteh, 2016), which has witnessed a surge in the adoption of web-based technologies such as emails and social media, with the sole intent of elevating the overall customer experience and maintaining their competitive edge (Acquaah & Yasai-Ardekani, 2008). The Ghanaian Banking industry is currently relatively saturated, with a combination of local and foreign multinational banks operating

Figure 1. Conceptual model



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Table 1. Sample profile

	<i>N</i>	Percentage (%)
Gender		
Male	272	63.4
Female	157	36.6
Age (Years)		
18-20	2	0.5
21-30	121	28.2
31-40	182	42.4
41-50	97	22.6
Above 50	27	6.3
Educational Level		
Primary	5	1.2
Secondary	137	31.9
Tertiary-Undergraduate	103	24.0
Tertiary-Postgraduate	38	8.9
Diploma/ HND	146	34.0
Online Channels Used		
Email	429	100
Website	339	79
Social Media (Facebook/ Twitter)	165	38.5

within the industry (Acheampong, 2013). The total number of banks operating in the industry as at 31st December 2016 was 33; 16 locally owned and 17 foreign controlled. 449 of the 500 questionnaires issued to bank customers who have previously interacted with their bank online, either via email, their website or through social media were returned. These responses were coded and entered into SPSS 20, following which the data was verified and screened for any form of error, missing data or outliers (Kline, 2011). The screening process revealed that several of the responses had more than 5% missing data. Therefore, it was decided to delete the responses that had missing values in various sections; resulting in the deletion of a total of 20 cases. Thus, excluding missing and unusable data, the resulting sample included a total of 429 respondents.

Instrument

A self-administered survey questionnaire was used in collecting data from the identified sample. The questionnaire captured demographic information, as well as items relating to the antecedents, mediator and outcome variables presented in the conceptual framework. The measurement items were adapted from existing literature on Online Relationship Marketing (ORM) and Relationship Marketing (RM) and measured in the form of a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Engagement was measured using a ten-item scale adapted from the works of Guo (2014) and Cobos, Wang and Okumus (2009). Interactivity was measured using eight items adapted from the works of Cobos *et al.* (2009) and Farquhar and Rowley (2006). Online trust was assessed using nine items developed based on the work of Bilgihan and Bujisic (2015) and Brun *et al.* (2014). Calculative commitment was measured by seven items in this study, based on Brun *et al.* (2014) and Dabholkar, van Dolen and de Ruyter (2009). While Customer loyalty was measured using nine items adapted from Labrecque (2014) and Huang and Shyu (2009).

EMPIRICAL RESULTS

Structural Equation Modelling (SEM) was utilized in analyzing the data collected, as well as testing the hypothesized relationships (Kumar, Manrai & Manrai, 2017; Byrne, 2010). The two-stage approach to SEM recommended by Anderson and Gerbing (1988) was performed, using the maximum likelihood extraction method in order to estimate a measurement model and a structural model in Amos 22.

Measurement Model

The measurement model was assessed by conducting a Confirmatory Factor Analysis (CFA) utilizing all the individual constructs in the model. The psychometric properties of the model constructs, along with the factor loadings of items measuring each construct are presented in Table 2. Each variable was tested for reliability, convergent and discriminant validity; and as can be observed from Table 2 all the factor loadings are well above the cut-off point of 0.5 (Ladhari, Souiden & Dufour, 2017). Also, the Composite Reliability (CR) and Average Variance Extracted (AVE) values are above the required minimum values of 0.6 and 0.5, respectively (Bagozzi & Yi, 2012). As such, the reliability and convergent validity of the constructs are confirmed. To provide support for discriminant validity, the square root of the AVE of each construct should be greater than the correlation between the construct and other constructs in the model (Kumar *et al.*, 2017; Fornell & Larcker, 1981).

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Table 2. Constructs' psychometric properties

Construct	Factor Loading	t-Value	CR	AVE	α
Engagement			0.93	0.76	0.92
-I write comments and messages on my bank's Facebook page	0.85***	-			
-I 'like' content posted on my bank's Facebook page	0.93***	26.56			
-My bank's website has hotlinks to their Twitter/ Facebook pages	0.87***	23.48			
-Other customers provide helpful information on my bank's Facebook page	0.82***	21.53			
Interactivity			0.96	0.79	0.96
-My bank has site navigation tools on their website	0.89***	-			
-My bank's website has a search tool that enables me to locate items	0.93***	30.89			
-I get the desired answers to my online enquiries	0.90***	28.41			
-24-hour live chat/ help is available on my bank's website	0.85***	25.27			
-My bank's online platforms provide mechanisms that help me to evaluate and select appropriate products and services	0.90***	28.69			
-My bank offers exclusive webpages and information for customers on their website	0.87***	26.19			
Calculative Commitment			0.87	0.62	0.86
-The management of my personal finances would be disrupted if I decided to stop patronizing my bank's services	0.74***	-			
-I am afraid something will be lost if I stop using my bank	0.83***	16.47			
-Some aspects of my life will be affected if I cease patronizing my bank	0.80***	15.82			
-There are no banking services comparable to those offered by my bank	0.79***	15.72			
Online Trust			0.83	0.56	0.83
-I can count on my bank to ensure that transactions carried out on its website are without error	0.79***	-			
-My bank makes every effort to address and solve customer concerns and problems online	0.74***	15.85			
-I think that my bank would not do anything intentional on their website that would be unfair to customers	0.83***	17.99			
-I feel like my privacy is protected while transacting with my bank online.	0.59***	12.24			
Customer Loyalty			0.86	0.56	0.85
-I would be willing to pay a higher price for my bank's services over other banks	0.66***	-			
-I prefer my bank to its competitors	0.73***	13.05			
-My bank is the best bank for me	0.75***	13.36			
-I would be willing to defend my bank in the face of any controversy	0.81***	14.07			
-I would consider my bank as my first choice for patronizing banking services	0.77***	13.53			

***p < 0.001

Table 3 presents the correlation, mean and standard deviation of each construct, as well as the square root of their AVEs. It can be observed from the table that the square root of the AVE of the constructs, in all instances is greater than the correlation between the constructs, thereby, indicating discriminant validity. Furthermore, the resulting model produced good fit indices: Chi square (χ^2)/ Degrees of freedom (df) = 2, Tucker-Lewis Index (TLI) = 0.96, Comparative Fit Index (CFI) = 0.97, Incremental Fit Index (IFI) = 0.97, Root Mean Square Error of Approximation (RMSEA) = 0.05 (Schreiber, 2008).

Structural Model

After establishing that the measurement model depicted adequate levels of reliability and validity, the structural model was assessed in order to test the hypothesized relationships. This was done by examining the p values of the paths, as well as their standardized regression weights. Based on the above, the structural model showing hypotheses H_1 to H_5 was tested; the outcome of which is summarized in Table 4 and graphically presented in Figure 2. The test of the general fit of the model yielded Chi square (χ^2)/ Degrees of freedom (df) = 2.2, with a p value less than 0.001. The value of the Tucker-Lewis Index (TLI) was 0.96, the Comparative Fit Index (CFI) was 0.97, the Incremental Fit Index (IFI) was 0.97, and the Root Mean Square Error of Approximation (RMSEA) was 0.05; all of which fall within the acceptable cut-off limits (Schreiber, 2008).

As shown in Table 4, Interactivity was positively and significantly related to Online trust ($\beta = 0.69$, $p < 0.001$) and Online trust was found to be positively and

Table 3. Correlations, mean, standard deviation and square root of AVE

	Engagement	Interactivity	Calculative Commitment	Online Trust	Customer Loyalty
Engagement	0.87				
Interactivity	0.70***	0.89			
Calculative Commitment	0.20***	0.22***	0.79		
Online Trust	0.54***	0.74***	0.34***	0.75	
Customer Loyalty	0.29***	0.29***	0.73***	0.55***	0.75
Mean	2.6	3.5	3.6	4.1	4.0
Standard Deviation	1.2	1.2	0.9	0.7	0.7

***p < 0.001

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Table 4. Summary of hypotheses test

Relationship	β	t Value	p Value	Hypothesis	Remark
Engagement → Online Trust	0.06	0.93	0.36	H ₁	Not supported
Interactivity → Online Trust	0.69	10.50	***	H ₂	Supported
Online Trust → Calculative Commitment	0.33	5.93	***	H ₃	Supported
Online Trust → Customer Loyalty	0.32	6.67	***	H ₄	Supported
Calculative Commitment → Customer Loyalty	0.62	10.01	***	H ₅	Supported

***p < 0.001

significantly related to Calculative commitment ($\beta = 0.33$, $p < 0.001$), as well as Customer loyalty ($\beta = 0.32$, $p < 0.001$). Calculative commitment was also positively related to Customer loyalty ($\beta = 0.62$, $p < 0.001$). Nonetheless, Engagement was not significantly related to Online trust. Thus, hypotheses H₂ to H₅ were supported. But, hypothesis H₁ which examined the relationship between Engagement and Online trust was rejected.

Mediating Role of Online Trust

Table 5 depicts the mediating role of Online trust between the ORM activities (engagement and interactivity), calculative commitment and customer loyalty.

Figure 2. Structural model results

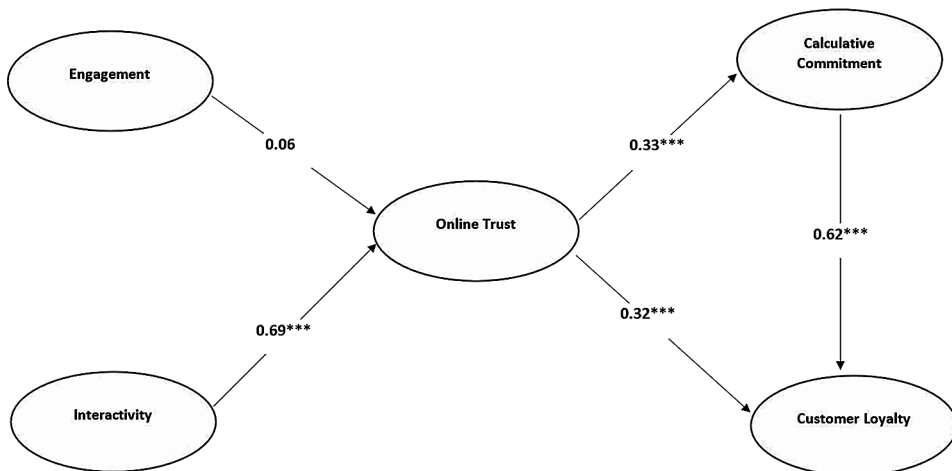


Table 5. Mediating role of online trust

Relationship	Hypothesis	Direct Without Mediator (p Value)	Direct With Mediator (p Value)	Indirect Effect	Mediation Type
Engagement → Online Trust → Calculative Commitment	H_{6a}	0.10 (0.20)	0.10 (0.18)	0.47	No mediation
Engagement → Online Trust → Customer loyalty	H_{6b}	0.18 (0.02)	0.16 (0.03)	0.53	No mediation
Interactivity → Online Trust → Calculative Commitment	H_{7a}	0.15 (0.05)	-0.44 (***)	***	Partial mediation
Interactivity → Online Trust → Customer loyalty	H_{7b}	0.17 (0.02)	-0.61 (***)	***	Partial mediation

***p < 0.001

This was tested using the bootstrap technique in Amos, as advocated by Preacher and Hayes (2008). As observed from the table, the outcome of the structural model shows that the direct relationships between interactivity and calculative commitment, as well as interactivity and customer loyalty, are both significant without online trust as a mediator. However, the indirect effect of interactivity on calculative commitment and customer loyalty, respectively, through online trust as a mediator are both significant. This provides enough evidence for the partial mediation of online trust in the relationship between interactivity and calculative commitment, as well as that between interactivity and customer loyalty. Thereby, substantiating only hypotheses **H_{7a}** and **H_{7b}**.

DISCUSSION OF FINDINGS

The findings highlight the impact of ORM activities (engagement, interactivity) on calculative commitment and customer loyalty; as well as the mediating role of online trust in these relationships between firms and their customers within the Ghanaian banking industry. However, the findings failed to establish a relationship between engagement and online trust (**H₁**) indicating that engagement does not exert any significant influence on bank customers’ online trust. This finding came as no surprise since previous research by Hsu, Chiang and Huang (2012), as well as Wu and Chang (2005) suggests that it is only when trust exists in an online community that the customer can meaningfully engage. Thus, these findings suggest that bank customers appear to be less engaged online (see Table 1).

Though Ghanaian banks, the signalers, are providing information online, the signals are either not reaching the customers, the receivers, through the appropriate medium, or not being correctly understood by the receivers to have an effect or draw out a response. According to the tenets of signaling theory, for the objectives of the signaler to be achieved, the signals sent need to be received and correctly understood by the receiver in order for it to have an effect (Mavlanova *et al.*, 2016). Extant literature also argues that among other online platforms, customer engagement primarily takes place on social media (Wirtz *et al.*, 2013). Nevertheless, from Table 1, one finds that social media is the least used medium for communication with customers. Far less than 50 per cent of the customers (38.5%) surveyed communicate with banks or obtain information through social media, while that of website and email were 79% and 100%, respectively. In effect, social media is less used by Ghanaian banks.

Much of the efforts for ORM activities of Ghanaian banks is through the websites of banks and emails. It could be inferred that the lack of an engagement focus exhibited by the Ghanaian banks could be associated with the risks, security and privacy issues related to the use of online technologies for communication. For websites and emails, the signals in the form of data privacy assurances and secure transaction mechanisms like Secure Socket Layer (SSL) encryption, as well as usability functions like Help tabs and Frequently Asked Questions are used by Ghanaian banks to reinforce customer perceptions of quality. Thus, signals for security for websites and emails are fairly certain (Mavlanova, Benbunan-Fich & Koufaris, 2012; Li, Srinivasan & Sun, 2009); but that of social media is still emerging (Cheng, Fu, & de Vreede, 2017).

Hence, in contexts where cybercrime is quite prevalent (see Boateng, Longe, Isabalija, & Budu, 2011) and internet banking is growing out of its nascent stages (Boateng & Narteh, 2016), Ghanaian banks are likely to be more cautious in their online activities, especially with technologies that they are quite uncertain about. In the tenets of signaling theory, Ghanaian banks are more likely to prefer 'environments' which are assessed or perceived to be free of any form of 'noise' that could hinder their signaling process (Taj, 2016). In précis, engagement as an ORM activity is assessed to be low by Ghanaian bank customers and presently does not influence customer commitment, online trust and customer loyalty. However, per the responses captured through open-ended questions in this study, customers expect banks to leverage social media to engage more with them.

Nonetheless, hypotheses H_2 to H_5 were proven; indicating that interactivity has a significant positive impact on online trust. It also indicates that online trust positively influences calculative commitment and customer loyalty; while calculative commitment has a direct influence on customer loyalty. Interactivity enables banks to mitigate the negative effects of the lack of physical interaction online by providing semblances of a human presence in customer dealings with them online. These

semblances communicate an air of reliability and dependability to the customer, as proffered by the Signaling theory. Thereby, corroborating the findings of Beuckels and Hudders (2016) on the positive effects of interactivity on customer attitudes.

Regarding the relationship between Online trust and calculative commitment, literature identifies both trust and commitment as essential components in any long-term relationship (Lin, Weng & Hsieh, 2003; Morgan & Hunt, 1994). Online trust is considered to be of prime importance when transacting over the internet due to issues of security and privacy in the online environment. Once bank customers are convinced of the efficiency and reliability of the bank's online channels, they are sure to remain loyal into the foreseeable future. Banks, therefore, need to enhance their trust-inducing measures online, to endear their customers to remain loyal, as opined by Ladhari and Leclerc (2013).

Even so, it is acceptable to find some customer segments committed to their service provider for calculative reasons such as high switching costs and unique product and service benefits (Rajaobelina, Brun & Toufaily, 2013). Thus, a customer will most likely remain loyal to their bank if they are locked-in by some form of contract or lack of viable alternatives. In this instance, their loyalty to their bank is not because they are emotionally attached to them, but for purely rational and economic reasons (Lariviere *et al.*, 2014; Sashi, 2012). This assertion is supported by the outcome of the current study, which unearthed a significant positive relationship between customers' awareness of the costs associated with leaving their bank (calculative commitment) and their loyalty to them.

In addition, the findings provide evidence for online trust's partial mediation of the effect of interactivity on calculative commitment, and that of interactivity on customer loyalty (H_{6a} to H_{7b}). This implies that an increase in online trust will likely influence a customer's decision of whether or not to switch banks based on their interactivity. Likewise, an increase in online trust will, to some extent, impact bank customers' decisions to remain loyal to their bank based on how interactive their bank is with them online. These outcomes confirm the findings of previous studies (Chen, Griffith & Shen, 2005; Bart *et al.*, 2005) which provide similar results for testing such relationships. For instance, Bart *et al.* (2005) found that online trust partially mediates the relationships between website characteristics and customer behavioral intent.

Therefore, customers' perceptions of how well a bank's online channels can perform their required functions, can contribute significantly to their need to stay committed to their bank, as well as their intentions to remain loyal. Hence, one concludes that ORM activities pay; as such, instituting measures to increase interactivity would generally increase online trust, calculative commitment, as well as customer loyalty.

CONCLUSION

The study advances our understanding of the online signals sent through banks' ORM activities, namely engagement and interactivity and how they affect customer loyalty, as well as customers' perceptions of online trust and calculative commitment. The findings suggest that signals communicated through ORM activities, particularly interactivity per the Signaling theory, is indeed beneficial in influencing customers' online trust, calculative commitment and loyalty. The results substantiate the mediating role of online trust in Ghanaian banks' ORM activities, where online trust was found to mediate the impact of interactivity on calculative commitment, as well as the impact of interactivity on customer loyalty. This confirms one of the main assumptions of the Commitment-Trust Theory (Morgan & Hunt, 1994). Hence, together, the Signaling theory and the Commitment-Trust theory enable us to understand the complementarities between banks' online relationship building efforts and other relationship marketing outcomes.

Banking service delivery online has become a major topic of discussion among scholars in recent years; especially in Sub-Saharan Africa (Blankson, Ketron & Darmoe, 2017; Tarus, 2015; Narteh & Owusu-Frimpong, 2011). The introduction of online technology into banking in Ghana has precipitated several advances in the industry; leading to the introduction of various innovative banking products and customer solutions. The outcome of this study corroborates this by highlighting the role of online technology in relationship marketing, which enhances customer engagement, builds trust and fosters customer loyalty. This study enables banks in Ghana, and perhaps, other sub-Saharan African countries to recognize the nature of their online interactions with customers, as well as gain an understanding of the appropriate policies and measures necessary to effectively harness these technologies in their interactions with customers. Further, though website and email emerged as the most predominantly used internet applications in ORM in the banking industry, customers also expect banks to engage with them through social media. Social media has the potential to improve upon the current levels of bank-customer interactivity online. Banks should, therefore, develop strategies to leverage social media appropriately in order to engage and interact better with their customers.

Finally, most of the studies on ORM are done from the perspective of the customer; future research may consider, through a qualitative approach, exploring the decisions and strategies which underpin ORM activities of firms. Such a study may explore the roles of relationship managers (who may be offline) and employees who manage content on internet applications. Since this study used cross-sectional data, a longitudinal study on how relationships are developed online over time may offer an understanding of the influences of time sequence upon the relationships discussed in this study. Future research could also be directed at other sectors to

explore the applicability of the underpinning theories further, as well as to fine-tune the conceptual model used.

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Chapter 4

The Affective Domain of E-Commerce

Vildan Ateş

Ankara Yıldırım Beyazıt University, Turkey

ABSTRACT

The purpose of this chapter is to examine customer perceptions in the affective domain that directly or indirectly influence the shopping process and purchasing decision between the online customer and online shopping sites. This chapter investigates the effects of nine different perceptions as perceived benefit, perceived control, perceived customer services, perceived customization, perceived risk, perceived security, perceived self-efficiency, perceived privacy, and perceived value on the trust, satisfaction, and loyalty of online customers. Revealing the effects of these relationships on online customer trust, satisfaction and loyalty is important for online shopping sites to maintain their existence in the long-run, be able to compete with others, and increase their profitability.

INTRODUCTION

Trade is an initiative that has existed among people since the ancient times. With the prevalent usage and centralization of the internet in our lives at the end of the twentieth century, it emerged as a new format that is known as “Electronic Commerce”. In the digitalizing world, electronic commerce can also be defined as the digitalized state of commerce. Costs of accessing customers have decreased because the internet provides opportunities for the consumer to be able to access information about products or services. The price difference that was caused by reduced costs has led customers towards online shopping and increased the trade

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volume (Bourlakis, Papagiannidis, & Fox, 2008). Electronic commerce (e-commerce) was accepted by a wide proportion of the public and started to spread (Erbaşlar & Dokur, 2008; Xiong, Hou, Dong, & Nyberg, 2012). Sales made to consumers from e-commerce businesses worldwide have reached 3.3 trillions of dollars (Orendorff, 2017). This situation has brought along changes in shopping behaviors and habits for both vendors and customers in a digitalized world.. This development revealed a different structure to those in markets where producers and consumers are found together, and e-commerce establishments started to interact with online customers all over the world.

The prevalence of e-commerce turned all people in the world into potential customers for vendors (Butler & Peppard, 1998; Civan & Bal, 2002). Now, consumers have become e-customers and been turned towards online shopping sites to meet most of their needs for goods and products. In this new form of shopping and trade, it was observed that the purchasing behaviors, shopping habits and general behaviors of consumers are influenced by various factors. This is why a need arose for reevaluation of the effects of some affective factors such as perception, motivation, learning, attitude and beliefs on this process. Additionally, the relationships between e-commerce businesses and online customers resulted in changes in and redefining of selling and purchasing behaviors. Customer satisfaction, trust and loyalty, which are among the main elements between the seller and buyer in trade, have become affected more by some affective characteristics of customers. The purchasing decisions of customers during the process of shopping from online shopping sites are affected more by affective factors (Akbar & James, 2014), and this influences customer satisfaction, trust and loyalty.

Considering the perspective of online shopping sites, having an organization in terms of e-commerce and increasing the satisfaction, trust and attachment of customers who prefer online shopping have become a key factor in terms of the purchasing behaviors of customers, profit margin and long-term growth goals. This is why it has become important to investigate the relationships between customer perceptions and customer satisfaction, trust and loyalty, as well as their effects on the purchasing decisions of customers (Srinivasan, Anderson, & Ponnayolu, 2002; Park & Kim, 2003; Flavián, Guinaliu, & Gurrea, 2006; Cyr, Hassanein; Head, & Ivanov, 2007; Kim, Ferrin, & Raghav, 2008).

In the following parts of this chapter, firstly the findings of studies which investigated customer perceptions, satisfaction, trust and loyalty and the relevant literature are presented. Secondly, online customer trust, satisfaction and loyalty are discussed in terms of e-commerce. The third part presents the customer perceptions that affect the trust, satisfaction and loyalty levels of online customers the most, and the relationships of the determined perceptions with customer satisfaction, trust and loyalty are separately presented.

BACKGROUND

The relationships between online customer perceptions and customer satisfaction, trust and loyalty and the effects of these on customers' purchasing decisions have been prevalently researched in recent years (Bilgihan, 2016; Ozkara, Ozmen, & Kim, 2017; Kim, & Peterson, 2017; Pee, Jiang, & Klein, 2018). This section discusses the results of previous studies on relationships among online customer perceptions, customer satisfaction, trust and loyalty and the effects of these on the purchasing decisions of consumers. While presenting the aforementioned literature, firstly studies that demonstrated the relationships among customer loyalty, customer satisfaction and customer trust are included. Then, the section presents the findings of studies that investigated the effects of customer perceptions separately on customer satisfaction, customer loyalty and customer trust. Finally, findings on the comprehensive relationships between online customer perceptions and customer loyalty, satisfaction and trust are provided.

Considering the findings of studies which investigated the relationships among online customer loyalty, satisfaction and trust, it is seen that customer satisfaction and trust affect loyalty directly or through mediating variables. Akbar and James (2014) asserted that customers' online purchasing behaviors, what they understand from the concept of a product and what they have learned through their lives are associated with their attitudes and beliefs. They concluded that perceptions, satisfaction and trust directly affect purchasing. Other studies also emphasized that customers' decisions on shopping or not shopping online are affected by perceptions, motivations, learning, attitudes and beliefs (Corbitt, Thanasankita, & Yi 2003; Kim, Ferrin, & Raghay, 2008). Customer satisfaction, trust and loyalty may be increased by accurately determining and suitably managing their expectations and perceptions (Chiu, Hsu, & Chan, 2012). As stated by Reichheld and Scheffer (2000), for the management of online shopping sites, it is critically important to know which factors affect the customers and which factors make them loyal customers. Gaining loyal customers for online shopping sites is dependent on several factors, and studies have reported that customer satisfaction, trust and perceptions have a determining role in this issue (Srinivasan et al., 2002; Park & Kim, 2003; Cyr et al., 2007; Kim et al., 2008).

A study which investigated the factors that affect online customer satisfaction reported that electronic service quality, perceived values, customer trust and customer satisfaction are the most significant and effective factors on customer loyalty (Suhartanto, Triyuni, & Leo, 2018). Another study investigated the effects of perceived website usefulness (PU) and customer satisfaction on customer loyalty. While PU affected customer loyalty more after the first purchase, as the number of purchases the customer made increased, there were more effective and determining factors on customer loyalty (Pee et al., 2018). Jaiswal, Niraj and Venugopal (2010)

emphasized that at least one purchase should take place for online customer loyalty to be measured. They stated that, if one customer purchases again from the same vendor, they will be a potential loyal customer, and this situation may be directly associated with customer satisfaction and loyalty.

Kim and Peterson (2017) conducted a meta-analysis study and found that online trust was affected by perceived privacy and perceived service quality, while trust affected loyalty and repeated purchase intentions. Song and Lai (2017) determined that customer satisfaction in online shopping had a positive relationship with perceived value that changes based on the online shopping experience. On another study, the researchers studied the factors that affect the trust of customers who shop online for clothes. Accordingly, the showed that customer satisfaction was indirectly effective in shaping online loyalty through the mediating variables of trust and perceived value (Molinillo, Gomez-Ortiz, Pe'rez Aranda & Navarra-Garcia, 2017). Another study that investigated customer loyalty found that customer loyalty was affected by customer satisfaction and trust. It was also reported that customer satisfaction and trust were affected by service quality, which consisted of the sub-components of web design, responsiveness, customization and assurance.

The findings of studies which examined the relationships between customer loyalty and online customer perceptions revealed significant relationships between these and provided important information for organizations who are involved in online commerce. Oypan (2017) emphasized that customers want to feel special while shopping online, and they prefer firms that offer such services more. They also stated that individuals may use their time more efficiently and complete their operations faster with personalized websites. Sherbill (2014) also reported that the sales of online shopping sites that made customizations increased. Öztürk, Coşkun and Dirsehan (2012) emphasized that customization was one of the most important factors in distinguishing those with low e-loyalty and those with high e-loyalty.

Bilgihan (2016) investigated the relationship between the online loyalty of generation Y in online shopping and factors of user experience and brand loyalty. As a result of the study, they found that all three variables affected online loyalty, but the most effective one was trust. Another study which examined online shopping site customer loyalty compared online shoppers in Taiwan and Thailand (Chen, Yen, Pornpriphet, & Widjaja, 2015). They reported that information, system and service quality, including customization, affected customer satisfaction, trust and loyalty. In addition to this, they stated that customer trust and satisfaction also affected customer loyalty. There were significant differences in the perspectives of online customers from two difference cultures on information and system quality. Srinivasan et al. (2002) also emphasized that customization is one of the important perceptions that affect customer loyalty.

Pan, Sheng and Xie (2012) investigated the precursors of online customer satisfaction. As a result, they revealed a conceptual framework that showed that online customer satisfaction was affected by variables in two main groups as customer-related and product-related factors. Customer-related factors consisted of customer satisfaction, trust, psychological commitment, loyalty program membership, while product-related factors were perceived value, product quality, perceived fairness, switching cost and brand reputation. They reported that these two groups of factors shaped customer loyalty.

The findings of studies which investigated the relationships between customer satisfaction and online customer perceptions revealed a direct connection. Rowley (2006) argued that online shopping sites should adopt strategies that increase online shopping self-efficacy levels in management of customer satisfaction for their sites. Shih (2004) reported that customers with high self-efficacy levels displayed a more positive attitude towards online shopping, while Sanchez-Franco and Roldan (2005) also stated that e-service quality and self-efficacy would affect satisfaction and trust positively. Thongpapanl and As (2011) reported that information and customization options offered to the customer on online shopping sites positively increased customer satisfaction and shopping intentions. Additionally, it was stated that information provided to the customer is important, but it is not sufficient by itself to motivate the customer for shopping and satisfy them. Consequently, they asserted that customer satisfaction and shopping intentions that develop in a positive way will increase the sales performance of the business.

The findings of studies which investigated the relationships between customer trust and online customer perceptions revealed a direct connection between these except for risk perception. Kim et al. (2008) proposed a decision-making model based on customer trust. As a result of their study, they determined that customer trust was affected by information quality, perceived security and perceived privacy. Moreover, they revealed that risk perception, customer trust and perception of benefit affected the customer's intention for shopping. While risk perception affected customer trust and intention for shopping negatively, the other factors affected these positively. Teo and Liu (2007) examined the factors that affected the trust of online customers in the United States, Singapore and China. They reported that the results for the three countries were not different, and customer trust affected the customer's perceived risk and attitudes. According to their findings, the intention for purchasing decreased by risk perception and increased by positive attitudes.

The findings of studies on the relationships between online customer perceptions and customer loyalty, satisfaction and trust that were conducted in a comprehensive way revealed direct and indirect relationships between these variables. Kurt (2013) investigated the effects of the ethical value perceptions of online vendors on customer loyalty based on the intermediary variables of customer trust and

satisfaction. Accordingly, they revealed that perceptions of ethical values consisted of sub-components including security, privacy, honesty and reliability. While ethical value perceptions directly affected customer trust, it affected customer loyalty and satisfaction indirectly. In conclusion, they stated that customer trust affected satisfaction, and satisfaction affected loyalty, while these effects were direct. Kaya and Özen (2012) stated that perceived value has a significant effect on purchasing. Mathwick, Malhotra and Rigdon (2001) also argued that obtaining value is a main goal of purchasing and the basis in all successful transactions. The study conducted by Eid in Saudi Arabia in 2011 found that user interface quality, information quality, perceived security and perceived privacy were variables that affected online customer trust and satisfaction. The researcher reported that online customer satisfaction and trust also affected online customer loyalty. Özgüven (2011) argued in their study that the website that is designed should feel secure for the customer, and for this, all security measures must be taken. While it was seen that customer satisfaction is an important predictor of loyalty, it was emphasized that the security factor for online shopping sites also plays an important role on loyalty.

To sum up the findings of the studies cited above which investigated the relationships between online customer perceptions and customer satisfaction, trust and loyalty, the interactions of customer perceptions with customer trust, satisfaction and loyalty were explained by two models. In the earlier periods, these relationships were explained over a model that states perceptions affect trust, trust affects satisfaction, and satisfaction affects loyalty. In recent years, these relationships were explained by a model that argues that perceptions affect both trust and satisfaction, and trust and satisfaction together affect customer loyalty. Some current studies focused on a model that aimed to explain the relationship of the trust and satisfaction defined in the second model with loyalty through an intermediate variable defined as perceived value. However, there are not enough studies for explaining these relationships over this model.

Online Customer Trust

Customers only shop from individuals, brands, organizations and shops that they trust. This is why managing the sale is important. After this, the exchange continues based on a connection of trust, and the continuity of shopping is achieved. Customer trust on online shopping sites is the belief of the customer that the site and the brand will fulfil their responsibilities during or after shopping and their desire to trust the site in case of a security problem (Erçetin, 2015). In other words, online customer trust consists of the beliefs of customers that the online shopping site will support them when they are defenseless (Hou, 2005; Rewatkar, 2012). While online customer

trust is important, the lack of trust of customers in the online shopping website is the main reason why they do not shop online.

As the decisions to be made by the customer during the online shopping process carry risks, online customer trust also has an effect that speeds up decision-making. Studies have reported that the website to be designed should make the customer feel safe, and for this, all security precautions must be taken (Ozguven, 2011). Customer satisfaction is an important determinant of loyalty, while customer trust in online shopping sites plays an important role on loyalty. Studies have defined customer trust as an important factor for customer loyalty (Garbarino & Johnson, 1999; Chaudhuri & Holbrook, 2001). Furthermore, if the customer trusts a site, they are more likely to develop a positive attitude towards the product, pay a good price, stay loyal and mention positive things through word of mouth (Chaudhuri & Holbrook, 2001; Wu, 2013).

Online Customer Satisfaction

Satisfaction has always been a critical issue since the earliest times of trade, and it is becoming increasingly more important. Today, customer satisfaction has a highly significant place in the achievement of competitive advantage by businesses (Bitner & Hubbert, 1994; Su, 2004). Satisfaction is generally defined as the level of the customer's pleasure with and expectations that are met from the good or service they have purchased (Bennington & Cummane, 1998). Online customer satisfaction is the level of satisfaction or dissatisfaction the customer takes from the good or service they have purchased online (Barutcu, 2007). Customer satisfaction is one of the important priorities of online customers that make them ready to shop online (Kuo & Wu, 2012; Wu, 2013). Customer satisfaction plays a key role in repeated purchasing, achieving customer attachment and higher profits by businesses (Reichheld & Schefter, 2000). Online shopping sites must provide customer satisfaction as their customers can distribute information to other customers very easily and fast with the help of the internet. While achievement of customer satisfaction means new customers for a business, dissatisfaction corresponds to loss of customers. This the necessity to satisfy the customer has a vital significance for businesses today. Online shopping sites, just as in conventional commerce, aim to keep their customers.

Customer satisfaction on online shopping sites is accepted as one of the key variables that affect the future purchasing intentions and decisions of customers that shop online. On the other hand, in the case of dissatisfaction of the customer of the online shopping site, the customer stops shopping from online shopping sites and turns towards conventional distribution channel (Barutcu, 2007). While an appeased customer may express their satisfaction to potential customers, a dissatisfied customer poses a risk of expressing their complaints and dissatisfaction to those around them

(Dubrovski, 2001). Hence, it is crucially important for online shopping sites to have satisfied customers.

In order to achieve customer satisfaction, online shopping sites need to monitor the process until the product is delivered to the customer and provide support afterwards. As a result of this, the satisfaction level of the online customer will increase, and the customer who is pleased by the good or service they purchased will make their next choice in favor of the same vendor (Leclerc, 2013). As a result of solutions that would not negatively affect the satisfaction and loyalty of customers, online vendors will experience the feeling of permanence as the trust in the website will increase.

Online Customer Loyalty

Loyalty may be explained as a customer's positive attitudes, tendency, likelihood to come back and make purchases from a business due to their belief that the value perceived from a business service is higher than those of alternatives. As drawing new customers towards online shopping sites is costlier in comparison to conventional businesses, loyalty is vitally important in e-commerce in the economic sense. Loyal customers are customers who have formed an emotional connection with the business, and they help presence and recognition of the site's name by making positive recommendations to people around them (Avcikurt & Koroglu, 2006). Therefore, loyalty is seen as an important factor for achieving the success and sustainability of an online shopping site (Dekimpe, Steenkamp, Mellens, & Abeele, 1997; Casaló, Flavián, & Guinalú, 2008). Online customer loyalty is also seen as a significant competitive advantage in terms of customers' attachment to a business and preference of that business despite the presence of others. This is why it is important for businesses to establish customer loyalty (Çati & Koçoğlu, 2008). Studies have shown that loyal customers stay attached to the brand and the site even if they encounter better options. These customers visit online shopping sites more by 32% and spend 46% more money (Corless; 2019). Establishing customer loyalty is a very difficult process for online shopping sites. The preliminary conditions for this are achieving customer satisfaction and trust and developing long-term customer relations (Eid, 2011).

Customer Perceptions of Online Customers

This section introduces customer perceptions that affect the satisfaction, trust and loyalty of online customers and presents the relationships of these perceptions with customer satisfaction, trust and loyalty. Perception is defined as complex, objective consciousness content that emerges with the contributions of memory and through an affective impression, namely, becoming aware of something through the senses by

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directing attention towards it. Perception is formed by signals on the nervous system that are created by stimulation of the sensory organs of individuals. Considering it regarding customers who purchase from online shopping sites, it is defined as interpretations that are felt and made before, during and after shopping for a good or service. Customers' development of positive perceptions towards online shopping and sites will lead to the development of e-commerce. This is why revealing the perceptions of customers towards online shopping and designing appropriate e-commerce strategies will allow online shopping sites to conduct their operations efficiently. Furthermore, the perceptions of online customers form a structure that is directly effective on the success of e-commerce. The comprehensive review of the literature showed that, as a result of the interactions of customers with online shopping sites, they developed perceptions of benefit, customer services, control, customization, privacy, risk, security, self-efficacy and value.

Perceived Benefit

Perceived benefit is defined as the perceptions on the benefits customers gain from their shopping process on the online shopping site and as a result of this process (Pavlou, 2003). These benefits may be listed as practicality, easy purchase, opportunity of searching fast and increased options. Online shopping sites should be designed in a practical way for searching for and purchasing products, and this process should be made easier for online customers. Moreover, the options of online customers should be increased by allowing them to look for and buy products faster.

Online shopping sites' provision of detailed information and product diversity to the customer for shopping will increase the perceived benefit they gain as a result of this exchange. After the formation of the perception that the online shopping site's purchasing process for goods or services is beneficial, shopping processes on these websites will increase customer satisfaction and trust (Bhattacharjee, 2001; Devaraj, Fan, & Kohli, 2002; Pavlou, 2003). Customers with feelings of satisfaction and trust will become loyal customers.

Perceived Control

Perceived control refers to the feelings of customers regarding their degree of ability to have control over the content access, searching and processing processes while using the online shopping site with the help of their skills of using information and communication technologies (Rose, Hair, & Clark, 2011).

In the shopping process, there are activities that will develop perceived control in the positive direction. First of these is the feeling of customers to be technically equipped and adequate regarding what they would do when they visit the online

shopping site for the first time. Knowing what they would do throughout the shopping process and feeling that they have control in making the purchasing decision are others. Thinking that they can check the information that is provided and feeling that all the process is under control while setting their order are also activities that shape perceived control. One of the advantages of the internet environment is the depth of information provided to customers, and it is important that, through the shopping process, customers feel that they are adequately equipped and have the control. Having a positive perception of control regarding online shopping sites and the shopping process will increase the number of purchases that are made on online shopping sites.

The results of some studies showed that individuals behave more positively when they think they have control over their environment (Ozkara et al., 2017). Therefore, if users have perceived control over the process, it is natural to expect that their trust and satisfaction levels will increase. Perceiving that they can control whatever piece of information they want and will make the best purchasing decision will affect the approaches of customers towards online shopping and their experiences positively. Customers who perceived that control is in their hands will be pleased by the shopping process. Customers with increased satisfaction levels will also have increased trust levels in online shopping.

Perceived Customer Services

Difficulties that are encountered as a result of the impossibility of customers to closely examine and immediately obtain products as in physical stores may only be compensated by advanced levels of customer services. Customer services is an issue that should be prioritized by online shopping sites of all sizes, and it is in the center of the business strategies of e-commerce establishments. While the price and brand of the product create the different in today's commerce, it is expected that this difference will be created by customer services in 2020s. The Customer Report by Microsoft Customer Services stated that almost all of their customers emphasized the importance of customer services. Perceived customer services consist of the feelings of customers that online shopping sites will provide them with the necessary services before and after purchasing not only while conducting their real-time transactions but also for achieving long-term customer services. When today's customers have a question, they want to be answered fast. In the case that they cannot get a response fast, they also quickly move their shopping on the internet towards a different site. Customer services of online shopping sites provide information regarding the usability of the selected products and the status of the orders. They spend efforts to minimize the problems in the provision of the demanded services.

The success of online shopping is determined by the services that are provided during and after the shopping process. The greatest problem is when customers are not sufficiently satisfied by customer services (Bal, 2014). Online shopping sites need to spend an effort to not lose the customer they accessed once. Minimizing the problems experienced in customer services will lead to higher levels of perceived customer services (Eid, 2011). When customer services are provided successfully, customers will be satisfied and develop trust. In turn, this will help keeping the existing customers and drawing new customers. Studies have reported that one of the most effective methods of accessing loyal customers is provision of a high-quality customer service (Eid, 2011).

Accordingly, online shopping sites should also aim to increase this perception by developing a sensitive feedback mechanism based on understanding customer needs and improving services. The customer services of the online shopping site should be accessible for improving this perception, product delivery information should be easily accessible, and detailed product information and answers to frequently asked questions should be certainly provided to the customer.

Perceived Customization

Perceived customization refers to an online shopping site's provision of operational opportunities and platforms for the customer to customize the products or services based on their taste (Srinivasan et al., 2002). Online customers state that they like it very much when online shopping sites present them platforms that feel like directly talking to themselves which allow customization of the colors and visuals on the windows that open after logging in as a registered user. When customers log in to online shopping sites as registered users, they have the feeling of being accepted as a customer. It is seen that online customers attach great importance to their feeling of the shopping site as a space that is theirs. This is why online shopping sites need to provide a customized shopping experience to their users to increase sales and achieve customer loyalty (Schrage, 1999). Customization also allows the online customer to focus on the product they want and make a choice fast (Shostak, 1987). Online shopping sites that carry out customization work report that their sales increase (Sherbill, 2014). Customers report that they want to feel special while shopping online, and they prefer firms that provide this opportunity more (Lee & Lin, 2005; Oypan, 2017). Studies have reported that 59% of customers found more interesting products on customized online shopping sites, and 56% visited the sites that recommended products again for purchasing (Saleh, 2018). Customers use their time more efficiently and complete their operations fast in customized sites. Providing customers with a more personalized experience and products that appeal to their interest will lead them to see the website as a special place. With the provision

of these advantages, online customers will visit the online shopping site again, and their purchasing probability will increase. As a result of achieving the satisfaction of customers, it will naturally be possible to turn them into loyal customers. Studies reported that one of the most important variables in distinguishing those with low loyalty and those with high loyalty levels is customization (Ozturk et al.,2012).

Perceived Privacy

Privacy is one of the three elements that form the basis of information security. Privacy aims to prevent information from being obtained by unauthorized individuals. Personal and private information is requested for the activities customers perform on online shopping sites. Such information may include name, last name, e-mail addresses, home and work addresses and credit card numbers. Perceived privacy is a customer perception that is based on the extent to which an online shopping site pays importance to prevent the private information of customers from being accessed by unauthorized users or released. Revelation of private information is one of the main sources of anxiety for customers. It is very important for customers that this information they use while shopping is protected (Kim et al., 2008). Studies have revealed that, although online firms promise security, 90% of customers state that they do not trust these firms for the protection of their personal information and feel anxious about this issue (Light, 2001). Online shopping sites should inform their customers regarding how and in what way the personal data they collect for different purposes will be used. It was reported that the vast majority of customers trusted businesses more when they are informed on how their personal information is being used and how their privacy is ensured (Saleh, 2018). Provision of appropriate and sufficient privacy by online shopping sites increases the customer's perceived privacy (Odom, Kumar & Saunders, 2002; Ramanathan, 2011). Customers with high perceived privacy will continue their shopping as satisfied, and then probably, loyal customers.

Perceived Risk

Perceived risk is defined as the uncertainty encountered by customers when they cannot foresee the outcomes of their purchasing decision (Schiffman & Kanuk, 2000). It plays role in shaping customer behavior and is highly important for customers of online shopping sites (Doolin, Dillon, Thompson, & Corner, 2005).

The risk that is perceived by customers is seen to be one of the most significant obstacles in online shopping. Online shopping sites should take the steps necessary to eliminate risk anxiety in their customers by security technologies, awareness campaigns and security policies and reduce perceived risk (Liao & Cheung, 2002;

Chih-Chung & Chang, 2005; Lopez-Nicolas & Molina-Castillo, 2008). A study that was conducted in the United States, China and Singapore found that, in all three countries, as the perceived risk of the customers regarding online shopping sites increased, online consumer trust decreased, while perceived risk directly affected the customer's decision to shop or not shop again from the same site (Teo & Liu, 2007). Another study determined that perceived risk that decreased as a result of positive experiences was replaced by perceived advantage (Saydan, 2008). The degree of perceived risk affects customer satisfaction and trust negatively. In order to minimize the perceived risk in customers, online shopping sites should adopt appropriate strategies that will eliminate their anxiousness about the quality, delivery and return of products or services.

Perceived Security

Security refers to mechanisms that prevent unauthorized access to data and systems that include such mechanisms. Perceived security is defined as the perception of a customer that is formed as a result of work that is carried out by online shopping sites to meet security requirements. As online customers cannot interact with the vendor face to face as in the case of conventional shopping, they experience more trust issues (Ha & Stoel, 2009). Trust is at the center of people's interpersonal relationships, and achieving trust in sites that are involved in e-commerce is directly related to technical infrastructure. Sites that have a complicated structure where security features (security policy, security agreement, guarantee of secure shopping) and protection mechanisms (encryption, protection, authentication, secure socket layer technology) are not used lead customers to have trust issues (McKnight & Chervany, 2001). It is known that lack of perceived security is the main reason why several potential customers do not make purchases on online shopping sites. This is why e-commerce sites should create a security plan where security systems work in harmony and provide the infrastructure that is needed for it (Chiu et al., 2012). Shopping sites need to take a set of security precautions for a positive and high perceived security. Some of such precautions include digital certificates to prove the online shopping site is real, secure socket layer (SSL) technology that allows transfer of customer information through a secure platform, 3D security passwords for credit card purchases and usage of firewalls. In addition to these, online shopping sites must have Privacy and Security Policies, and these policies should be presented to customers. If customers feel that the online shopping site aims to meet the security needs of its customers and their goal is to provide a secure shopping platform, their perceived security will increase. As a result of high and positively developed perceived security, customer satisfaction and the sales of the site will increase (Chellappa & Pavlou, 2002; Eid, 2011; Chen, 2012).

Perceived Self-Efficacy

Online shopping self-efficacy is the perception of a customer regarding their skills of online information and price researching and purchasing. In other words, online shopping self-efficacy is the output of the socializing of the consumer, and it is defined as the acquisition of certain consumer skills that contribute to the adequacy of the individual. This variable is an indicator of the extent to which online customers are comfortable in collecting information and shopping on online shopping sites (Chuang, Lin, & Chin-Chung, 2015). Rowley (2006) emphasized that, in customer satisfaction management, online shopping sites should adopt strategies towards increasing online shopping self-efficacy levels. A study emphasized that customers with high self-efficacy levels display more positive approaches towards online shopping (Shih, 2004). Another study noted that high perceived self-efficacy levels will positively affect the quality of the e-service, satisfaction and trust (Sanchez-Franco & Roldan, 2005). The perceived self-efficacy of customers during online shopping leads them to have a positive shopping experience. This, in turn, affects trust, satisfaction and loyalty positively (Corbitt et al., 2003; Udo, Bagchi, & Kirs 2010; Rose et al., 2011).

Perceived Value

Perceived value is formed as a result of the combination of the cost of the product or service purchased by the consumer and the benefits it provides, and it affects the shopping intention and behavior of the customer (Lai, Griffin, & Babin, 2009). When the value they get compensates or exceeds their expectations, customers decide that the product or service they have purchased is worth purchasing (Srinivasan et al., 2002). Obtaining value is the goal of a basic purchasing process, and perceived value has a substantial effect on purchasing behavior. Customers choose the product that will provide them the best value by comparing the value they obtain to alternatives. This situation is applicable to all commercial operations (Mathwick et al., 2001). In the case that online customers' perceived value regarding a product on an online shopping site is low, they will turn towards the products of competing brands and be more likely to purchase the product from the other site (Parasuraman & Grewal, 2000; Sirdeshmukh, Singh, & Sabol, 2002; Srinivasan et al., 2002). E-commerce sites that work with customers who have low perceived value have to spend more effort to be able to compete with those that work with customers who have high perceived value (Ates, 2018).

Perceived value is one of the perceptions that trigger repeated purchasing behaviors (Parasuraman & Grewal, 2000). Studies have shown that the perceived value of customers who shop online is the most significant variable that predicts

customer trust and loyalty. If perceived value is high, online customer trust and loyalty are also high, and this situation affects both the vendor and the customer positively (Flint, Woodruff, & Gardial, 2002; Srinivasan et al., 2002; Chen, 2012). Perceived value is one of the driving forces in the formation of customer trust and loyalty. The feelings of having made a profitable and rational purchase and their efforts were worth it after online shopping will lead to attraction of a loyal customer by creating a positive perception of value. Achieving customer loyalty is a very difficult process, and previous research reported that online shopping sites lose 25% of their users by average each year. Turning customers loyal may prevent a loss of as much as 25% in the profits of the firm. In contrast, when the perception of value that will be formed in the customer is low at the end of the shopping process, the online shopping site will have to spend more effort to stay in the competition (Chen, 2012). Online shopping sites follow up on the constantly changing customer values by acting in this direction and analyze what they and their suppliers could do regarding this matter.

SOLUTIONS AND RECOMMENDATIONS

In order to increase their profit margin, businesses that have online shopping sites need to increase the number of customers who will purchase the services or products they offer. As it is very easy to lose customers on the internet, it is greatly important for online shopping sites to increase the number of customers that are loyal to them. The first thing to do in achieving customer loyalty is achieving customer satisfaction. Customer trust should be earned for customers to become satisfied customers. Trust and satisfaction which affect customer loyalty are also influenced by customer perceptions. Online shopping sites should increase their awareness on how customer perceptions affect this process, work towards managing customer perceptions and adopt relevant strategies.

The great increase in the numbers of security and privacy violations in online shopping shows that the two most important threats for e-commerce today are security and privacy. As it is not possible for vendors and customers to interact directly and in person, security and privacy policies act as a bridge between the two sides. With the help of these policies, customers are able to understand the approach of the online shopping site to these two high-priority issues. Online shopping sites should share information online about the precautions they have taken against threats related to this issue by security and privacy policies.

In order to gain the trust of their customers, online shopping sites should provide the necessary information that customer data are stored in a very secure way and at a very secure place. Online shopping sites may increase their revenues to a significant

extent by taking steps that will reduce the fears and perceived risks of their customers regarding online shopping. They may reduce perceived risk and facilitate customer trust by additional precautions using technology such as protection of sensitive customer data, website authentication and risk management. Gaining the trust of online customers will play a great role in increasing sales and reaching the firm's strategic goals.

Online customers have different perceptions in comparison to traditional customers. While shopping, online customers prefer sites that make them feel more special and provide such services more. Online shopping sites may strengthen the bilateral relationships with their customers by collecting information about the activities of the customers on their site and providing customized products and price opportunities based on this information. Online shopping sites may allow customizations based on redirection, prediction and third-party data. The method of customization that is based on behavioral characteristics of customers like the products that check out on the online shopping site, the tabs they browsed, and their purchase history is redirection-based customization. This way, the probability of the customer to purchase may be increased by directing the customer to areas they are interested in. In prediction-based customization, based on orders placed by others, product/service recommendations may be shown to customers with similar profiles. The e-commerce giant Amazon, which achieved 30% increase with the help of recommendation, is one of the firms that benefitted the most from the "frequently bought together" approach, which is one of the best examples of customization. Customization that is based on third party data is a highly practical approach for transmitting the most accurate message to the most accurate audience at the most appropriate time. With the help of these services that are provided, the satisfaction and loyalty levels of customers with high perceptions of customization will increase.

Online shopping sites should make it easier and faster for customers to search for and purchase products in order to increase their perceived benefit. The storefronts that are used in traditional businesses are replaced by the main pages of websites in online shopping. In online shopping, websites with high usability should be designed. This way, the product search and purchase processes of customers will be easier and faster. Additionally, with the help of usable websites, the perceived control of customers that they have the information, resources and capabilities required in the process of using the internet will also increase. In order to increase perceived control and benefit, it is needed to avoid complicated structures that bore their customers, are difficult to use and lead the customer to leave the site in a short time. The customer should be helped in easily accessing products and information related to products with graphics and category titles. As customers cannot see or touch the product itself, the site should include high-resolution and fast-loading images of the product. In-site search and reliably comments and reviews should be

provided for products. Hence, in order to increase the perceived benefit of customers, an online shopping site should certainly utilize usability, speed, comprehensive product/service information, visuals and true opinions and reviews.

The perceived value for online customers is influenced by their perceptions of quality, price and sacrifice. In online shopping, if the customers find products more reliable, durable and higher-quality, they will think their online shopping experience is more valuable, and their perceived value will increase. Online shopping sites should provide low prices, develop strategies to motivate customers for shopping and increase product variety.

One of the main reasons for customers' lack of trusty in online shopping sites is related the problems related to customer services that they experience while shopping. Customers are able to solve the problems they encounter in conventional trade with sales representatives. So, they have concerns that they might not find a person that will help them solve the problems they encounter during online shopping for a real-time conversation. Such problems in online shopping are usually solved through phone calls after the fact and e-mails. Instead of this, providing online customer services will be more useful. Knowing that there is a customer services platform from which they can receive support any time they need will contribute to their trust by eliminating their concerns.

At the point customers have purchased online, the responsibility falls on the online shopping site. Fulfilling the promises that are made for increasing customer satisfaction is a golden rule for the continuity of trade in the virtual world. An active and up-to-date 'frequently asked questions' part that covers the topics that might confuse customers should be available on the online shopping site. When customers are able to find the answers to the questions they might have here, they will feel safer. Providing guarantee of original product, quality and return, making payment easier, explaining the return policy and providing technical support will create satisfaction and trust in the customer. Payment processes constitute another factor that shapes customer trust. Secure Socket Layer (SSL) certificates, 3D secure systems, address verification and tokenization are services that may be used for payment. Offering different payment options will increase customer satisfaction. Diversification of payment options such as installments, bank transfer, payment on delivery, PayPal, Payu and Ipara will increase the probability of purchases.

FUTURE RESEARCH DIRECTIONS

This chapter presented the effects of customer perceptions on customer trust, satisfaction and loyalty in a comprehensive manner. The number of studies on online customer perceptions that were newly defined by recent studies such as perceived

fairness may be increased, and the interactions of these perceptions may be examined in the model. Moreover, studies may also be carried out by considering the types of each perception within itself. In future studies, moderating effects of additional variables, for example, demographic and psychographic variables on customer trust, satisfaction and loyalty may be studied. Additionally, the effects of customer perceptions in online and offline shopping on customer trust, satisfaction and loyalty may be examined. Researchers may investigate whether or not these effects on customer satisfaction, trust and loyalty differ in two different formats of shopping.

Another topic that may be worth studying is investigating online shopping sites in different sectors and determine whether or not the effects of customer perceptions on customer trust, satisfaction and loyalty differ based on sectors. Researchers could also study the effects of perceptions in real-time online shopping processes on customer trust, satisfaction and loyalty. Mobile devices are frequently preferred by online customers, and mobile commerce (m-commerce) is developing rapidly. Accordingly, online customer perceptions may be studied in terms of e-commerce, m-commerce and omnichannel commerce and comparison may be made.

CONCLUSION

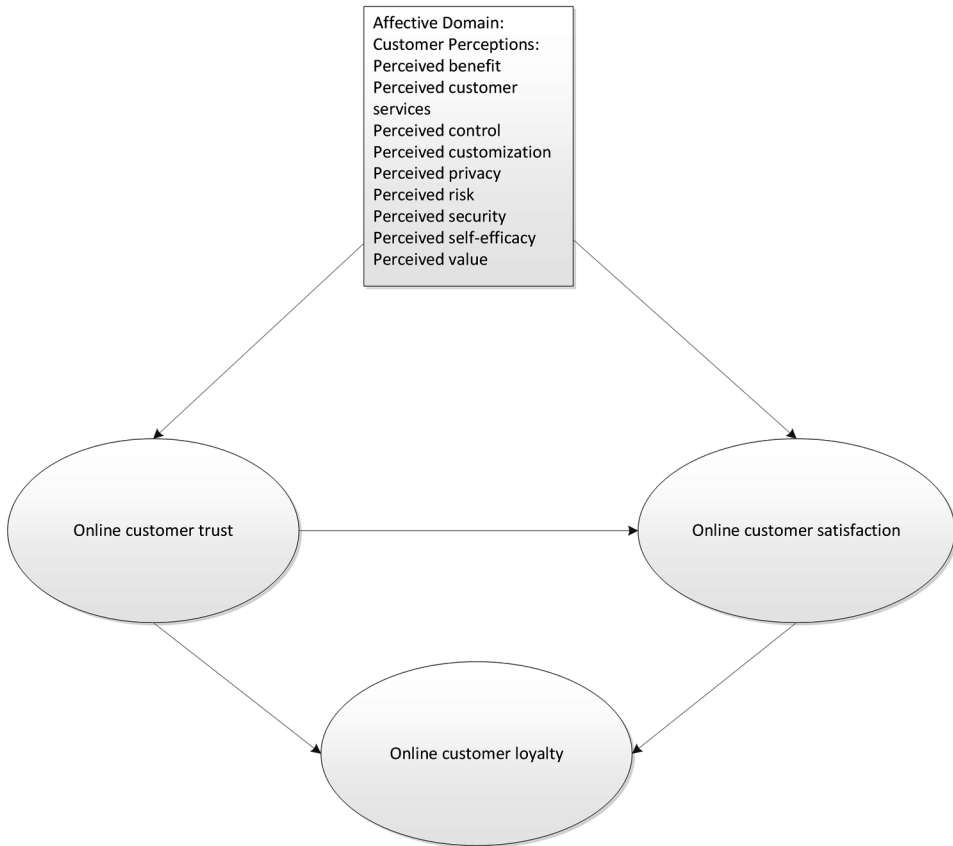
Customer trust, satisfaction and loyalty are important in commerce. However, in difference to conventional commerce, it is seen that customer trust, satisfaction and loyalty in online commerce are affected some customer characteristics whose effects were not well-known before. This study investigated some perceptions in the affective domain that are thought to affect purchasing decisions directly and indirectly in the commercial process between online customers and online shopping sites.

As a result of the study, it was observed that customer trust affects customer satisfaction. Customer trust and customer satisfaction both affect customer loyalty separately and directly, while trust also affects loyalty indirectly through satisfaction. Customer trust and satisfaction are shaped by customer perceptions as shown in Figure 1. This study investigated the effects on nine perceptions in the affective domain as perceived benefit, perceived control, perceived customer services, perceived customization, perceived risk, perceived security, perceived self-efficiency, perceived privacy and perceived value in the purchasing process.

The important issue for online shopping sites is not how many new customers they gain but how long this relationship will last. Today, responsible customers now know what they want, how much they are willing to pay as a price or how they will receive services. The future of online shopping will be in the hands of businesses that manage the perceptions of customers well and are able to keep up with customer needs.

The Affective Domain of E-Commerce

Figure 1. Conceptual model



In conclusion, customers should be approached not as transactions but as relationships, and they should be viewed not in terms of one-time shopping but in terms of increasing the number of loyal customers. Online shopping site that consider customer trust, satisfaction and loyalty, understand the perceptions that affect these completely and develop strategies towards these and are able to manage the affective aspects of customers will be able to preserve their competitive power and sustain their existence and profitability.

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KEY TERMS AND DEFINITIONS

Customer Perception: The process where a customer selects, organizes and interprets information to create a meaningful picture of the brand or the product.

Customer Satisfaction: A term that measures how products and services offered by a company meet customer expectations.

Online Customer: An individual who purchases products or services via the internet.

Online Customer Loyalty: The customer's constant preference of the same online shopping site.

Online Customer Trust: The customer's feeling of believing and connecting to the online shopping site they are using without hesitation or doubt.

Online Shopping: Conducting all processes in commercial activities through an online platform.

Online Shopping Site: A website where customers may take part in the presentation of products or services, information, and purchase of such products and surfaces online via the internet.

Chapter 5

Connected Employee Platforms: A Case Study in a Global Company

Ufuk Cebeci

Istanbul Technical University, Turkey

Batuhan Burak Ersözlü

Istanbul Technical University, Turkey

Can Berk Acar

Istanbul Technical University, Turkey

Sahen Tokatlioglu

Istanbul Technical University, Turkey

ABSTRACT

In the modern era, enterprises are facing a variety of difficulties because of today's emerging technologies. One of the numerous difficulties for a business is to fulfill its employees in order to adapt to the constantly changing business processes and to make progress and stay in competition. In order to build proficiency, viability, efficiency, and occupation responsibility of employees, the business must fulfill the requirements of its employee by giving great working conditions. The target of this chapter is to dissect the effect of workplace on employee work fulfillment. This chapter may profit society by urging individuals to contribute more to their occupations and may help them in their daily work life. Consequently, it is fundamental for an association to support their employee to snap down for accomplishing the hierarchical objectives and goals.

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INTRODUCTION

Advanced working environment may increase the efficiency of the employees and their motivation. When technological and innovative product is developed for business, it is an appropriate opportunity to join a firm's stakeholders, managers, employees and suppliers.

Regardless of whether your employees are work area based, out and about away at the forefront, interact presents to you an intranet arrangement that works the manner in which a firm works: from any gadget, wherever, whenever.

Each organization needs to keep its employees satisfied and profitable, in light of the fact that an extraordinary employee encounter means incredible business results. It gives employees a chance to be progressively inventive and adaptable by the way they complete their employments. It makes them need to remain with the organization longer. It draws in best ability. However, what is needed to make the employee experience truly stunning, It is more than people suspect is.

A good employee experience is about more than to give individuals a chance to utilize their cell phones and one of the most popular applications at work. It is about the whole experience of how function completes and offers employees more decisions for when and how they utilize. One of the trends in business is to increase fun and satisfaction for employees by using connected devices.

In addition to this, that feeling originates from a mixture of things; a mix of connected abilities, a connected workspace, a connected office, and connected employee. It is called the Connected Employee Experience.

BACKGROUND

With the development of technology, there are some changes in the internal dynamics as in many other areas. With the increasing use of smartphones all over the world, internet-based applications have taken an important place in human life. These applications contribute to companies in internal processes and in different areas. We can classify them under the following headings;

The paper process, staff knowledge, highlight the best practice, secure documents, network files, KPI's, business management systems, professional networking.

As companies started to use these technologies, such applications have become a new sector and diversity has increased. Applications are customized and developed for the changing and evolving needs of companies.

Plaskoff (2017) defined that; "Employee experience borrows these same design principles, tools and processes and applies them to the design of employees' experiences with their work environment and employers. Design thinking treats

work not as mere employment, but as a life journey, with the employee as the hero. The employee journey has many milestones and interactions (or touchpoints), and the quality of employee experiences has a direct influence on employee satisfaction, engagement, commitment and, in the end, performance. The fundamental relationship between the employee and the organization, therefore, must be transformed.”

Buniamin and Barber (2004) focused on the concepts of intranet, knowledge management system, knowledge mapping in detailed way and they mainly found that the intranet is a suitable platform for the implementation of a knowledge management system.

Scott (1998) states that, “An intranet is a ‘powerful tool’ for institution-wide communications, collaborative projects, and the establishment of a sense of community on a manageable scale.” Horton (2001), note that some organizations and individuals in the literature on knowledge management have also anticipated that substantial benefits will be derived from the development of intranets, while others are skeptical about what technology-driven plans for organizational change are effective. Scarbrough (1999), for example, described a banking organization that aimed to break down barriers between organizational divisions and allow ‘global knowledge management’. In practice, independent intranet development by the bank’s divisions brought about quite the opposite and succeeded in reinforcing the barriers between them.

Mahapatra and Lai (1998) worked on Enterprise Resource Planning (ERP) systems and software support for main business functions and after this work, they asserted that especially training large number of employees, intranet tools are very beneficial for all.

MacCormick, Dery, and Kolb (2012) study that a stunning 130 million smartphones were chased around the world in 2010. Since 2008, exponential growth in the number of devices has led to a six fold increase in smartphone-related telecommunications traffic in North America, Asia, Western Europe, Latin America, and Oceania. It is anticipated that there will be more mobile users than traditional Internet users by 2014. Interestingly, smartphone statistics show that 48 percent of users use their smartphones to help them with their work, although only about 23 percent of the phone costs of these users are borne by their employers. This makes smartphones the “holy grail” for both employees who enjoy their fascinating, useful and/or entertaining” apps” and employers who can enhance employee engagement with minimal (if any) investment.

Jacob Morgan analyzed more than 250 companies and Morgan also informed that organizations that invested extremely in the employee experience earned more than four times the average profit and two times the average revenue compared to those that didn’t.

Connected Employee Platforms

BMC software (2012) has provided its employees with a digital working space that they can connect from anywhere in the world. The company employs approximately 6,000 people around the globe and approximately half of those based in the US work from home. Outside the US, this figure varies.

Mphidi and Snyman (2012) studied on a large literature review about intranet and knowledge management. In this study, they specifically worked on three different library. These library's characteristics are totally different. After researching process, they stated that intranet can be used very different purposes in library and these purposes depend on a library's type. Also, intranet system is useful for employees. Damsgaard and Scheepers (2001) presented a different point of view about potential of intranets for knowledge management.

PWC is one of the largest companies in the international portfolio. The perspective of the PWC's company internal system is very important.

The standard for interacting with employees used to be from high organizational structures and management. Employees today can connect with your business through a network of people and interactions using a variety of technologies — through, adjacent, and within your business. This change both enhances their productivity and transforms their customer relationships. By developing a linked staff experience tailored to your organisational requirements, you can harness the strength of the links of your talent, boost commitment and motivation, increase retention, and attain common company objectives.

One of the important data on this subject belongs to Deloitte from the year 2017. The result of Deloitte's studies has very interesting numbers.

In 2017, the organizational culture, engagement and brand proposal for employees remain top priorities ; this year again, employee experience ranks as a major trend. Nearly 80% of managers rated employee experience as very significant (42%) or significant (38%), but only 22% reported that their businesses were outstanding in constructing a differentiated employee experience. 59% of survey participants reported being unprepared or only somewhat willing to tackle the challenge of staff experience (“The Connected Employee Experience”, 2019).

There are many kinds of applications and approaches related to Connected Employee Experience. Various companies working on their employee platforms and intranet systems related with their digital transformation processes. Furthermore, many companies have an intranet platform products to sell large companies. In this paper there is only one application to be studied. This application is about employee platforms and intranet systems on digitalization view of the company.

Connected Employee Experience and a Case Study

Connected Employee Experience. Employees can experience following applications:

- Simple access to IT support through a self-benefit entryway
- Safe access to all your applications and information, whenever, anywhere
- Increasingly helpful approaches to libraries and office space
- Faster, simpler approaches to interface with sound and video conferences
- Brilliant candy machines that make it simple to get a console, earphones, or different assets from IT
- Customized administrations that anticipate your necessities

The Connected Employee Experience brings another dimension of decision and adaptability to employee support, commitment, and communications. It is offering three center components that can be conveyed separately or coordinated together to meet particular necessities: Connected Workspace, Connected Office, and Connected Employee. Each one offering supplements and increases the value of the other, making a value chain in every stage that conveys central points to clients, IT, and the business.

Some basic terminology about the connected systems are explained below:

- **Connected Workspace:** Makes it simple for employees to work the area that they want to work. It empowers them to utilize any tools for work, organization based or individual. Furthermore, it gives them a quick, simple access to all-purpose applications, web applications, helpful applications, and information. It can be given likewise a solitary door to corporate applications, cloud administrations, self-improvement support, explanatory, social coordinated effort abilities, and many more from there.
- **Connected Office:** One part of the experience that is often overlooked is physical spaces and office facilities. Connected Office makes it simple to interface with the physical office condition.
- **Connected Staff:** Transforms the administration experience. People utilize subjective registering, machine learning, analytics, chatbots, chatbots and gamification to react or even predict employee needs. These administrations ensure clients get exactly what they require in less time, with less exertion, so they are increasingly beneficial and fulfilled.

The company is one of the biggest manufacturers in Turkey. Employee satisfaction and simplifying the processes are of the strategies of the company. After decided to digitize processes in production and office works, lean management and lean production became popular. With these kind of new approaches, employee satisfaction become very important. Many companies change their strategies to employee satisfy based decisions even if they had a conventionality management systems over a century.

Connected Employee Platforms

When comparing existing solutions, we can see many applications, which has similar abilities. The companies that provide this kind of solutions are divided into three groups. The first group has web-based desktop application solutions, the second one has only web application solutions and the third group has combined all solution in a single mobile application on a cloud environment.

In this case, the product of one of the biggest automotive companies in Turkey is chosen for some reasons below;

- It was a multi-disciplinary project. The team consists of the employees of human resources, managers and other departments for this project.
- More than 3000 people use this application every day.
- It is the first mobile application project, by using the agile methodology.
- This application integrates both cloud and on-premise servers with native iOS and Android operating systems (“Android Operating Systems Wikipedia”, n.d.).
- The application integrates with many system including but not limited to HR module of SAP that runs as SaaS.

One of the strategies of the company is digitalization. The connected employee application has an important role in the vision of the company about to digitalize the internal processes. Moreover, it supports less paper use and less use of natural resources while filling and sending some important documents. It offers to make everything easier for the employees about their business processes by using mobility and connectivity power of the mobile devices.

This connected application enables most of the departmental needs met in one platform. Employees reach many of core systems including but not limited to enterprise purchasing, annual leave, and application publishing request. Also, it assures the company’s announcements reach their audience and let employees browse and comment to private blog articles that enterprise publishes. Moreover, it helps employees use their smartphones to open turnstiles in front of the building without using any security RFID based cards.

The developed mobile application has two main platforms, web-based and native mobile application based. Web-based solutions includes a web application running on the mobile device like a website. The native application based solutions contains some features which use mobile device components, like sensors, camera or microphone. These two platforms are explained as follows;

Web-Based Solutions


1. Feed, provides employees with easy access to industry insights and blogs. Employees can read last announcements managed by the HR department and blog posts -shows in Figure 1- written by managers and other associates. Additionally, mobile application users can get push notifications about comment replies or managers' posts.
2. Directory, help accessing employee profiles and contact information. With multi-functional searching algorithm, employees can find other colleagues' contact information such as phone number, email address and department.
3. SAP HR Module (for mobile), supports employees to make lots of things as making leave requests, viewing pay stubs, updating their information and view time & attendance reports.
4. Travel & purchasing expense module, provides to make an approval request for travel expenses for business trips or purchasing expenses to buy items or licenses for enterprise use.
5. IT demands module, helps employees to open a ticket to the IT department about their problems or new demands for needs.
6. Employee shuttles, ensures employees to track if there is a shuttle which goes to the nearest place from home or searching a shuttle to go somewhere after their shift. Tracking where the buses on map as in Figure 2 and searching employee's shuttles with selecting departure and arrival locations and time interval.
7. Delegation, helps someone as approving party while a manager is absent.
8. Meeting room reservation system, helps employees to schedule reservations to the meeting rooms. Smart meeting room reservation system assist employees to select a room which is available on the intended time interval.
9. Surveys, procures employees to create or reply surveys inside of the company ecosystem. Surveys help employees to be heard by managers and ease to make a decision.
10. Idea submit module, enables employees to share ideas, feedback, and suggestions for continuous improvements and innovation as a part of a suggestion system.
11. Mobile application store, derives employees to install enterprise applications available to use by all level employees.

Native Solutions


1. Multi-language support, implements all web-based and native functions support both Turkish and English.

Connected Employee Platforms


Figure 1. Summary page of the topic about Smart Technologies, inside of the company's official blog; all posts below header related with future technologies and new opportunities in the future



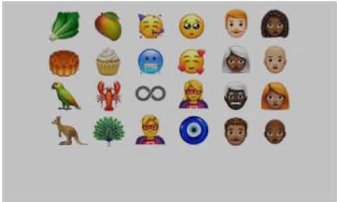
Smart Technologies ▾




▶ End the Electricity Bill! ▶



Sandy Monsters
18.08.2018

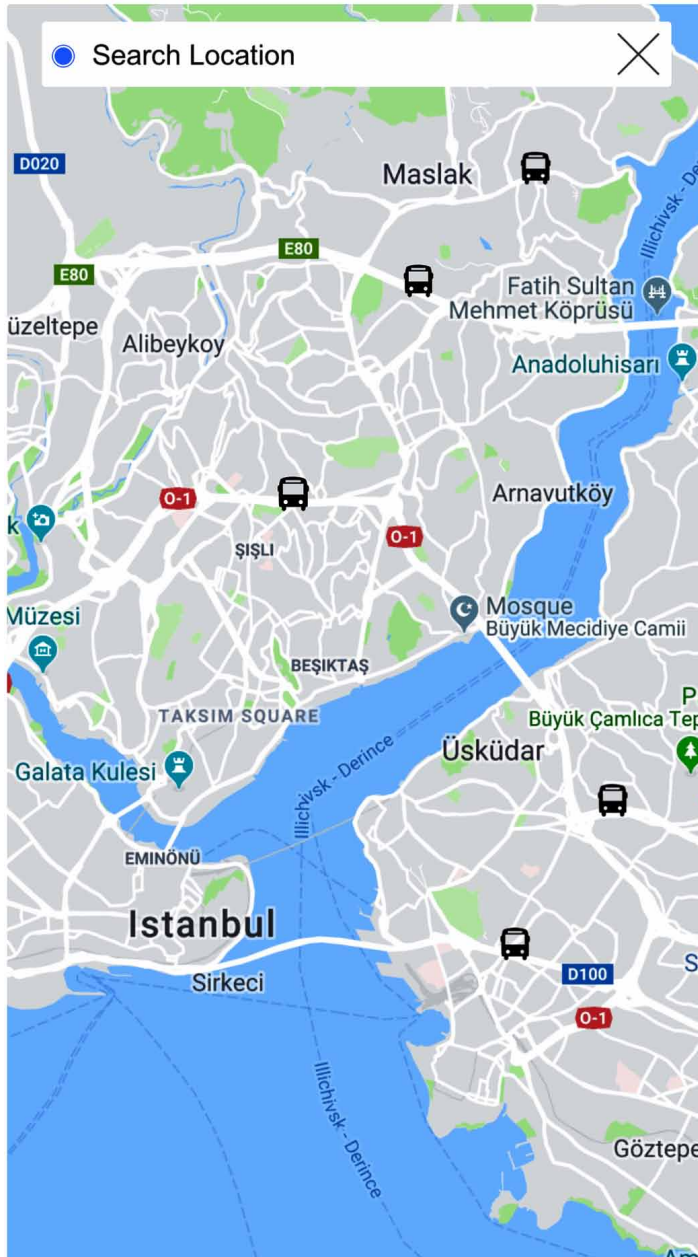


Apple Introduces New Emojis: Reds, Lobsters and Super Heroes Em
25.07.2018



Diagnosis of Cancer Without Artificial Symptoms

Figure 2. Online employee shuttles can be tracked by employees in map; every user can search a bus on map and check the route if it is correct or not. (Informations are not based on a real data)



Connected Employee Platforms

2. Open turnstiles module uses iBeacon® technology. Turnstiles or gates can be opened with mobile devices. The sensors inside the gates collect the Bluetooth signals from the device and sends signals which include authentication keys to servers. After the authentication process, it triggers the relay to unlock the barrier arms. As shown in Figure 3, mobile device transmits Beacon® signals for thirty seconds. Moreover, on this screen, previous transitions can also viewable.
3. Check in / check out module for work shift, managed by mobile devices. This module reads the signals from iBeacon® transmitters installed at company premises. On this module, this time mobile device is listening the Bluetooth signals as shown in figure 4. The iBeacon ID is checked against the list of approved iBeacons. Application double verify the users' GPS location to see if the user indeed near the premises. If both passed, application calls an API to register the employee's check in or check out request to file the work start and stop times.
4. Push Notifications: Send direct alerts, calls to actions and important messages to all employees' devices. Not only general information, comment replies on company's blog, approval information, campaigns and daily food menu sent to employees by push notification system.
5. Fingerprint and face recognition system, secures the application. Login into the application is performed according to mobile devices hardware specifications if chosen. Application users may define a fast-login option by using their devices biometric authentication such as fingerprint, face recognition and etc.
6. Daily food menu, helps everyone to view the daily menu in the restaurant for all locations of the company with an option of voting the quality of location's that day menu.

Advantages from Competing Products

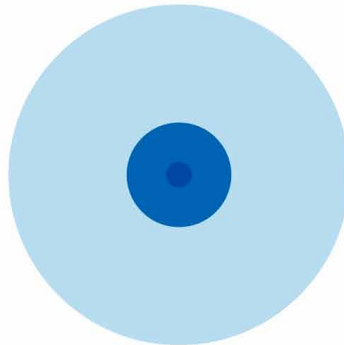
Although there are many similar products in the market, the biggest reason why this company wants to create its own product is to easily overcome the commitment to internal systems. In addition, the company wants to determine the course of the application according to the data obtained from the surveys conducted with the employees. For these reasons, the company produced and applied the most suitable model for itself by comparing it with other implementers.

Other differences and advantages include less internal application development costs, the accumulation of knowledge in the development process, the ability to retain qualified employees and the ability to observe the needs accurately and quickly.

Most of the modules in this application has been mentioned. Although, there are many other features may be added to this application, the date that we finish

Figure 3. iBeacon® technology is used in this process. Employees can use this module when they want to open turnstiles by their devices.

Please get closer your phone to
receiver on the door

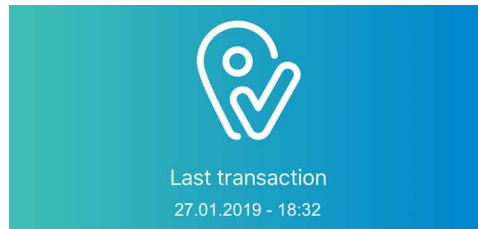


00:28

[Show History](#)

Connected Employee Platforms

Figure 4. First verification controller which is location control process in Check In / Check Out module. After this control, employee can inform the managers to start working



Checking your location..

this paper it was limited with these modules. This company mentioned about future plans and vision with this application like, being a product to sell to other companies to improve common digitalization vision, adding a chatbot to answer employees questions quickly and making the main menu view customizable and more personalized.

Addition to this case study and its future plans, connected employee experience platforms will evolve more complicated and powerful. The number of studies and concept works on the market are increasing. From small to large companies, who think that the future of these platforms are hopeful are working to enrich the capabilities of these platforms.

FUTURE RESEARCH DIRECTIONS

Think about this; 80% of specialists characterise themselves as deskless employees, yet functional applications for big business programming are embarrassingly dreadful (Leman, 2017). Most enterprises organize items for work area programs first—and, tragically, their portable contributions are a reconsideration. Employees once in a while download endeavor applications on their own cell phones, making an enormous botched chance for employee to associate and be beneficial through the gadget they want to utilize.

The move to versatile is greater than the essential vehicle for representative commitment changing from PC to smartphone/tablet; Forrester says that “like the move from mainframes to client/server or from client/server to the Web. Development leaders need to understand how customer adoption of mobile computing is changing business models and requiring a new class of software: systems of engagement.” (Kate Leggett, Stephen Powers, Ian Jacobs, Maxie Schmidt-Subramanian, Arelai Ephraim, and Peter Harrison. 2016) These frameworks of commitment enable organizations to give their clients, accomplices, and employee with more control — all with the development of setting mindful and smart applications.

Forrester Analyst Kate Leggett composes that in 2015, client benefit experts “will explore new communication channels such as video chat with screen sharing and annotation as well as remote control of customer devices to perform tasks on the customer’s behalf.”

Implementing hands-on services like video chat and remote control of client devices, make client communications more personal and efficient. By enhancing the nature of the innovation your client benefit reps use, you empower your employees to give increasingly essential admiration and manage a superior Customer Experience.

Imagine AI pulling together essential data about work applicant diagonally over resumes, computerized profiles, and the sky’s the limit from there. These are on the whole assignments that can be mechanized. By enabling our PCs to deal with the simple, ordinary errands, employees will have the capacity to concentrate on higher gauge assignments that drive more an incentive for the business.

While the representative experience is without a doubt at a depressed spot, a superior future is coming. Programming will turn out to be increasingly customized and mobile, workspaces will be helpful for both focus and coordinated effort, and AI will enable employees to be exponentially progressively beneficial. The organizations that refine later on will be those that are as of now putting resources into these activities. In the event that your company is not, there is no preferred time to begin once again today.

Overall, the underlying future is first to motivate organizations to capture it, to comprehend it and to begin making interests in it. The longer-term future of it is

Connected Employee Platforms

in the long run use information and AI to have the capacity to make more altered encounters. So to have the capacity to know each and every representative within our organizations and to have the capacity to use information and AI to make and create customized and modified meeting for everyone who works there.

CONCLUSION

The work environment is changing, obscuring the lines between employee and innovation, while in the meantime associations are moving their concentration from consumer loyalty to that of the employee. Welcome to the period of the Employee Experience (EX).

As indicated by a 2015 Gallup consider, 37% of employees have worked remotely at one point in their profession. In a related improvement, CNN says that as of May 2017, 34% of the American workforce was doing “gigs,” described by transient contracts or independent work, rather than lasting employment. This is uplifting news thinking about that free specialists are normally progressively drawn in, self-governing, and synergistic.

It is essential to recognize the diverse needs of a deskless workforce and to try endeavors to connect with them regardless of where they are. All-purpose specialized instruments—including applications, content informing stages, push notifications, and web-based technologies—empower you to associate consultants and non-work area laborers crosswise over offices and areas. Supporting employee on their cell phones will create a more conspicuous network concerning employee correspondence and efficiency—including on the web gatherings, preparing, and video learning.

Because of the tests and examinations carried out because of these studies, it was observed that:

In addition, after the end of this article, the company’s other earnings are as follows;

- The duration of the daily operations of the employees was shortened,
- the satisfaction of the employees increased
- the errors in the works performed decreased.
- Besides, empowering your workforce to draw in with individuals and data wherever they are and at whatever point they pick is a characteristic creator in the easily focused market for pulling in the ability important for your business to advance.

Furthermore, companies should likewise empower representative socialization. In the time of online life, every stage enables clients to convey and connect with people in a variety of ways. Utilizing a connected life stage brings an incredibly

favorable position for a company. Employee will feel they have to a greater degree a voice and try to connect more than with usual email. Online networking raises the craving to share an interface and will result in more outstanding learning, sharing and joint effort among employees. Opening the methods for correspondence between employee makes the opportunity to utilize the stage most appropriate for explicit prerequisites.

To conclude, when examined the usage results and effects on employee satisfaction of the case study mobile application, it is obvious that to see the difference before and after using this application. The first place result is, making most of the processes for all departments and employees. Hence, integrated solutions to interval systems in this application reachable from outside the office network, particularly managers can respond to approval requests with less than 5 click. Secondly, after focusing on an Employee Experience, employee commitment started to increase rapidly. Personnel realized that they are worthwhile for their companies and sensing they can be connected to other collaborators by not only emails or phone calls, for instance socializing on blog pages.

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Chapter 6

The Role of Artificial Intelligence Within the Scope of Digital Transformation in Enterprises

M. Hanefi Calp

Karadeniz Technical University, Turkey

ABSTRACT

Digital transformation, which is the beginning of a new era, and performed in order to provide a more effective service, has become a compulsory situation for the enterprises that take into account the increasing corporate volumes. However, the processes and technologies used in this transformation may change according to the enterprise volume and needs. At this point, activities that implement artificial intelligence technologies will make significant contributions to digital transformation. Artificial intelligence technologies serve many purposes such as search, reasoning, problem-solving, perception, learning, estimating, analytical thinking, optimization, and planning. The purpose of this chapter is to demonstrate the effects of artificial intelligence techniques on the processes of digital transformation utilized in enterprises by considering the difficulties experienced in the realization of digital transformation. It is expected that the study will provide a perspective for other studies on digital transformation and thus create an awareness.

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INTRODUCTION

Nowadays, the findings obtained show that the real world is rapidly digitized when the researches in digitalization topic and the statistical results in global digitalization are investigated. Digital transformation is generally the ability of organizations to provide more effective and efficient services, in line with the opportunities provided by rapidly developing information and communication technologies, and changing social needs. Within the scope of digital transformation, analog recordings are processed in a digital environment by transferring the processes that realized in the enterprises to digital media with the support of technologies such as of industry 4.0 components (smart factories, cyber-physical systems, internet of things, big data, autonomous robots, simulation, system integration, cloud computing, augmented reality), digital media, Artificial Intelligence (AI) and internet, and thus automation is provided. Today, all corporate assets and stakeholder relations are largely transferred to digital media. Thus, organizations can always make their automation more efficient with new technologies and improve the digital technology experience they use to deliver services (Bohnsack et al., 2018; Hanelt et al., 2015; Kamalipour & Friedrichsen, 2017; Gimpel & Röglinger, 2015; Morakanyane et al., 2017; Westerman et al., 2012b; Fitzgerald et al., 2014; Piccinini et al., 2015; Liu et al., 2011; Tas et al., 2017).

The digital transformation of economic processes, transactions, and human interactions are transformed into an inevitable mega-trend in unexpected ways with each passing year, and it is still at the initial level. Digital transformation has become a necessity with demographic changes, reduced availability of resources, increasing international competition and globalization of markets (Marquardt, 2017). At this point, digital transformation brings new features to the applied management strategies and plays an important role in the correct and fast decision making of business managers. However, businesses should follow innovations in digital transformation and update themselves in line with business strategies. Because digital innovations lead to new opportunities that were not possible before in management strategies. The technologies to be used in the digital transformation process also change with the rapid change in the business environment. The effective determining of these technologies bring to organizations significant advantages and opportunities such as transformation, earning, creating value and protecting their competitive advantages. Businesses must systematically develop their digital capabilities and resources to take advantage of these opportunities and respond to potential threats. The digital technologies determined in accordance with the enterprises provide better communication between different stakeholders; this turns leads to increased cooperation, quality and success in digital transformation (Hyvönen, 2018).

Managers who face the need to protect their competitiveness in enterprises must develop strategies, methods, and techniques that adopt the effects of digital

transformation and provide better operational performance, and carry out these activities in full. Otherwise, they will be doomed to disappear in the evolving digital world (Morakanyane et al., 2017; Fitzgerald et al., 2014; Piccinini et al., 2015). In this context, AI techniques are used in almost all areas for different goals (Calp, 2011; Sahin et al., 2011; Erkalan et al., 2012; Sahin et al., 2014; Edwards et al., 2018; Calp, 2018; Calp & Akcayol, 2018; Dener & Calp, 2018; Brynjolfsson et al., 2018; Elkatatny et al., 2018; Méndez-Lucio et al., 2018; Qi et al., 2018; Calp, 2019). There are two main reasons why AI is so fast in the context of solutions: The first reason is that this technique can successfully solve problems that cannot be solved. The secondary reason is that it can provide very good solutions to the problems that cannot be solved by classical methods in the effective and efficient level. For these reasons, AI has become preferable in application processes (Köse, 2017).

As a result, AI techniques, which have correct and fast results in solving difficult-to-solve problems, will play an active role, especially in digital transformation processes. In the light of all these explanations and given the difficulties of creating and administrating of digital transformation, the motivation and aim of this book chapter can be expressed as “to demonstrate the effects of AI techniques on the processes of digital transformation utilized in enterprises”. In this study, the digital transformation process and the difficulties experienced in this process, the brief information about the AI techniques and properties, and the effect, the role and the contribution of AI techniques on digital transformation processes were given respectively.

DIGITAL TRANSFORMATION

Definition of Digital Transformation

Two concepts come to mind about Digital Transformation. The first concept is that printed materials (text, image, sound) called “Digitization” processing and converting them into digital versions by computer. The other concept is “Digitalization”, that is digital transformation. Digital transformation is a strategy to do this rather than converting a material into digital versions, and it is the transformation in a business model. Therefore, it is not possible to talk about digital transformation without the digitalization of materials and processes. In this respect, it can be said that digitalization, ie evolution, is a prerequisite for digital transformation (Aybek, 2017).

In recent years, digitalization has shifted the economy to a software-controlled economy and become an essential part of the information technology sector and society. In this context, digitalization or digital transformation is discussed in many platforms such as the Internet of Things (IoT), robotics, automation, big data,

mobility, and others. Digitalization, with the shortest definition, means converting analog information into digital information (Foerster-Metz et al., 2018). According to another definition, digital transformation is described as the usage of technology to radically develop the performance or access of enterprises. Digital transformation is defined as the application of digital technologies to transform society and institutions in all respects (Heavin & Power, 2018; Westerman et al., 2012b; Gruman, 2016).

Since the mid-20th century, digitalization technologies have transformed traditional media such as signal, sound, image or video into bits and bytes of computer storages. The figures published by BMWi (2016) demonstrate that the digital information capacity has risen dramatically, in 1993 it was only 3% and in 2007 it reached 94% of the world's information (Figure 1) (Foerster-Metz et al., 2018).

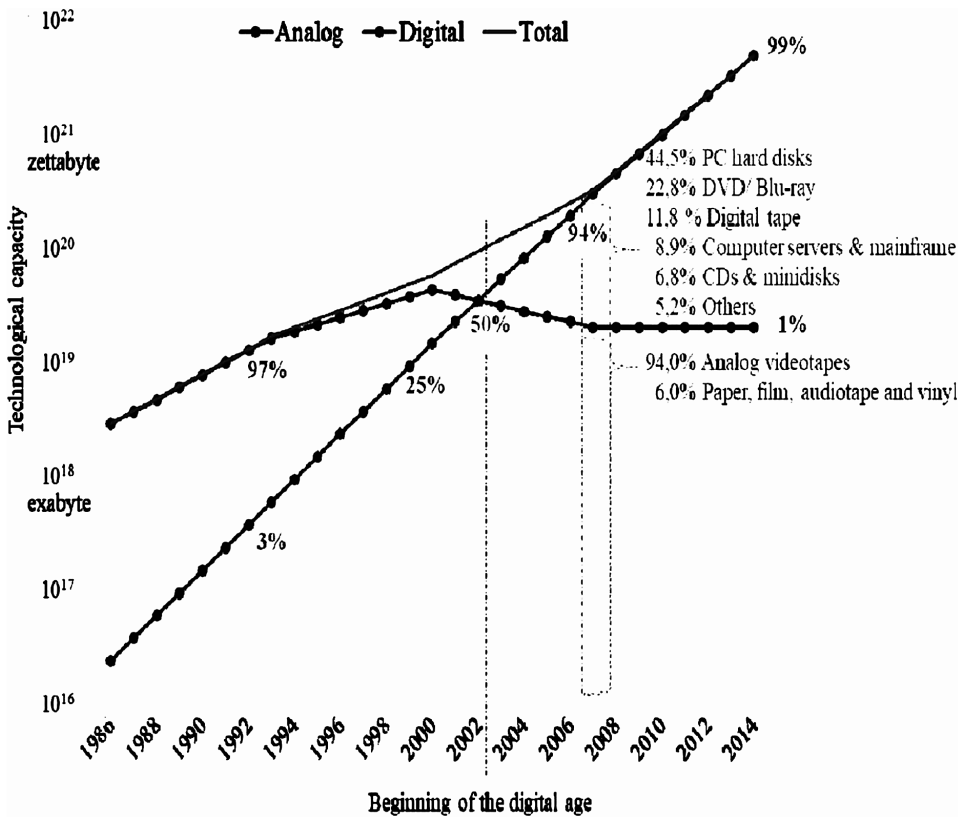
The digital transformation that allows information to be perceived, collected, managed, allocated, distributed and used plays a facilitating role in business transformation through tasks, information flows, knowledge and culture. Researches emphasize the role of IT in re-designing business processes, in particular by organizing the flow of information, obtaining and disseminating the information, arranging, tracking, analysis, evaluating and decision-making (Heilig et al., 2017; Venkatraman, 1994; Davenport, 1993; Guha et al., 1997).

Digital Transformation in Organisations

Since the 1950s, digitization and digital transformation have been realized in organizations. In the years 1943-1958, vacuum tube computers led to transformations in activities such as accounting, transaction processing, and decision support. The benefits were not so much due to technology limits and constraints. In the 1960s, some production robots were seen more transformations such as online operation processing and duration sharing. In the mid-1970s, the personal computer reform was starting. The espousal of computer technologies during the 1980s was accelerated. In the 1990s, technology possibilities such as data storages, global internet, local area networks, digital data storage, and digital phones were reached. In the 2000s, affordable mobile faster parallel processors, distributed computing and storage, and digital cellular networks were realized. Storage of digital data and computing skills raised too much in early 2010. Corporate applications provide for machine learning, modeling, speech recognition, AI applications, real-time monitoring of analytical technologies, digital assistants, predictive analytics and distributed decision support (Heavin & Power, 2018).

Digital Transformation is described as the use of technologies to essentially improve all aspects of the community. This means transforming decision making with technology for businesses. The percentage of institutions involved in digital transformation is expected to double by 2020. However, digital transformation is

Figure 1. Development of the global information storage capacity (Foerster-Metz et al., 2018; Hilbert & López, 2011)



still ongoing in many institutions. The key factors of digital transformation in an organization in terms of business are developing customer behaviors and preferences, growth opportunities in new markets, new standards in regulatory and compliance, and increasing competitive pressure (CellStrat Editor, 2017).

In the process of adaptation to the digital age, it is a fact that businesses can prevent them from lagging behind in this process of change by making the right moves and that the needs can be responded to more effectively. In this context, the points that businesses should take into account can be listed as follows:

- Digital transformation should influence the organization in every way. Digitalization is not just the use of information technologies. Technology only prepares the ground. Some organizations initiate programs in the management of information technologies in order to accelerate this transformation, but very few of these transformation programs, which are initiated without realizing

the important role that digitalization plays throughout the organization, are efficient. The IT department should be involved in the transformation process. However, this should be done by making good planning on which technology will be more efficient in the field, by creating support units and converting them into sustainable applications.

- Digital transformation should cover all the vision and strategies of the organization. The vision and strategy clearly laid out by the management is the basic element of the change program. In the initial stage of technological transformation, the employees of the institution should be aware of the objectives, areas of use, and the roles of these technologies in their access to the learning outcomes with these technologies. All stakeholders should be aware of this transformation in a transparent manner and why, how and who will contribute to this transformation should be clearly understood from the beginning of the process.
- One of the most important prerequisites for digital success in the digital age is to provide the necessary training for transformation to all needy people with the best opportunities when making the necessary investments. Throughout the business, staff should be provided with training on digital technologies and technical support networks should be provided and this incentive should be made sustainable. The holistic point of view is important in this process. This transformation will not take place at a time and there is no specific point to end this transformation. This transformation process should keep going continuously with the new technologies brought by the digital age. Employees should be encouraged to implement new technologies and flexibility should be ensured throughout the organization.
- A digital transformation approach should be adopted not only as a digital transformation that will shape the internal structure of the organization but also as a design that can meet the needs of customers outside the organization. In this process, external suggestions, criticisms, and feedback should be taken into consideration. Feedback should be continuously taken from formal and informal social media groups, by surveys, discussion forums, questionnaires, and it evaluated for change (Taskiran, 2017).

Strategies of Digital Transformation

There are components of digital transformation strategies regardless of industry or business. These can be expressed in four basic dimensions: ***the use of technologies, changes in value creation, structural changes and financial aspects***. *The use of technologies is to address the attitude of an enterprise to new technologies and the using skills of them.* Therefore, it includes the strategic role of an enterprise for IT

and technological purposes. A firm should decide whether it wants to be the market head in issues such as to need for creating its own technological standards in terms of technology use and to see technology as a means of performing business operations. Leadership in the technological market can lead to competition and dependency on other companies on technological standards. However, this situation may be riskier and require some technological competences. Utilization of new technologies generally means changes in value creation from a business perspective. They show how digital transformation strategies have an impact on firms' value chains. Digitization of products or services can even provide different strategies for moneymaking and business arrangements in terms of new markets or customers. Structural changes are generally required to ensure a sufficient basis for new transactions with forms of value creation and various techniques/technologies in use. *Structural changes* vary according to changes in the organizational installation of a firm, particularly with the settlement of new digital activities in institutional structures. If the scope of the changes is rather limited, it may be more plausible to application new operations into available institutional structures. But, it may preferable to create another affiliate within the company for more important changes. However, the previous three dimensions can only be converted after taking into account the financial aspects. These contain the urgency of a firm to take action due to declining core business and the ability to finance the efforts spent on digital transformation. *Financial aspects* are a limiting force for transformation. Companies under financial pressure may be deprived of extrinsic means of financing a transformation. For this reason, firms should make digital transformations and discover their options in a clear and well-timed manner (Matt et al., 2015).

Challenges of Digital Transformation

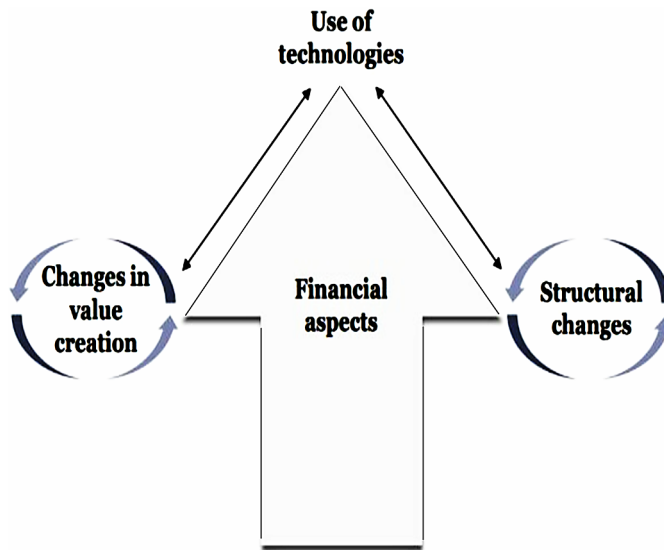
Most businesses realize the appropriate digital transformation as a core strategy for competition and survival. Managers reported that their businesses digitally transformed three key areas: operational processes, customer experience, and business models. At this point, there are some difficulties in the process of digital transformation. These difficulties can be summarized as follows (Westerman et al, 2012a).

Priorities

The first quandary is whether rising the efficiency or performance of existing operations is a priority, or whether customer and meeting needs are the focus. Two missions may be discordant and focusing on efficiency may decrease the pleasure and loyalty of the customer, and the purchases (Tiersky, 2017).

Figure 2. Digital transformation framework: balancing four transformational dimensions

(Matt et al., 2015)



Aggregate Data or Personalization

Emphasizing the prediction of customer behavior may lead to ignoring model searches and serving individual customers. While meeting needs often require personalization, too much accent on customer categories leads to personalization. Normally, business managers will be mind to the interests, requests, and needs of customers and employees, understand the individual and serve to them (Tiersky, 2017).

Supplying More Resources to IT Staff for More Equity Analysis

IT staff and non-IT employees desire more resources. In this point, more data scientists and IT staff require more education and resources compared to manager and staff in functional fields (Panetta, 2016).

Storing All Data

All data can be stored at a charge. It is much more difficult to understand which data is selected and useful for analysis. It is even more difficult to index data sources and evaluates data quality while finding opportunities to bring data sources together.

Data is both an opportunity and a problem. Unused or unavailable data are worthless. Therefore, it is very important to select data that serve a specific goal (Tiersky, 2017).

Work Implemented by People

IT machines and robots will keep going to replace unqualified and semi-qualified personnel. The continuing transformation, including Question / Answer bots, assistance, and decision automation, suggests that qualified personnel can also be replaced (Newman, 2016; Davenport & Kirby, 2016).

Security

It may be easy to access and use data or enforce. Administrators should balance the importance and sensitivity of data with accessibility concerns. This is actual indecision in the field of health (Filkins et al., 2016).

Privacy of Individuals

Although digital transformation has difficulties, current studies suggest that digital fact is a chance to renew and re-identify the work way of organizations (Bharadwaj et al., 2013).

ARTIFICIAL INTELLIGENCE

The first to introduce the concept of AI to the literature was John McCarthy. McCarthy (2007) defines this concept as intelligent machinery making science or engineering. Nabyev (2012) defined a computer or a computer-controlled machine, generally assumed to be man-made attributes such as reasoning, meaning extraction, generalization and learning from past experiences as high mental expressed the ability to perform tasks related to processes. Many alternative definitions can be reached when the literature is examined. Firstly, the concept of AI, which was introduced to the literature in an event in Dartmouth, USA (McCarthy et al., 2006:1955), was based on imitating the way people think and behave. But, over time, all kinds of dynamic that can be put into logical and mathematical patterns within the framework of intelligent mechanisms in nature have been taken into account within the scope of this field. According to Chuck Williams, AI is a multidisciplinary field that aims to automate activities that require human intelligence (Williams, 1983).

It is the sub-research area of computer sciences, which works on the simulation of human thought and behavior and natural dynamics in computer-based systems

when the AI is defined as a research area. It is that natural dynamics by human thought and behavior forms are fulfilled as much as possible by computer-based systems when it is necessary to define as an abstract concept. AI has developed in a short time with effective solutions to real-world based problems, especially in different disciplines. It is able to offer its solution to any problem that can be expressed in the logical and mathematical plane. They have presented successful solutions for different AI approaches, methods, and techniques which developed over time, advanced mathematical analysis, prediction - prediction, pattern recognition, audiovisual recognition and identification, adaptive control and interpretation - diagnosing (Allahverdi, 2002; Aydın, 2013; Elmas, 2011; Nabiyeu, 2012; Strong, 2016). This situation has caused the field to be in demand by all disciplines. It can be stated that AI has gained widespread use in the name of automating many activities in our daily life, not only in the scientific solution of interdisciplinary specific problems. Progress has reached such a point that it has often become controversial whether intelligent systems will bring about the end of humanity, whether working individuals will cause them to lose their jobs (Brougham & Haar, 2017; Brynjolfsson & McAfee, 2014; Makridakis, 2017; Niewiadomski & Anderson, 2017). Hence, AI has developed significantly in recent years and has entered every aspect of life. The complex problems can be solved by using AI and many processes such as classification, optimization, estimation, and image recognition can be carried out (Agrawal et al., 2018; Brynjolfsson & McAfee, 2014; Cockburn et al., 2018; Brynjolfsson et al., 2018). A computer is not capable of recognizing emotions and placing them in real situations. Therefore, it is almost impossible to convert some sub-components that make up human intelligence into a system. However, AI is more of a research field, dealing with some aspects of human intelligence in computer science, such as speech recognition, interruption, interference, creative behavior, the ability to learn from personal experiences, computer skills, and the ability to draw conclusions from incomplete information (Tohănean, 2018). However, AI can also be distinguished as strong AI and weak AI. Powerful AI is described as a general intelligence in the meaning of creating human-like intelligence of machines; the weak AI purposes to ensure intelligent techniques/algorithms in a place stored within the software (Hanne & Dornberger, 2017).

Stuart J. Russell and Peter Norvig further divide AI into four categories: *Systems that think like humans*, *Systems that act like humans*, *Systems that rational-thinking* and *Systems that act rationally*. Act like a human being is important for AI while interacting with people. In the category of thinking like humans, historically, AI is designed in a way similar to the thinking patterns of the human brain. Nowadays, AI is used to evaluate decisions made by people. The systems that rational-thinking and systems that act rationally include logic-based decision-making processes. Accordingly, the problems should be simplified and defined in a logical representation.

In a complex environment, the solution provided by AI may not be perfect, but it can be at least at an acceptable level (Russell & Peter, 1995). The system should generally have a good knowledge of the areas of application in order to create systems thinking or acting like human beings or to act rationally. It can learn the necessary subjects or is trained on example data when applied as AI or neural network. Once activated, the AI can resolve the problems based on specific search algorithms by integrating present information with a new point of view and making decisions that information is unclear (Exner-Stöhr et al., 2017).

THE ROLE OF ARTIFICIAL INTELLIGENCE IN DIGITAL TRANSFORMATION

Nowadays, the spread of the Internet, the development of sensors, big data, and e-commerce, the increase of the information society, the integration of data and information into society, physical space and cyberspace have led to the rapid evolution of the digital world. This evolution process has led to the emergence of new technologies such as AI and to be used in areas such as digital transformation in order to get results that are more effective. The importance of AI is clearly recognized when considering the purposes of digital transformation and the scope of technologies used in this process of transformation (Li et al., 2017; Pan, 2016). The rising of AI requires a novel combination of man-machines, offering a division of labor between machines and people. The common view among partnerships between people and machines shows that machines need to take on ordinary tasks and enable people to take care of studies that are more creative. Although AI ensures for people to accomplish complexity with a successful analytical approach, the role of decision-makers to deal with the instability and uncertainty of decision-making is indisputable. AI is superior to humans in fulfilling some quantitative objectives with calculable criteria by reducing the complexity of problems. People will perform better than AI at handling subjective (personal opinions) and qualitative issues (e.g. norms, non-material political interests, and other complex social factors). The cognitive technologies such as AI can absolutely assist, but strategic thought, especially, requires a level of meaning and understanding of the world except for certain decision environments where people are competent (Jarrahi, 2018).

AI has high technology and is the development of computer systems in order to fulfill the tasks requiring that require human intelligence. At this point, AI helps the functions involved in digital transformation processes by modernizing enterprises' communication centers, business models and processes. AI is also used in many processes such as data acquisition, analysis, and estimation. These processes take part in innovations such as virtual agents, identity analysis and suggestion systems that

have previously transformed the way businesses look at staff experience in various sectors. It helps machines to analyze and process people in similar ways (Jadhaw, 2017). The use of AI in businesses' digital transformation processes is not limited to them. AI helps manage staff or customer interactions by using information from the service areas provided by operating personnel and from a series of observations. It is used in many sectors to provide automation. The most important step in incorporating AI into a business is to make it the trained. This will help them to understand areas of where and how to use a particular AI technology (Soni, 2018).

Data is the most important tool for effective AI. The more data on businesses and entrepreneurs affect more efficient decisions through automation. Enterprises process large amounts of data to meet compliance and regulatory requirements. These procedures or processes are increasingly formulated, but the performing a repetitive task of a large number of people ensures that they become candidates for robotic process automation. In its digital transformation journey, AI transforms the most central functions such as inter-business agreements and earnings reporting and has the potential to participate in more strategic tasks such as financial analysis, estimating and asset allocation. AI ensures speed and accuracy for almost all processes of businesses. For example, the entire reporting process can be performed in real time. Instead of waiting for the end of the process to be performed, the AI can detect problems beforehand and can make some adjustments much faster, improve accuracy, and eliminate the effort spent on negative results of the process. As businesses realize the digital transformation process, they must use the power of AI to simplify and automate the most basic business processes. Thus, they develop more effective and innovative strategies to expand their digital transformation (Jadhaw, 2017).

In addition, businesses should develop a strategy map before using AI technology in the digital transformation process. Staff also need to be trained in AI technologies. Because digital transformation from a technical point of view does not provide the benefit that the business will derive from this transformation. Therefore, staff should have enough knowledge about AI technologies, monitoring skills, management, and management environment, data science while the digital transformation continues. Digital conversion increases the speed of AI. Therefore, businesses should ensure that all of their staffs understand how the use of AI in the digital transformation process can affect the business and make it strong enough to compete with other top-tier businesses. For example, to personalize communication with staff, customer, and potential customers; to make all processes more streamlined and unique to prove virtual support; to estimate repair and maintenance needs; to provide service support to fill process gaps; to identify risks in the supply chain, and to fix the data errors. Today, the most important business objectives of business managers are better customer relations, competitive advantage and increased productivity. This can be perform much more effectively with AI in the digital transformation. The role of

the manager in business has altered evidently in the era of digital transformation, particularly with advanced technologies such as AI and machine learning. For this, managers need to redesign their business processes, use skilled labor, and utilize the latest technologies to maximize the benefits of organizations' digital transformation efforts (Soni, 2018).

AI is the recent trend of digital transformation, due to its continued use and its successful use in influencing decisions when combined with large data. The most common example of the use of artificial transformation in digital transformation is the implementation of a chatbot that can answer questions to people in a human and intuitive way. Some examples of effective chatbot can be seen here. The data is the basis of AI in the business world. Organizations should continue collecting data because of need much data according to past. At the same time, it is important to convert data into real actions. This is possible with automation and AI. Modern digital transformation is handled together data analysis, AI and customer obsession (Cruce, 2018).

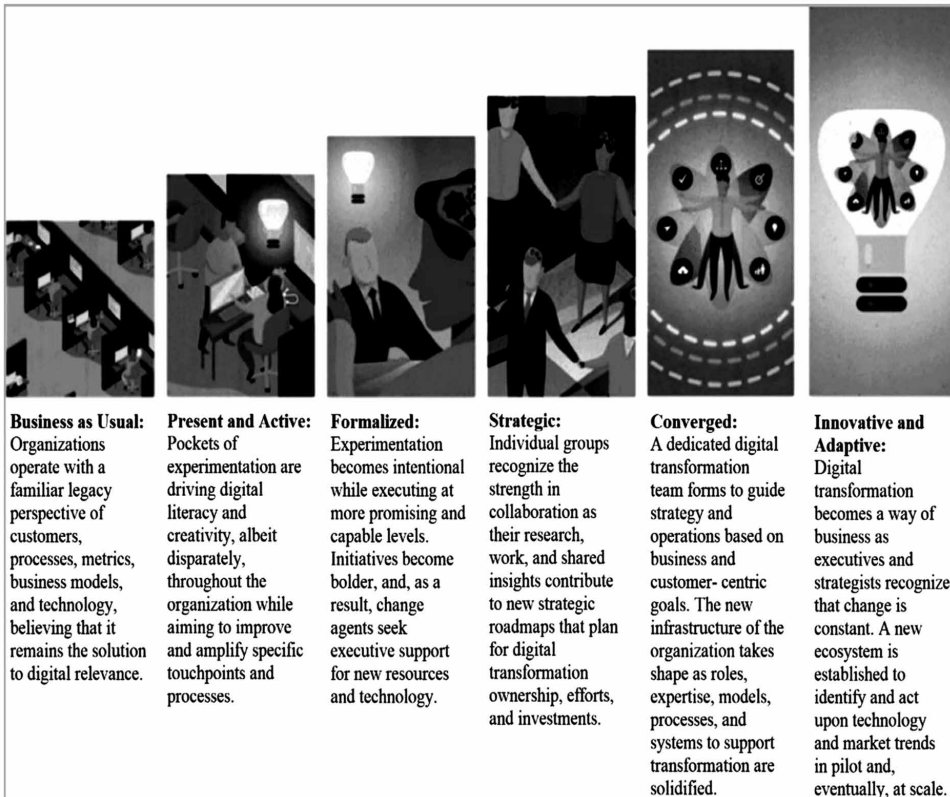
At this point, the use of AI techniques in digital transformation processes plays a very important role. AI not only improves customer experience but also has the power to change the way companies operate. Therefore, businesses should consider integrating these technologies into their digital transformation plans to remain competitive. For example, AI can be used for account management and customer service systems across sectors. Here, the benefit is not only to produce more but also to decide more quickly. Gartner predicted that by 2018, machines would write 20 percent of business content (such as shareholder reports, legal documents, and press releases). AI tools will help companies learn in ways that will accelerate innovation and will be an aid to approach targets for companies. Many companies are already using AI tools to personalize customer touches in their digital transformation work, and have begun to replace call center employees with bot-based customer service centers. In recent years, companies have only saved billions of dollars in salaries by distributing bots on customer service. The different approaches should be explored in the application of AI technologies in order to integrate AI-Digital Transformation efforts, and the best choice for the enterprise should be determined. In addition, it is necessary to make sure to large datasets for the creation of algorithms, to trained manpower in AI technologies, and to access data scientists (CellStrat Editor, 2017).

As the digital world proceed to utilize the physical world, the scope of digital transformation in businesses is growing even more. In the coming years, many sectors will be managed by AI technologies. AI is a major driving force of digital transformation in many sectors, such as automotive industry, insurance, and manufacturing. It does not include a great deal of potential for this technology to exchange business strategy into an actual customer-focused model, but business managers are more aware of the need for AI technology every passing day. The causes

of this situation are clear and understandable. It compared to existing data, it can be started to provide better experiences for modern consumer needs, which enable them to be understood with more data, and technologies that are more meaningful. AI offers a scalable, highly efficient way to fulfill this promise. It is unfeasible to discrete the digital transformation application from AI. It should be examined more deeply to reveal specific AI applications that will have the maximum effect on digital transformation. In fact, business owners and managers are aware of the importance of AI; however, it is important to implement AI in digital transformation strategies. Any successful digital transformation effort takes place by changing the mentality within an organization. It is necessary the new internal models that allow people to cooperate between functions to influence this change. These models should provide fields such as marketing and IT to work together smoothly. The level of technological complexity is increasing while moving from a digital project to a core business value. Each field must know and internalize the importance of AI, but many people or institutions do not unaware of the existence of AI's presence in the sector. Research shows that business managers are not sure whether they are currently using AI. Digital transformation is based on novel models and novel strategies of working, but company managers should also explore their existing technologies to expose their likely AI practices. Many businesses say that is customer oriented, but this does not seem to be the case, and a great effort is required. This effort becomes more effective by combining processes with AI technologies. By using large warehouses of historical data owned by companies, it is possible to use predictive analytics to understand the customer journey and reflect the results of future interactions with the brand. In a more effective organizational framework as part of the digital transformation process is most important the use of AI technologies in order to provide real customer orientation. The system is automated to create reproducible and reliable functions that can be used by everyone by using AI technology. Rather than seeing AI as a threat to employees in enterprises, most senior managers say that AI can manage the laborious aspects of the processes and work with personnel to achieve better results. This relationship between people and technology can be quite fruitful, but the responsibilities of certain tasks should be defined. AI technologies can analyze data on a conceptually scalable scale and learn from real-time feedback to adjust how it works. This could, for example, ensuring of employees to focus on the strategic vision of their campaigns. Thus, automation is not only about performing tasks that computers would prefer not to do; automation is related to performance. AI can implement these tasks in order to provide better experiences for customers and realize in a more successful and cost-effective way by revealing new insights in the process (Yu, 2018).

Digital transformation helps to create and optimize new capabilities by taking advantage of new and emerging technologies. However, the digital transformation

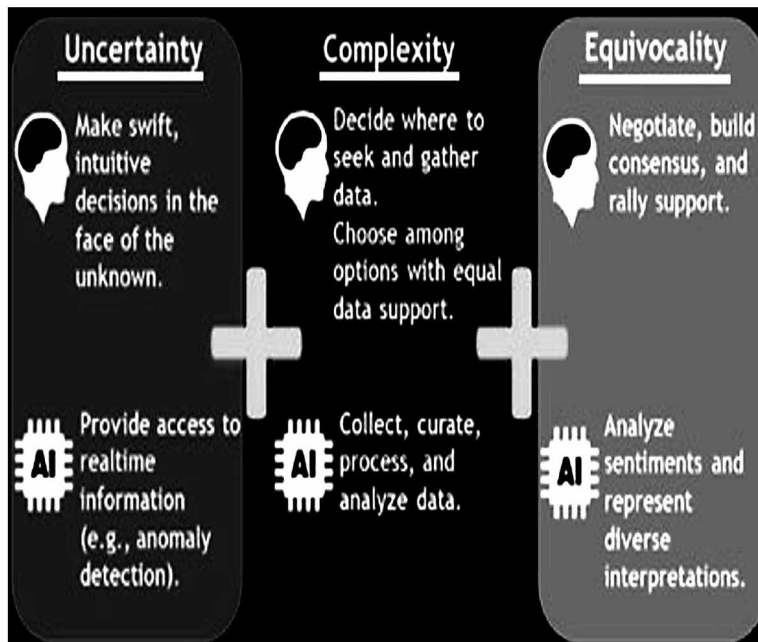
Figure 3. The six stages of digital transformation
(Yu, 2018; Solis, 2016)



journey needs a progressive approach with an open roadmap. AI also helps to guide this connected strategy, in which systems that restricted for developing high-level designs, architectures, and plans are shifted to media and content. The ability to fine-tune operational operations for business or production is now applicable to everyday consumer products such as smart homes, intrusion security, and autonomous vehicles. AI should be implemented to meet the needs for faster and better visualization of the generated content (Paulsen, 2018).

Although intuitive capabilities are the basic advantage of human in decision-making, they still require developing analytical skills. In this point, the supplementarity of humans and AI in decision-making characteristically described by uncertainty, complexity, and equivocality (Figure 4). People should develop a tactic of how analytical decisions are done by cognitive technologies and work on how to integrate the analytical skills provided by these technologies into organizational phases. Actually, the basic factor that aids people to rely on and interact more efficiently with

Figure 4. Comparison of humans and AI in decision-making (Jarrahi, 2018)



intelligent technologies is to know how these technologies are formed by analytical decisions or suggestions (Jarrahi, 2018; Davenport & Kirby, 2016).

Transparency of the human-AI process increases human-AI interaction and offers a chance for people to develop analytical capabilities. Digital transformation-building strategies should reorganize business and decision-making around human or artistic talents for adopting AI's promises. An effective AI strategy should build existing strategic powers and detect what AI and knowledge workers can complement each other. For example, General Electric (GE) has undergone a major digital transformation in the past. In this context, GE has been able to utilize AI to produce information technologies by detecting large amounts of data (such as gigantic systems) generated by a large number of industrial devices. One of the most important results is the optimization of the decisions made by more effectively understanding how the technologies or hardware is operated. Businesses can develop the most feasible solutions to integrate AI into their service lines (Jarrahi, 2018; CIO Network, 2017).

The use of AI in digital transformation means the transformation of the system into an intelligent product. AI application in the smart product field can be evaluated in three aspects: application technology, industry, and application impact. Infrastructure installation level and capacity, single applications, synergy

applications, and business development needs should be evaluated with application technology. The evaluation of industry development includes the development of smart products, intelligent industrial software, and hardware supporting intelligent design/production/management. It is recommended that the assessment focus on changes in social and economic benefits, competition power in order to evaluate the direct or indirect impact of the intelligent production system on the implementation of the capabilities and economic advantages for implementation impacts (Li et al., 2017).

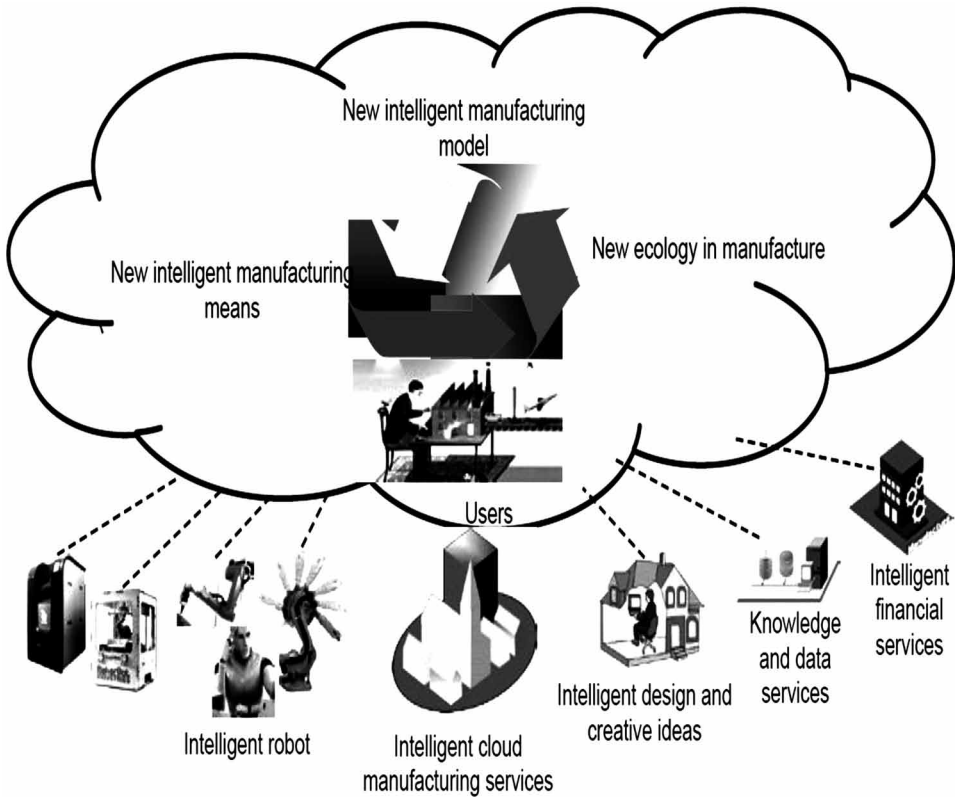
AI simplifies the development of intelligent production. That is, this technology facilitates the improving of novel models, techniques, applications, system architecture and systems containing technology in the field of intelligent production (Li et al., 2014). At this point, new models are flexible, customizable, service-oriented, internet-based, collaborative, and socialized intelligent production system that is used to simplify production and ensure service to users. New tools are digitalization, Internet of Things, virtualization, service, collaboration, personalization, flexibility and intelligent production systems that integrate human-machine. The new format is an ecology of intelligent production with interconnectedness, data loyalty, automation-based intelligence, cross-border integration, and massif innovation. This means the deep integration of the implementation of the models, and the forms will finally form a smart production ecosystem (Figure 5).

As a result, the use of AI in digital transformation processes in enterprises is very important. The use of these new technologies contributes significantly to the organization, managers and service providers.

CONCLUSION AND RECOMMENDATIONS

In this study, the effects of AI technologies on Digital Transformation processes are discussed. At this point, the use of AI technologies in digital transformation processes to improve the performance or access of enterprises were proved a very effective technique. However, in each day's growing information systems, enterprises have bigger data and they have to manage these data. Management of large-scale enterprise data is quite difficult with traditional methods. However, it will be much easier, efficient and low cost to manage these data by using AI techniques to achieve the objectives of classification, clustering, and optimization. In other words, managers will be able to make more effective and more accurate decisions with the use of AI techniques. In addition, enterprise data must be stored in a storage to save and recall them. This requires a considerable cost. Therefore, AI techniques can be used in such subjects as to which data will be stored, recalled or analyzed, and how much capacity will be needed in the future.

Figure 5. The elements of intelligent manufacturing (Li et al., 2017).



Digitalization has shown that it greatly changes the workforce, the skills needed and the way to communicate and cooperate. AI and digital transformation go hand in hand, but a harmonious effort is needed to maximize the potential of this relationship. Digital transformation needs new structures, new technologies and, most importantly, a new mindset about the customer. This is possible by revealing new insights such as AI, creating personalized experiences and improving the capabilities of marketing departments.

Finally, digital transformation, which is realized or planned by enterprises, affects the business process in many ways. Therefore, it is necessary to make good planning on which technology will be more efficient in the field, how to create help and support units and how to be transformed them into sustainable and lower cost applications in order to make digitalization effective. However, the digital transformation should cover all the vision and strategies of the enterprises. In addition, in the initial phase of digital transformation, enterprise personnel should be informed about the vision

and purpose of the implementation of this transformation. It should be clearly known that why, by whom and how this transformation will take place by all the stakeholders in enterprise-wide from the beginning of the process.

In summary, the digital transformation should not only be seen as technological innovation or technological revolution, but also human and processes should be digitized. It is expected that the study will provide a perspective for other studies on digital transformation and the use of AI techniques in these transformation processes and thus create an awareness.

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KEY TERMS AND DEFINITIONS

Artificial Intelligence: The computers techniques that provide to behave like humans.

Decision Making: The action to be taken to reach a conclusion.

Digital Transformation: The developing new strategies and increasing efficiency to ensure competition using digital technologies.

Enterprises: A unit that produces goods or services in a planned and systematic way.

Management: The process of using financial resources, tools, materials and time factor in a coherent and effective manner in order to achieve certain objectives.

Production: The activities done in order to obtain the goods and services that will meet the human need.

System: The whole of the interactive parts that are brought together to achieve or achieve a common purpose.

Technology: Skills, methods, and processes used in the production of goods or services.

Chapter 7

The Potential and Capabilities of NoSQL Databases for ERP Systems

Gülay Ekren
ETH Zürich, Switzerland

Alptekin Erkollar
ETCOP, Austria

ABSTRACT

Today, nearly all possible business activities or information systems in enterprises such as sales, marketing, accounting, finance, customer relations, and manufacturing are carried out through traditional relational database management systems. However, technological, social, and competitive pressures in enterprises coming together with the rapid change in technology and then the problems arising from traditional databases force enterprises to adopt new database technologies. This chapter aims to highlight the main differences between traditional relational databases and NoSQL databases and to present an overview of the concepts, features, potential, problems, benefits, and limitations of NoSQL databases for enterprise information management systems, for especially enterprise Resource Planning (ERP) systems, which have a significant role in digital transformation of enterprises.

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INTRODUCTION

Recently, the development of the Internet and cloud computing are impacted database management systems in especially nonlinear ways. A large amount of data are streaming around the world in different formats (e.g. images, documents, texts, web logs) which cannot be easily modeled, processed or analyzed by traditional methods like relational database management systems (Kaur & Rani, 2013). Many organizations have already changed their single-CPU based relational database management systems to capture and analyze vast amounts of dynamic data. In other words, using traditional relational database management systems has started to be underserved to store and query streaming data. Therefore, it is required to meet the needs of reading and writing such data concurrently as well as accessing and storing them efficiently in higher scalability and availability with lower management and operational costs (Singh, 2015:363).

Nowadays, nearly all possible activities and actions in enterprises such as Customer Relationship Management, Enterprise Resource Planning, Supply Chain Management as well as sales, finance and production systems usually carried out through structural data managed by traditional relational database management systems. However, technological, social and competitive pressures come together with the rapid change in technology as well as the problems arising from the relational database systems built-in enterprise management systems force enterprises to update or transform their data warehousing systems. Moreover, relational databases are well-suited for traditional data analysis such as reporting, classical statistical analysis; however these databases do not fit with big data analytics. Additionally, the need for data storage increasing day by day makes traditional relational databases insufficient, since relational databases have problems in responding to multiple concurrent requests simultaneously. The data stores of the relational databases are usually clustered in more than one field (distributed systems), but in this case, data synchronization problems are encountered. Besides, too much joins and relationships between tables make data access more complex as well as more difficult to implement strict principles in relational databases. In order to eliminate these problems, NoSQL databases which structured as non-relational come into existence by changing some of the parameters of the existing databases including no joins or no complex relationships (Kanwar & Trivedi, 2013: 702-705; Ghasemi, 2013).

On the other hand, NoSQL solutions play a key role for enterprises. Most of organizations have already integrated their enterprise management systems with NoSQL databases to gain competitive advantage in today's marketplace by offering the possibility to work with both structured and unstructured data. Additionally, they can be used successfully to store huge amount of data for enterprise systems (Singh, 2015; Radulović et al., 2016). Since the increasing popularity of big data

technology facilitates the integration of NoSQL database systems into business information management systems. Today, enterprises are investing these innovative technologies and then restructuring their decision making mechanisms based on big data. By force of NoSQL database systems as well as big data technologies, enterprise management systems are significantly improved by real time data processing, as the data are accessible in real time by various groups within the enterprise.

NoSQL database systems are considered a solution for the survival of enterprises in the future. They can be seen a new trend for the enterprises that wants to improve their managing capability and its resources. However, there is a need to discover the potentials and capabilities of NoSQL database systems for management of enterprise systems, and for especially ERP systems that play a crucial role on digital transformation. This chapter aims to highlight the main differences between traditional relational database management systems and NoSQL database systems by covering some of the concepts, features, benefits and limitations of these systems.

BACKGROUND

NoSQL was first introduced by Carlo Strozzi in 1998 as a name for his relational database without SQL interface. In 2009, Eric Evans has used it for the discussion of open source, distributed systems with non-relational databases (Kaur & Rani, 2013; Priyanka, 2016).

The term NoSQL is the abbreviation of ‘Not only SQL’ as NoSQL databases use their own SQL language as well as low-level SQL-like query languages (e.g. Cypher Query Language-Neo4j, Cassandra Query Language- Cassandra, MongoDB Query Language- MongoDB). NoSQL databases developed in the late 1990s provide higher scalability and more performance than traditional relational databases. NoSQL typically used for distributed data stores. They have no relational structures but include semi-structured as well as unstructured data especially suitable for big data storage systems. In order to talk about big data systems, it is necessary to collect at least 100 TB data a year, ready to grow at least 60% every year, and to create scale-out architectures for storing data (Pokorný, 2013).

In recent years, “the NoSQL databases” and “cloud computing technology” are two sides of the medallion. Since cloud computing provides a cheaper storage place for NoSQL databases. Besides, the broad distribution of IT resources of cloud computing systems provides advantages for enterprises such as the processing and analyzing of the high volume of stored data (Liu, Yang & Zhang, 2013). According to McCreary and Kelly (2014), NoSQL databases are not only for cloud computing, as they can also run in any corporate data center. Besides, they are not only open

source; many commercial products use NoSQL concepts like other NoSQL based systems.

NoSQL based systems have better performance than the relational database management systems under a large volume of data (big data). In case big data is an issue for NoSQL approaches, not only volume (scalability) and velocity (speed) but also variability and agility are seen important. Since big data is a term used for large or complex datasets including diverse data types such as structured, semi-structured and unstructured data, and the relational database management systems are inefficient to handle these them (Priyanka, 2016). NoSQL databases can be defined as “*a set of concepts that allows the rapid and efficient processing of data sets with a focus on performance, reliability, and agility (p.4)*”. In this definition, agility refers to how quickly an organization responds to business change (McCreary & Kelly, 2014). Most of the internet giants use NoSQL databases; such as Google- Bigtable, Facebook-Apache HBase, Twitter-MongoDB, Amazon-DynamoDB.

In 2000s, developing community needed to manipulate increasingly growing data generated by web applications. As querying these large amounts of data started to force the designers of relational databases through more clusters of commodity processors, as well as more processors on a single chip. On the other hand, faster processors frequently moved organizations to data management problems since many organizations considered to move away from the relational database systems to the NoSQL systems due to the such reasons (McCreary & Kelly, 2014): (1) a single processor system based on the relational databases have the ability to read and write data rapidly but not handle real-time inserts and online queries at an equal rate, (2) The relational databases have a rigid database schema structures as adding a few columns or rows to a large database mostly required extra time and cost as well as normally impact the availability of the whole system, (3) The applications based on relational databases usually have nested and repeated subgroups of data structures using complex object-relational mapping systems. Adding new applications or updating these existing applications are usually a big handicap when a rapid change needed.

RELATIONAL DATABASES VS NoSQL DATABASES

Relational database systems invented by Edgar Codd in 1970s (Codd, 1970:61). These systems are used as a primary data storage system for years (Enaya, 2016). Before the 2000s, nearly all the organizations used the traditional relational database management system to store real-time data (e.g. event logs). Real-time data usually has a set of activities associated with business processes ordered by timestamp (Gupta, 2015). However; the characteristics of relational database systems are inadequate to deal with large amounts of traditional enterprise data, machine-generated sensor

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data or social networking data. On the other side, using NoSQL database systems is more convenient as well as more flexible to expand the data storages and to custom system architecture (Liu, Yang & Zhang, 2013).

Additionally, the relational database systems are typically different from NoSQL databases in various aspects with regards to patterns, architectures, and methods (See Table 1).

The key differences between relational and NoSQL databases in performing operations can be summarized as follows:

Investment

The relational databases use expensive proprietary servers and storage systems; however, NoSQL databases use clusters of cheap commodity servers to manage the exploding data and transaction volumes (Sareen & Kumar, 2015). Besides, storing a big volume of data usually required commercial solutions on relational database management systems (e.g. MSSQL Server, Oracle), however NoSQL databases exactly open source (Győrödi, Győrödi & Sotoc, 2015) and their hardware infrastructures tend to have a high cost. In this case cloud solutions can be available to reduce cost, because of this skilled experts required for network configurations as well as for the management of the systems (Tole, 2013)

Table 1. The main differences between relational and NoSQL databases

Properties	Relational Databases	NoSQL Databases
<i>investment</i>	Need expensive proprietary servers	Using clusters of cheap commodity servers
<i>management</i>	Need highly trained database administrators	Required less management
<i>scaling</i>	Vertical scaling (scale-up)	Horizontal scaling (scale-out)
<i>data modeling</i>	Minor changes are more complicated	Allow changes easily
<i>design theme</i>	Focused on questions	Focused on answers
<i>schema characterization</i>	Have a rigid schema	No specific schema
<i>transaction control</i>	Using ACID principles	Using BASE principles
<i>diverse data</i>	Handle structured data	Handle structured, semi-structured and unstructured data.
<i>standardization</i>	Structured Query Language	Different query languages

Management

The relational databases required maintaining only with the assistance of expensive, highly trained database administrators; however NoSQL databases require less management through automatic repair, data distribution, and simpler data models (Sareen & Kumar, 2015). Additionally, relational databases are in use for years and they are stable, but NoSQL databases are still evolving. Therefore, it is difficult to find skilled manpower for the management of NoSQL databases.

Scaling

The relational databases have vertical scaling, thus required more powerful servers for database load increases. They have designed to run on a centralized environment as well as on the distributed environment. However; NoSQL databases easily scale out on commodity clusters and distributed hardware well-suited for horizontal scaling (Kaur & Rani, 2013; Priyanka, 2016; Enaya, 2016). Different from relational databases, NoSQL databases share their workload among distributed nodes without having a rigid schema (Kanwar & Trivedi, 2013; Priyanka, 2016; Gupta, 2015).

Data Modelling

Relational data models are generally used by the relational database systems. This means the relational databases consist of tables and their relationships through key fields. They generally used to store structured data. Doing minor changes in the data model are more complicated when databases have much more interconnected tables. On the other hand, data modeling is still mature for NoSQL databases; however, these databases allow changes to be created without too much fuss (Kaur & Rani, 2013; Vera et al., 2015; Singh, 2015).

Design Theme/ Schema Characterization

Design theme focused on questions in the relational database management systems; but the design theme focused on answers in NoSQL databases (Kaur & Rani, 2013). Kanwar and Trivedi (2013) stated that “*NoSQL works according to the designer instead of the designer working according to the database (p. 701)*”. Additionally, NoSQL databases do not have a specific schema characterization. Therefore, there are difficulties in the integration of structured datasets with unstructured or semi-structured datasets (Pokorný, 2013).

Transaction Control

Transaction control is crucial for distributed systems with respect to performance and consistency. The most used transaction control models are as follows (McCreary & Kelly, 2014; Kanwar & Trivedi, 2013): (1) **ACID Model:** ACID model can be used in relational databases to ensure the principles- Atomicity, Consistency, Isolation, and Durability to maintain transaction control. Relational databases utilize foreign keys of structured data for data integrity and data consistency, especially for transaction controls. Therefore, the maintenance of relational database systems can be quite complex when the data has no structure. In this model; atomicity preserves competition of business process. For example, a transaction takes place completely or never occurs. Likewise, isolation means that the transactions can be carried out simultaneously. Thus, it is required a locking mechanism for uncommitted database modifications. Additionally, in the event of any interruption or failure in the system, the ongoing transactions must not be adversely affected (Mohammed & Osman, 2017). However; this model is well-fit with banking systems to provide data integrity, (2) **BASE Model:** BASE model can be found mostly in NoSQL systems typically to maintain transaction control and to ensure the principles- Basically, Available, Soft state and Eventual consistent. Basically Available uses replication and sharing to increase the availability of data. Soft State means that data can be inconsistent in NoSQL databases. Eventual Consistency means that consistency can only be guaranteed by NoSQL databases in some unidentified cases (Berndt, Lasa & McCart, 2012). The BASE model can be preferred by e-commerce systems.

Nowadays, NoSQL databases have adopted by CAP theorem stands for Consistency, Availability, and Partition Tolerance. CAP theorem is firstly proposed by Eric Brewer in the Principles of Distributed Computing of ACM Symposium in 2000 and then proved by Seth Gilbert and Nancy Lynch. Berndt, Lasa, and McCart (2017) defined consistency, availability and partition tolerance as “*Consistency means if one value is written or updated to one node then another node should be updated automatically. Availability means if there is any kind of failure in the system then the value can still be retrieved from the system. Partition tolerance means if partitioning is done then there will be no impact on data that is data should be able to retrieve and write to multiple places*” (p. 5). Consistency and availability principles are important especially for distributed systems and available in both relational and NoSQL databases. However, partition tolerance is not available in relational databases (Singh, 2015), additionally some of NoSQL databases such as BigTable, MongoDB, Memcached ensure only “availability and partition tolerance” when some of the others such as Cassandra, CouchDB, Dynamo ensure “consistency and partition tolerance” (Choi, Jeon & Yoon, 2014).

Handling Diverse Data

The relational database management systems cannot handle a huge amount of diverse data, as they usually used for only structured data. However, NoSQL databases can handle a huge amount of diverse data, not only for structured but also for semi-structured and unstructured data (McCreary & Kelly, 2014; Priyanka, 2016). Therefore, NoSQL databases are suitable for big data applications and show better performance than relational databases with a growing amount of data coming quickly (Kaur & Rani, 2013).

Standardization

Relational databases use Structured Query Language (SQL) to access data, thus it has high reliability as well as high portability by means of the American National Standards Institute (ANSI) standard. On the other hand, there is no portability or standard for NoSQL because of vendor-dependent APIs (Choi, Jeon & Yoon, 2014; Enaya, 2016). SQL is a standard query language for storing, retrieving and manipulating data in relational databases. However, there is no standard query language for NoSQL databases. Since NoSQL databases are data-model specific, therefore each database comes with its own query language (Kaur & Rani, 2013). NoSQL database does not use SQL queries to retrieve data with tabular form, as relational databases do (Priyanka, 2016).

NoSQL DATA STORES

Currently, many business organizations have a big volume of data to be processed and required a new type of thinking for managing that data by moving away from traditional methods. Since they need to increase the performance of their databases as well as they need to accept orders or requests quickly and budget-friendly. Relational databases were started to be inefficient to handle a huge amount of diverse data generated by real-time web applications as well as by enterprise management systems. Since Google was one of the first business drivers that lead NoSQL data stores by introducing BigTable in 2006 named as column-based data stores, followed by Amazon's Dynamo in 2007 named as key-value based data stores. Then, document-based and graph-based data stores have emerged. NoSQL databases can be categorized based on their data models as follows (See Figure 1):

1. *Column-family data models* can be stored columns of data together, instead of rows. Each data item has a key (row) and a set of attributes. Attributes stored

as key-value pairs, the key can be called a column, and a set of related columns forms a column-family. The tables involve one or more column-families (Enaya, 2016). As it is easy to manage distributed and replicated data by means of this model. Thus, this model is usually efficient to solve big data problems and to show web crawler results. Some popular examples of these data stores; Big Table (Google), Cassandra (Facebook), HBase (Apache), DynamoDB (Amazon), PNUTS (Yahoo), Hypertable, Druid, Vertica, Accumulo.

2. *Document-oriented data models* can be stored data or records as documents in formats such as a binary JSON, XML or Yet Another Markup Language (YAML). This model can store messages and their related attachments with different attributes. It is also well-fit for high-variability data, searching documents, integration of hubs, web content management and publishing. Some examples of these data stores; MongoDB, Couchbase, Apache CouchDB, Lotus Notes, OrientDB, Clusterpoint.
3. *Graph data models* can be stored data about networks such as social connections. Therefore, this model is well-fit with social networking applications (e.g. Facebook, Twitter) as well as fraud detection. In this model data items represented as graphs (nodes) and the relations between data, items are more important than the data item itself (Enaya, 2016). Some examples of these data stores; OrientDB, FlockDB, Neo4J, HyperGraphDB, AllegroGraph, Virtuoso, MarkLogic, InfiniteGraph.
4. *Key-value data models* can be stored data as an attribute name or key together with its value. They are well-fit for image stores and key-based file systems. This model also the base for all NoSQL databases, but it can not search the message on different attributes (Enaya, 2016). Some examples of these data stores; DynamoDB (Amazon), Redis, Riak, Voldemort (LinkedIn), BerkeleyDB (Oracle), MemcacheDB, FoundationDB, HyperDex, SimpleDB.
5. *Multi-model data models* support more than one of data models such as document, graph, relational, and key-value. Some examples of these data stores; ArangoDB, CosmosDB, Couchbase, EnterpriseDB, OrientDB, SAP HANA, Oracle Database.

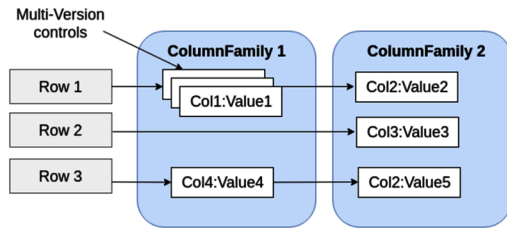
NoSQL FOR INFORMATION SYSTEMS

NoSQL databases are suitable not only for scientific data (astronomy, physics, chemistry, medicine, statistics, etc.) but also for sensor data, social networking data, digital data streams (media, video, image, sound, text, etc.), as well as for traditional corporate data in information systems such as customer information from CRM

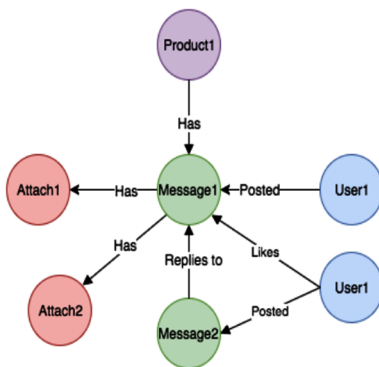
Figure 1. Different data models for NoSQL databases

Message	
Key	Value
1	{ model: res.partner, type: notification, body: <p>Partner Created.</p> res_id: 20, ...}
2	{ model: library.book, type: comment, body: <p>The Book is sold.</p> res_id: 31 ...}

Key-value



Column-family



Graph

```

1 {
2   "id": 1,
3   "model": "res.partner",
4   "type": "notification",
5   "res_id": 31,
6   "attachments": [{ "id": 4,
7     "name": "ProfilePicture.png",
8     "datas": <BLOB>, ...
9   }
10  }, { ...
11  },
12  ...
13 }
    
```

Document-oriented

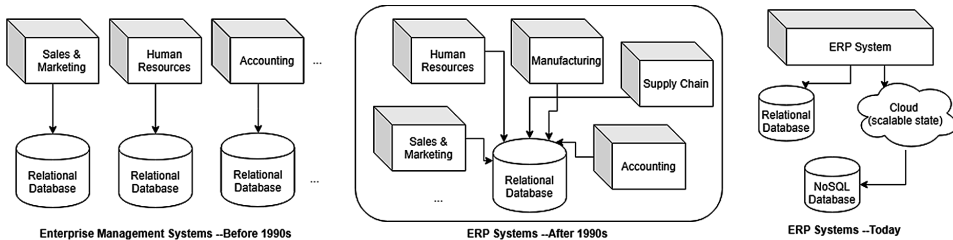
systems, transactional data from ERP systems (Liu, Yang & Zhang, 2013), financial data in accounting systems, sales and marketing data in e-commerce systems.

Enterprise information systems (e.g. ERP systems) usually initiated with data obtained from commercial transactions (See Figure 2). This data describes the completed operations but does not define data created before and after transactions. Moreover, this data are standard and structured as well as semantically homogeneous. In ERP systems, other structured data come from CRM systems through customer interactions before and after transactions. These interactions are not a commercial transaction but increase the amount of data called pre-transaction and post-transaction data. Besides, unstructured elements which are semantically homogeneous such as Web records, sensor data, and social networking data increase the amount of data (Schmidt & Möhring, 2013).

Nowadays, as the data flow on the internet increases, the systems face scaling problems. In order to solve this problem, new problems such as increasing costs and limit deficiency, updating of clusters have arisen, and then different solutions were

The Potential and Capabilities of NoSQL Databases for ERP Systems

Figure 2. Growing data in enterprise information systems (Schmidt & Möhring, 2013)



produced such as purchasing large servers or creating distributed systems (Berndt, Lasa & McCart, 2012).

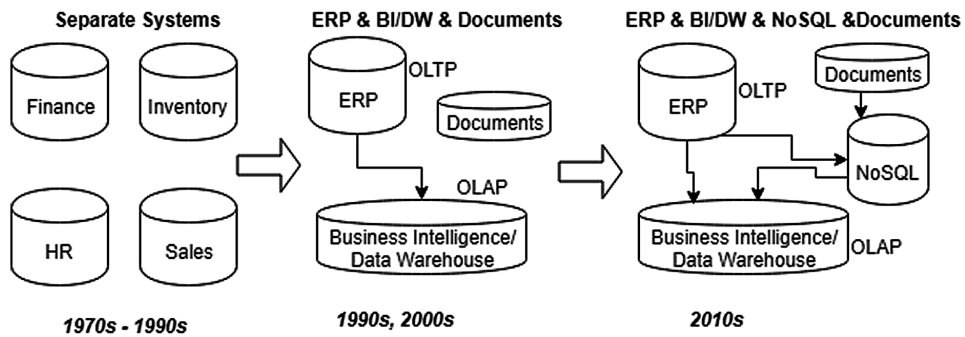
On the other hand, the findings show that the information system based on NoSQL database system reveals higher performance than the one which has a traditional relational database, for instance, the throughput of the system using NoSQL was found 20% higher than the one using relational database (Choi, Jeon & Yoon, 2014). In a similar study, Gupta (2015) conducted a study to investigate the performance of relational and NoSQL databases in a Process-Aware Information System (PAIS) and to compare which database system is more efficiently store massive event logs (real-time data) and analyze it in seconds to discover a process model. PAIS is an information system which manages and supports business processes and generated data like ERP and CRM systems. In this study, HBase as a NoSQL column-oriented data store is used in a real-time messaging system and compared its performance against MySQL as a relational database system. The results show that HBase performs better (on an average is 29 times faster) than MySQL in terms of storing data, performing query as well as loading large datasets.

NoSQL FOR ERP SYSTEMS

ERP systems have a significant role for the digital transformation of enterprises, not only in decision-making processes but also in reducing downtime and costs, quick, online and instant access to the streaming data, as well as efficient use of resources, real-time profit-loss and cost analysis. These systems integrate the transactional business data and business processes into a single system with a single database (See Figure 3).

ERP systems have a three-tier architecture including database layer, application layer, and user layer. Nowadays, businesses have started to move the database and application layer of their ERP systems to the cloud (Elragal, 2014).

Figure 3. Enterprise management systems over the years



Evolution of ERP Systems

The foundation of ERP systems is based on pre-accounting and inventory systems in the 1960s. These systems were developed in the 1970s in the form of material requirement planning (MRP) systems. In the 1980s, manufacturing resource planning systems (MRPII) came into existence. MRPII has emerged as an extended and more comprehensive MRP version covering all business processes in manufacturing companies. In the 1990s, ERP systems were introduced as an extension of previous MRP versions. These systems aim to integrate all business processes of the entire organization into a single platform. In other words, it focuses not only on manufacturing processes but also on all business processes. In addition, these systems provide a centralized data storage and integration center across all departments within the organization (Elragal & Haddara, 2012).

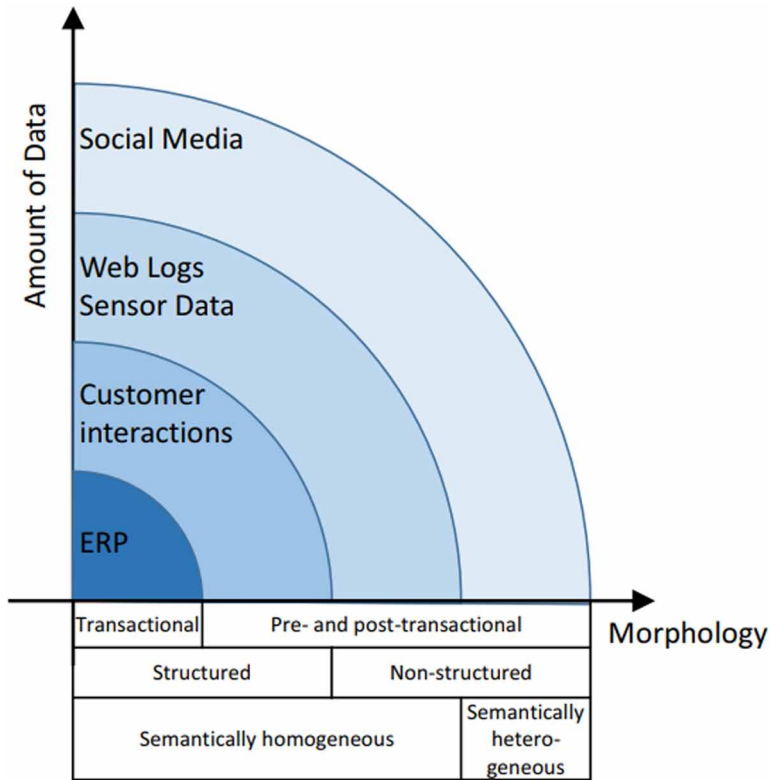
Over the years, there have been three phases of ERP systems related to database systems (See Figure 4). Between the 1970s and 1990s, the enterprises had control on business units such as human resources, finance, and accounting, inventory, sales and marketing separately together with their own database systems for each unit. Then, from 1990s to 2000s, Enterprise Resource Planning (ERP) systems come into exist, as one of the information systems that consist of “a set of business applications or modules, which links various business units of an organization such as financial, accounting, manufacturing, and human resources into a tightly integrated single system with a common platform to ensure the flow of information across the entire business (Beheshti, 2006: 184)”. ERP systems are integrated enterprise-wide systems which replace existing legacy systems or software applications with a single internal enterprise system. The system also provides to connect overall customers and suppliers to the common systems. Thus, eliminating the time and space limit by linking the entire organization from one point to the other, ERP systems ensure the

joint and efficient use of production and distribution resources such as materials, labor, machinery-equipment, information (Beheshti, 2006).

ERP systems are one of the best innovations of IT-supported business applications. In recent years, the centralized relational databases in ERP systems cannot adopt the demand of processing a large amount of unstructured data, thus NoSQL databases started to be using with ERP systems. A study conducted by Enaya (2016) examines whether NoSQL databases improve the performance of Odoo which is an open source ERP system, or not? Odoo has two special modules for mail messages and attachments, and these modules can be used by almost all other modules. The growing amounts of stored data produced by these modules reduce Odoo performance. To overcome this problem, Odoo was modified to communicate with a NoSQL database system, since Hadoop Hbase selected as secondary data storage, and its performance compared with the performance of regular Odoo based on relational database system (PostgreSQL). The findings show that NoSQL system has better performance to handle huge volumes of data (e.g. the response time increase almost 45% between four and five million records – mail messages), increasing the number of requests and generating reports. PostgreSQL has better performance than HBase to handle a smaller amount of data and shows less adaption with increasing data size its performance is reduced greatly with a huge volume of data. HBase starts to perform better than PostgreSQL especially after two millions of records. The results also show that NoSQL systems have scalability and to increase their scalability, more nodes can be added to the cluster. On the other hand, more powerful hardware systems are needed to increase the performance and scalability of relational database systems. In a similar study; Bhaswara (2017) compared the NoSQL database (MongoDB) with relational database (MySQL) in terms of performance, flexibility, and scalability through an ERP system (a case study of Retail module). According to the results, MongoDB proved to have superior speed rather than MySQL in Create/Read/Update/Delete (CRUD) applications. It has also a flexible structure for data storage (scalability) as the model of data in the form of Shared-Nothing Architecture (Binary JSON). Findings show that NoSQL databases are better to apply ERP systems.

On the other hand, traditional relational databases are designed to efficiently add, update, search, and retrieving small amounts of transactional data in a large database. A user can log in to an e-commerce site, search for products, and buy products over these databases. However, these business processes are replicated across the world in countless ways over the days, months, years, and traditional database management systems are inadequate when someone wants to learn from the large amounts of accumulated data (Jacobs, 2009). Additionally, these systems oriented toward processing large blocks of replicated, disk-based data at a time, so latency problems come into existence in the system (Madden, 2012).

Figure 4. The evolution of ERP systems
(McCreary & Kelly, 2014)



ERP systems are a kind of Online Transaction Processing (OLTP) system designed to provide high-speed transaction recording. Moreover, ERP systems have the capability to drive business intelligence systems and data warehouse systems through Online Analytical Processing (OLAP) tools to reveal the analytical capabilities of enterprises such as accessing reports at a great speed, creating balanced scoreboards, displaying data from different points on a single interface. OLAP tools have no adverse impact on ERP performance. OLAP tools based on NoSQL database systems can be added to enterprise management systems to eliminate problems arising from relational databases, as most of the tasks are not suited for relational database systems. Besides, relational databases do not support document integration. So, it can be said that NoSQL systems are well suited for ERP systems, business intelligence systems, data warehouse systems (Figure 3), Process-Aware Information Systems, as well as not only for document-oriented database systems but also graph-based, key-value based and column-oriented database systems. However; a NoSQL system does not replace ERP or business intelligence or data warehouse systems, but it can

complement these information systems to support the integration of structured and unstructured data (McCreary & Kelly, 2014)

NoSQL FOR BI/WAREHOUSE SYSTEMS

The use of data warehousing in business intelligence applications is generally seen as an alternative solution to traditional relational database problems. A data warehouse can be defined as a copy of process data specifically configured for query and analysis. In other words, the transactional data is bulk-extracted from one or more databases and then converted to analytical queries in a different database according to business rules. However, in the case of big data, it may not always be enough to create a data warehouse (Jacobs, 2009).

Business Intelligence (BI) is a system based on the intelligent use, reuse and management of enterprise data sources in order to add value as well as to increase the operational efficiency and to provide new business opportunities to the enterprises. BI systems are usually working together with big amounts of transactional data as an extension of the methods used in data warehouse systems. However, data warehouse systems generally focus on structured data, so they are not systems that fit the rich variability and main characteristics of big data. For the analytical processing of big data in business intelligence applications, new database architectures, as well as new methods, are required for analyzing data such as NoSQL databases, Hadoop MapReduce technologies. Hadoop is a framework that can be used with NoSQL databases as a highly scalable MapReduce platform (Pokorný, 2013).

Most of the traditional relational databases focus on OLTP applications but not have the capability to deal with efficiently on OLAP applications. However; NoSQL databases do not support OLTP and focus on OLAP applications, as they have been shown better performance on analytical queries using CRUD (Create/Read/Update/Delete) operations, MapReduce jobs or client API's - application programming interfaces (Gupta, 2015). MapReduce can deal with large amounts of structured, semi-structured and unstructured data by using a large number of cheap servers as it does not need high data consistency (Liu, Yang & Zhang, 2013).

BIG DATA AND ERP SYSTEMS

ERP systems and new applications should be updated to deal with new trends in technology such as cloud computing, social networking, crowdsourcing, and service-oriented architectures. However, these technologies discussed more in the IS (Information Systems) literature, but not usually discussed in the context of ERP

systems (Elragal & Haddara, 2012). According to Cadarsaib et al. (2018), big data is an issue that needs to be discussed and developed in the context of ERP systems.

A typical big data processing is performed as follows; (1) First of all, the data is collected coming from different sources such as traditional ERP transaction data, streaming data from various social media platforms, sensor data from Internet of Things (IOTs) based devices, data from business process, log files, tag data created by mobile phones etc. (2) Then, this data is transformed according to quality standards, as data with an acceptable level of quality is stored, (3) Next, the stored data processed, aggregated and analyzed with various algorithms such as MapReduce, (4) Finally, the analyzed data visualized and made ready for use by decision-making mechanisms (Schmidt & Möhring, 2013; Windmann et al., 2015). Data collected from ERP systems usually manually entered by staff with low efficiency, easy to have mistaken (unreliable), and poor in real-time performance, so the acquisition of big data must be realized by intelligent data collectors, classified and stored to facilitate query, and update in real time (Liu et al., 2018).

On the other hand, the combination of ERP systems and big data technologies brings together a number of problems and needs for enterprises. Elragal (2014) summarized some of them as follows; (1) Structured data in ERP systems contain certain quality restrictions and must comply with internal quality standards and procedures. However, when these data combined with data from external sources, there would be biases and inconsistencies related to the system, (2) Combining structured data with unstructured data or semi-structured data in ERP systems requires the development of new analysis methods, models and frameworks, (3) Big data outsourcing to ERP systems may require restructuring of ERP lifecycle or implementation processes. Most of the ERP vendors have their own implementation methodologies such as SAP ERP's ASAP methodology, Oracle ERP's AIM methodology. With the emergence of social networks and cloud computing, it is likely that there will be a change in the ERP implementation life cycle. As it is known that cloud computing shortens and changes the life-cycle of ERP systems (Elragal & Haddara, 2012). Babu and Sastry (2014) introduced a new implementation framework that uses large data to automate operational decision making and forecasting operations in SAP ERP systems. According to the Babu and Sastry, when designing decision-making systems for ERP systems, they should be designed in agile, analytical and adaptive with existing systems in a way that includes people and processes. ERP systems such as SAP, Oracle have already generated their system based on NoSQL to take advantages of sensor data, social networking data, customer data and data from other resources (Tole, 2013).

Next Generation Relational Databases: NewSQL

One of the biggest disadvantages of NoSQL database systems is that they have no support earlier applications based on relational databases. In other words, they have no adaption to expand existing applications for real-time data. This means implementing scale-out architecture required NoSQL systems, but can not support all ACID properties. However, alternative database systems called NewSQL can be used to develop new applications in traditional OLTP systems. NewSQL is seen as next-generation relational databases for OLTP systems that provide high-level linear scalability, delivers all the properties of ACID transactions, handles complex data as well as supports standard SQL language (Moniruzzaman, 2014). Some of the NewSQL database systems are as follows:

- VoltDB (<https://www.voltdb.com/>),
- ClustrixDB (<https://www.clustrix.com/>),
- NuoDB (<http://www.nuodb.com/>),
- MemSQL (<https://www.memsql.com/>),
- Altibase (<http://altibase.com/>),
- c-treeACE (<https://www.faircom.com/>),
- CockroachDB (<https://www.cockroachlabs.com/>),
- Apache Trafodion (<https://trafodion.apache.org/>),
- ActorDB (<http://www.actordb.com/>).

NewSQL systems are significantly different in some aspects from NoSQL systems. The comparison of characteristics of both systems is shown in Table 2.

FUTURE RESEARCH DIRECTIONS

Database management is the heart of business information systems. Database systems are open to change and development in line with the needs of business information systems. Emerging technologies such as Apache Hadoop, NoSQL, and big data affect the way of using business data. On the other hand, companies want to take advantages of the emerging technologies to better understand their customers and to design more useful as well as more preferred products and services. For example; business data collected in the last five years help us to predict what can be done in the next five years by force of solutions such as big data analytics. The information management systems need to adopt the NoSQL databases to understand where and when it makes sense.

Table 2. The main characteristics of NoSQL and NewSQL systems

Properties	NoSQL	NewSQL
<i>scaling</i>	Store big data and having more scalability, ability to scale horizontally	Store big data and having more scalability, ability to scale horizontally
<i>data modeling</i>	Not support ACID transactions, or OLAP/OLTP tools	Support ACID transactions, OLAP/OLTP tools
<i>design theme</i>	Platform-specific query language	SQL as the primary query language
<i>schema characterization</i>	Support flexible non-relational data models, not require fixed table schemas	May be support rigid relational data models
<i>transaction control</i>	Provide high availability, capable of running on a large number of nodes without suffering bottlenecks	Provide high availability, support a non-locking concurrency control mechanism
<i>diverse data</i>	Handle structured, semi-structured and unstructured data.	Appropriate for diverse data (from sensors, mobile phones, network access points) but inappropriate for volumes exceeding a few terabytes
<i>standardization</i>	Support various query languages	Familiar SQL and standard tooling, but offers only partial access to the traditional SQL systems

Further research are needed which focuses on NewSQL technology that is one of the few trends affecting business information systems nowadays. More research can be done by comparing the performance of NoSQL and NewSQL systems on unstructured data which are semantically homogeneous such as Web records, sensor data, and social networking data as well as by generating a variety of architectures or applications on OLTP systems. Additionally, further extensive studies can be done on the security concern of NoSQL or NewSQL systems, as it is known the reliability of traditional database management systems is rather high, but there are bias, fears, mistrusts on other database systems.

CONCLUSION

Enterprise information systems typically contain massive amounts of real-time data at very high volumes, variations, and speeds. It is difficult to manage them effectively with traditional data management tools. Business information systems are generally compatible with traditional relational database management systems. They are inherently having difficulties in processing big data. Therefore, high volume of data, diversity of data, as well as performance and scalability issues of

data required alternative solutions for data management. For this reason, alternative database technologies such as NoSQL and NewSQL have emerged in recent years. Emerging systems are significantly different from traditional data management. For example, their data stores have generally scaled horizontally and are not required joining operations, fixed table schemas.

The need for alternative database technologies for enterprise information systems is increasing day by day, in which data is stored in a distributed manner but the access/read/write/update of data can be made quickly and smoothly by existing applications. Also, the data should be analyzed and used effectively by decision-making mechanisms.

For this reason, the integration of new technologies by information management systems is seen insufficient. However, the turning point for businesses to be ready for these alternative technologies are painful. The wished outcome of this chapter is to have brought awareness among researchers, scholars, business managers, decision makers, business analysts, ERP project managers to support the use of these technologies, which would be extensively used by enterprise information systems in a few years.

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KEY TERMS AND DEFINITIONS

Big Data: A collection of huge amounts of real time data in very high volume, variety, and velocity in nature that cannot be managed effectively with traditional database management systems.

Binary JavaScript Object Notation (BSON): A format for binary-coded serialization of JSON documents.

Diverse Data: It refers to different types of storage of data. The data can be stored in three ways; (1) structured data that hold in tables on traditional relational databases, (2) unstructured data that hold in like xml files, csv files, (3) semi-structured data that hold in like doc, pdf, email, and post messages on social platforms.

Horizontal Scaling: Adding new nodes (servers) to the system to increase the application workload without making any changes to the application.

JavaScript Object Notation (JSON): A text-based open standard format for exchanging data between applications.

MapReduce: A programming model that process large amounts of data stored in commodity machines for processing massive datasets in parallel.

NoSQL Systems: Non-relational, distributed database systems designed for big data storage and have capability to process data across a large number of commodity servers.

Vertical Scaling: Increasing memory, number of CPUs and cores of a computer to provide more data processing power.

Chapter 8

An Innovative Solar Energy and Decision Support System Approach by Using IoT

Ufuk Cebeci

Istanbul Technical University, Turkey

Zehra Düzgit

Istanbul Bilgi University, Turkey

Cansu Çavdar

Sanel Elevator, Turkey

ABSTRACT

Global warming affects everyone, and the effects will be more dangerous all over the world in time. Therefore, it is very important to use our world's limited resources and to prefer the renewable resources such as solar energy and wind energy. In this study, the authors consider an elevator system, which includes a solar-powered and conventional one with some new Internet-of-Things (IoT) features. The elevator may be operated by both electric energy and solar energy. Solar energy, as being a renewable energy source, leads to various benefits. Internet-of-Things-enabled elevator has a global system for mobile communications (GSM) module to send messages to pre-specified receivers in case of a power failure. The target performance measures are defined, and the advantages of the solar-powered smart elevator are explained.

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INTRODUCTION

Today's world, global warming affects everyone, and these effects will be more dangerous all over the world in time. Therefore, it is very important to use our world's limited resources and to prefer the renewable resources such as solar energy and wind energy. Elevators are important components in vertical transportation, as well as escalators and moving walkways. Due to urbanization and the increase in high-rise buildings, elevators play a major role in daily life. They will be an important part of smart buildings, smart cities and smart factories in near future. In this study, we consider an elevator system, which includes a solar-powered and conventional one with some new Internet of Things (IoT) features.

Although the turnover of the Turkish elevator sector is generally lower than other sectors, the function it carries out is an important area of activity for the country's industry and economy since people prefer the elevator as the most common vertical means of transportation. It is seen that the competitiveness of national companies is weakening as multi-national companies holding the world market move their production areas to cheaper Asian countries. Turkish companies should examine the areas such as installation, package elevator (elevator with all equipment together) and component sales, in the last years. The Turkish elevator sector will be significant in the coming period due to the advantages of housing needs within the country and the potential due to it, as well as the advantages of its geographical position. Turkish elevator industry, as among the leading manufacturers in all over the world, increased its exportation volume by 25% from 81,712,424 \$ to 101,359,096 \$ compared to 2016. (Liftvision (2019))

BACKGROUND

As the product life cycles become shorter, continuous improvement in the new product development is getting critical for firms. New product development (NPD) consists of the activities of the firm that leads to a stream of new or changed product market offerings over time. NPD process is a long and dynamic period which includes creating a new idea and converting it to a commercialized product. Kotler classifies eight NPD phases that are idea generation, idea screening, concept development and testing, market strategy development, business analysis, product development, market testing and commercialization (Kotler, 2011).

There are various studies regarding implementation of IoT in elevators. According to IoT Business News (2019), IoT in elevators is expected to boost in the coming years due to the increase in adoption of new information technology solutions and increase in number of high-rise buildings. They also report that, based on a new

market report titled IoT in Elevators Market - Global Industry Analysis, Size, Share, Growth, Trends, and Forecast 2018 – 2026, published by Transparency Market Research, the global IoT in elevators market is expected to reach \$ 50.76 billion by 2026. In the aforementioned report, ThyssenKrupp AG, KONE Corporation, Otis Elevator Company, Schindler Group, Mitsubishi Electric Corporation and Toshiba Elevators are indicated as the key players in the IoT in elevators market. According to ComputerWorld's article (2018), ThyssenKrupp launched its cloud-based predictive maintenance solution in the Microsoft Azure cloud in late 2015 which connects 120,000 elevators; Otis launched its connected elevator system in May 2018; Schindler launched its IoT platform, namely Schindler Ahead, in partnership with GE Digital and Huawei in 2017; Kone launched its 24/7 Connected Service in July 2018.

Proud Green Building (2019) mentions that modernization of the elevators, rapid urbanization, the increasing geriatric population, the emerging trend of green and intelligent buildings encourage the installation of energy-efficient elevators. Based on the same source, the global elevator market is expected to grow 7.4% and reach \$330.45 billion by the end of 2023. Delsing (2017) states that the share of elevators corresponds to 5% of total electricity consumption in buildings and there are 4,800,000 elevators operating in UE-27 countries, so there is a huge potential in terms of energy reduction through this number. According to the book, elevator companies have focused their research and development on development of intelligent, sustainable, safe and energy-efficient vertical transportation systems.

Li (2017) presents an elevator safety monitoring system based on emerging IoT technology to monitor the real time running status of the elevator. This study defines IoT as a technology that uses internet and techniques such as radio frequency identification (RFID), advanced sensors and wireless data communication to construct a network and to communicate with each other without human intervention. As opposed to conventional elevator systems, the examined system provides early caution notifications and increases response time, decreases repair time in case of a failure. Nichols (2018) discusses the opportunities through new emerging technologies and IoT in vertical transportation. The history of elevators, elevator technology drivers, passenger experiences and the challenges of mega tall buildings regarding elevators are investigated. Zhou et al. (2018) develop an IoT-based real time operational status monitoring, failure alarming, and supervision system for elevators. The architecture of the internet of things of the elevator is given. Salim and Akın (2017) study an elevator monitoring system with IoT and develop a web application for screening and fault diagnosis. A developed software gets the data from the application in every ten seconds and reports the type of the failure (if there is any). Ming et al. (2018) explain the design, implementation and test processes of an elevator monitoring system working based on IoT. Tu et al. (2013) analyze a remote elevator monitoring

and alarm system which collects real time data by the help of multiple sensors through IoT. Pan (2016) studies a multi-sensor elevator monitoring system which employs IoT to keep track of real time temperature, humidity and acceleration data. Yi (2016) examines an early warning elevator safety monitoring system that utilizes big data to predict future elevator behaviour through data mining. Decision support system helps to collect, mine and dig data to transform it into useful information. Ghobakhloo (2018) states IoT as one of the key building blocks of the fourth industrial revolution, namely Industry 4.0. The study identifies IoT in the Industry 4.0 context as Industrial Internet of Things (IIoT). According to the same study, IIoT improves companies' operations with accurate and consistent captured and communicated data by the help of sensors and cloud technology. IIoT is reported to hold a big potential for enabling predictive maintenance services and energy optimization. Wang et al. (2016) discuss a smart preventive maintenance platform for elevators in the context of Industry 4.0 so as to predict failures and prevent downtimes.

Li et al. (2015) study an elevator monitoring system which implements GSM to obtain real time information in terms of failure and improves troubleshooting process. Skog et al. (2017) propose a smart sensor system to improve monitoring and fault diagnostics of existing elevators. The operating characteristics of an elevator are recorded in a cloud server and united with past maintenance data to make necessary adjustments or repairs. If an action is taken, it is also reported back to the cloud server.

Mahbub (2018) surveys the setup of IoT architecture for the automation of service and maintenance in smart buildings, including the machineries such as elevators. In this thesis, the placement and the choice of sensors are explored for data acquisition. Real time operational status monitoring, real time failure alarming, data recall and statistical analysis are considered as main functions in the elevator monitoring system. Suarez et al. (2018) mention about an application which can receive real time data from the elevator, process the received data, send notifications and inform technicians in the maintenance company in case of a problem by the help of cloud technology. In this study, some existing cloud architectures are reviewed and a new one is proposed. Lai et al. (2018) describe three case studies from the elevator industry in China and compare their different business models employed regarding IoT technology. They implement a design framework that considers four value pillars (value drivers, value nodes, value flows/exchanges and value extracts) to demonstrate the differences in the companies under consideration. Ebeling (2018) discusses predictive maintenance of elevators by detecting the wear of components and condition monitoring in connection with IoT, cloud and machine learning. The use of sensors for status monitoring, the requirements and implementation of a predictive maintenance system are described.

There are also numerous studies in the field of solar-powered elevators. Prahani et al. (2016) propose a multi-functional solar-powered elevator system to cross the railway tracks or busy streets. The elevator under consideration can travel in horizontal direction, in addition to vertical direction. A prototype of the proposed elevator is constructed and working principle is explained. Chilate et al. (2016) carry out an analysis for running a solar-powered hospital elevator for emergency system which provides energy for critical systems in case of a power cut. In this study, a smart hybrid power system is considered that utilizes solar energy through photovoltaic (PV) cells and grid power. A decision support system is developed to make a feasibility study in terms of emission and financial analysis which is employed for the case of a solar-powered hospital elevator. Urban and Roh (2017) present a net-zero energy elevator model (that produces at least as much energy as it consumes) based on solar PV system. In this report, it is stated that elevators consume approximately 80% of all U.S. vertical transport energy in the commercial buildings which corresponds to about 5 billion kWh of electricity annually. It is claimed that, by the proposed elevator concept, electric bills could be reduced by up to \$500 million per year.

These studies show the great interest and potential of employing emerging technologies as IoT and the usage of renewable energy resources as solar energy in elevators.

AN INNOVATIVE SOLAR ENERGY ELEVATOR AND DECISION SUPPORT SYSTEM APPROACH BY USING IOT

The rest structure of the chapter is as follows:

- Objectives of the study, innovative aspects,
- Case study; an application in an elevator company,
 - Economic gains
 - The performance measures and the targeted values
 - Patent research results related to the subject of the study
 - Methods to be used in the R&D process
 - Techniques and technologies to be developed and used in the study
 - Comparison with competitors
- Further research
- Conclusions

The objectives of the study can be listed as below:

- To increase the use of renewable energy by reducing the use of electric energy in the elevator,
- To ensure the regular operation of the system by using solar energy in regions and countries with electric power grid and voltage irregularity,
- To measure the source and amount of energy used by the elevator,
- To send SMS to the failure center via GSM module, in case the elevator remains stationary and does not respond to calls within the specified time.

CASE STUDY

The company under consideration has been operating in manufacturing elevators and elevator parts providing services of these fields, since 1986. In the company, two main production lines of elevator manufacturing, namely mechanical and electronic production, are carried out. The company invests in R&D department to improve current mechanical and electronic production.

Both the sales and installation service of the elevators are provided by the company. Moreover, routine maintenance services in accordance with the elevator regulations and modernization works for existing elevators are carried out by the company. The company exports approximately 80% of its sales. High export rates provide advantages in terms of national and international branding. Additionally, the company has a great power against its competitors, since they can provide production, installation and maintenance services together, which is not very common in the national sector. The company launches the project to provide energy savings with alternative energies, to keep track of which and how much energy is used and to send SMS by GSM module integration in case of a problem in the specified time.

With the solar-powered elevator, the following innovative aspects are considered:

- Use of renewable energy sources in the elevator,
- Saving energy from elevator use,
- Use of elevator in case of power failure,
- Sending SMS via GSM module integration to the pre-specified receiver in case of failure or other pre-defined conditions,
- Integration of GSM module with elevator control panel,
- Development of electrical panels to transfer the energy obtained with solar energy to the elevator,
- Achieving higher carrying capacity with less energy by using servo-motorized elevator machine,

The economical and national gains are as follows:

An Innovative Solar Energy and Decision Support System Approach by Using IoT

- To increase the use of renewable energy sources in daily life.
- To make significant progress in the number and quality of staff, especially in the R&D department, with the development of new products.
- To increase the volume of export in regions and countries with intensive solar energy by creating product diversity.
- To increase the market share with the product diversity to be created, including the foreign companies that dominate the local sector.
- To inform the pre-specified receiver by SMS and to provide early intervention, in case of failure of the elevator for a pre-defined time interval.

The performance measures and the targeted values are given in Table 1.

Patent Research Results Related to the Subject of the Study

Related patent results in the field of the study are examined and tabularized in Table 2.

Methods to Be Used in the R&D Process

The following methods are to be used in the research and development process:

- Converting the energy to be obtained by the solar panels to 3Phase Sinus via DC / DS voltage inverter
- Preparing and testing the interface board with the help of PROTEUS to enable fault data communication in the control panel of the elevator with GSM module
- Designing the printed circuit board with EAGLE
- Designing programs with MP LAB CX8
- Designing the project with SOLIDWORKS

Table 1. Performance Measures and the Targeted Values for the Elevator

Performance Measure	Targeted Value
To reduce the rated power of the engine using the machine-room-free system	Reduction from 7.5 KW to 4 KW
To save energy	15%
To use of renewable energy sources in elevators	-
To inform the pre-specified receiver via SMS in case of malfunction	Within the pre-specified time
To record the usage amounts of electric and solar energy of elevator	Record keeping

Table 2. Related Patents in the Field

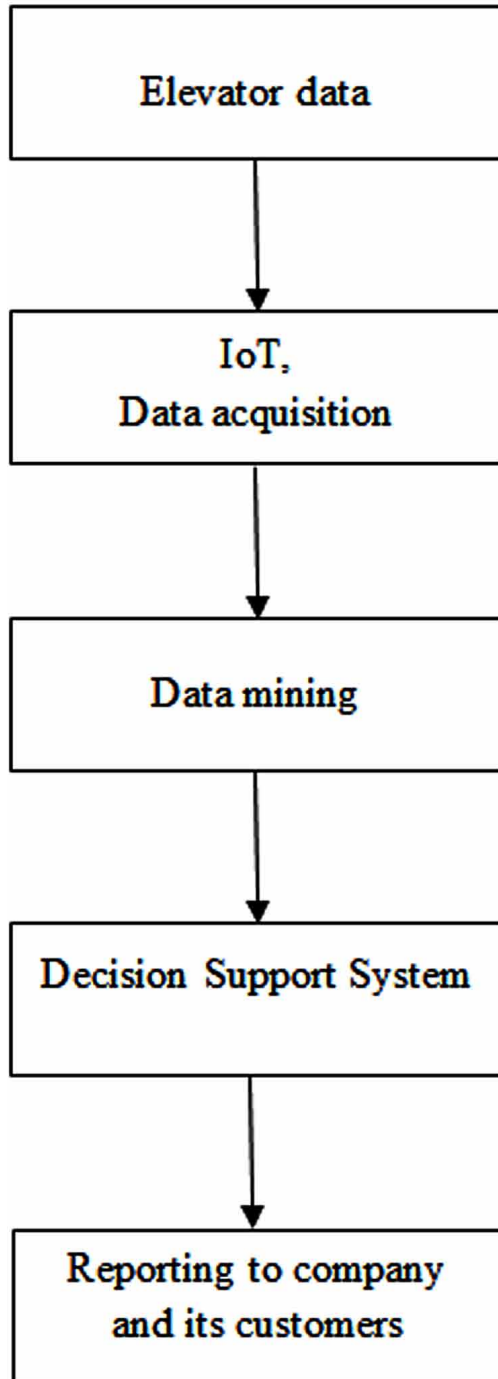
Patent No	Patent Office	Year	Summary
EP2686263B1	EPC	2015	An energy management system for an elevator installation coupled to a source of alternative energy integrates various operational modes regarding optimization of energy usage. The energy management system selectively executes these modes depending on at least one predetermined parameter of a variety of parameters.
CN 104836308 A	CN	2015	The system includes a solar energy controller, a control module, a bidirectional DC/DC converter, an elevator control frequency converter and a traction motor controller; the elevator control frequency converter is connected with the traction motor controller through a CAN bus, and the control module is in communication connection with the solar energy controller, the elevator control frequency and the traction motor controller.
CN 204689324 U	CN	2015	The patent of the utility model relates to an energy-conserving neotype full solar energy elevator of plastic steel rope of wrapping up in. Including driving sheave with around establishing steel cable on the driving sheave, its characterized in that, steel cable include by articulated wire rope that form of stranded steel wire, polyurethane layer are wrapped up in to wire rope outside adding, driving sheave diameter does the 18-30 of steel cable diameter doubly.
CN 205397775 U	CN	2016	A solar elevator, involving transport areas, including elevator body, inverters, batteries and solar panels, further comprising a controller and a tracking device to find the day, the day to find the tracking device includes a detector and a horizontal rotary actuator, the a detector connected to said control signal, said horizontal rotary actuator connected to said control signal, said detector is fixedly connected to the solar panel, and the detector detecting the direction of said solar cell.

BENEFITS OF IOT-ENABLED ELEVATORS

The new generation elevator under consideration brings several benefits. With the ability to store energy, it ensures to continue to operate safely in case of a power failure. This energy-efficient and environmentally friendly elevator provides clean energy balance and contributes to sustainability and ecological system by reducing the negative impacts of emissions due to non-renewable sources. This innovative elevator leads to reductions in energy costs.

Figure 1 shows how the decision support system (DSS) works for IoT-enabled elevators.

Figure 1. How DSS works



Real time data can be collected, processed and analyzed from all elevators worldwide by the elevator company. Based on the results, elevators can be separated into different classes. The results of this data mining model can be fed into Decision Support Systems (DSS) which can generate numerous reports and suggestions, based on smart algorithms. These reports can also change according to the geographical location of the elevator.

The following example examines the use of DSS in greater detail. If the elevator is used within the compounds of a middle school or high school, the students will likely fill the elevator and result in an overloading of sorts, and the buttons may be over utilized, increasing the risk of mechanical and technical failures. This report will be sent to the elevator company allowing the company to produce an elevator that can support not only a larger capacity, but mechanically stronger buttons to prevent against normal wear and tear, preventing mechanical and technical failures. This, combined with numerous geographical data mining processes the company will have access to, can allow the company to produce an elevator that solves such a problem and is well suited for such a location, geographically.

DSS can not only benefit the makers of the elevator, but also the consumers. Real-time information can be provided on the following:

- How long has the elevator been used. Within this time, how much of the energy has been provided through solar energy.
- How long it will take for the initial investment of a solar energy run elevator from returning on its value (based on running a conventional elevator run on electricity through non-renewable sources of energy).

These, among other information, can be provided to the consumer in real-time.

On the other hand, if the elevator is seldomly used between certain hours, then the elevator can be shut off entirely and allow for energy saving measures to be implemented. The DSS can also pinpoint which parts of the elevators are subject to frequent technical issues and reduce the frequency of such problems by highlighting the time between any two technical problems, the energy consumption at each fault and the physical load on the elevator at the given time.

By implementing IoT technology, large streams of performance data can be gathered about the elevator's usage and conditions (such as number of trips, waiting times, traffic trends etc.) and this big data can be used to predict maintenance requirements. Operating conditions and the status of elevators can be monitored and reported in real time which enables diagnosing problems simultaneously. By the use of real-time notifications and failure prediction, potential problems may be prevented in a proactively manner before a breakdown occurs. By this way, the company can follow a fault-avoidance policy, rather than a fault-reactive policy.

Constant monitoring and accurate real-time information may lead to cost savings in terms of maintenance and repair costs because instead of fixing a big problem which may be too expensive to solve, an economical solution may be enough which requires by changing or upgrading some components before a major problem happens. Therefore, unscheduled breakdowns can be eliminated, out-of-service time can be minimized, and elevator uptimes can be maximized which lead to more reliable elevator performance. From the view of passengers in the elevators, they can feel safer if they know that their situation is monitored in real time.

WORKING PRINCIPLE OF IoT-ENABLED SOLAR-POWERED ELEVATORS

Solar energy is obtained by installing solar panels. The expected daily passenger traffic congestion for elevators determines the power requirement, accordingly required number and size of solar panels to be installed. Solar panels generate energy which can be used instantaneously or accumulated in batteries to be used for later. While the elevator performs, a lot of data can be gathered about the condition of the elevator in real time, by the help advances in IoT technology. Then, this big data is interpreted and used for managerial insights and technical issues.

PREDICTED DIFFERENCES AND ADVANTAGES IN ACCORDANCE WITH SIMILAR PRODUCTS IN THE MARKET AND INDUSTRY

The elevator system will work with solar energy, which is a primary renewable energy source. Solar energy will be used together with electrical energy in a hybrid structure. With the help of servo motorized elevator machine, higher carrying capacity will be obtained with less energy. If there is a five-minute interruption in the operation of the elevator, the system will send SMS warning message via GSM module over TCP / IP to the center. When the elevator passes from solar energy to electrical energy, it will send a message to the pre-specified receiver.

Product will be developed according to the elevator regulations of the following countries and regions:

- European Union CE norms
- Russia and Turkic Republics
- Israel
- Ukraine

- Middle East and African countries

Table 3 shows the comparison of the elevator with the similar existing / potential products in the domestic / overseas markets.

The company under consideration is mainly considering the production of package elevator and has become the leading exporting company in the country. The company has realized \$ 5 million of package export of \$ 43 million of elevator exports realized in 2015 in the country and ranked 1st among domestic companies. The company fulfills 11.2% of the package elevator exports of the country by itself. The company utilizes its production power with the production, installation and after sales support services of elevators in high value added factories, business centers and private buildings.

Techniques and Technologies to be Developed and used in the Study

Table 4 summarizes the techniques / technologies to be developed or used in the process.

Table 3. Comparison with Competitors

Technical Specification	The Elevator Under Consideration	Competitor 1	Competitor 2	Competitor 3	Competitor 4
Working with solar energy	Yes (Planned)	Yes	Yes	No	No
Sending message when switching from solar energy to electrical energy	Yes (Planned)	Unknown	Unknown	No	No
Compliance with elevator regulations of various regions	Yes (Planned)	Yes	Yes	Partially	Partially
Sending messages in case of interruption of the operation	Yes (Planned)	Yes	Yes	No	No

Table 4. Techniques / Technologies to be Used / Developed

Definition of the Technique / Technology	To Be Used / To Be Developed?	The Reason of the Requirement in the Study
3D design with SOLIDWORKS	To be used	To draw parts
Remote data retrieval application	To be developed	To keep track of the elevator's inactivity in real time
Development of solar energy transmission unit	To be developed	To collect solar energy to be used as energy source in the elevator
Card design and writing required programs	To be developed	To design cards for data transmission
Gearless motor (servo motor) technology	To be used	To enable the transport of the system with lower engine power
Error proofing – Poke Yoke	To be developed	To reduce errors in the product automatically and to increase the quality of the product
Statistical process control	To be used	To measure the adequacy of the product and process, and to stabilize the process
Design of experiments	To be developed	To examine the effect of input parameters on output in terms of quality reliability
Product value analysis	To be developed	To use value analysis techniques systematically for minimum cost and effective operation of the product

FUTURE RESEARCH DIRECTIONS

As a part of smart buildings and smart factories, smart elevator systems can be connected to smart cities. Also, lessons learnt can be used for building more energy-efficient systems. A Quality Function Deployment application can be used to increase to listen the voice of customer. A TRIZ application can increase new innovative features. Lean manufacturing and Industry 4.0 concepts can be used for the production of these elevators.

NEXT GENERATION OF ELEVATORS

In the medium run, innovative elevators can be coupled with other alternative renewable energy sources; such as wind energy. Data regarding customer behavior patterns and the environment can be drawn and aggregated. By the help of IoT, machine learning, cloud technology, advances in wireless networking technology can be used as tools for predictive analytics and this big data can be transformed into valuable business intelligence.

For instance, through RFID sensors and all sorts of trendsetting innovative systems related with IoT, the time of arrival of a passenger to a building may be identified and an elevator may be waiting to take the passenger to the floor where he/she generally prefers. Or, when a person logs off his/her computer, by getting a notification through the embedded system, an elevator may be readily available for that person to take him/her to the ground floor. This can be done via storing all the passenger's elevator usage data, remembering and learning to predict where he/she wants to go, based on past behavior pattern. Combining historical data and learning from past experiences, service level quality and customer satisfaction can be improved. By this way, waiting time of passengers can be reduced which affects a lot of people working in high rise buildings. This can demonstrate an example of how to use and integrate big data in the field of elevators.

Similarly, learning from past operating conditions of the elevator, the future performance of the elevator can be predicted. For instance, components can be replaced before they fail. The root causes of problems can be identified. Breakdowns can be anticipated before they happen, and precautions can be taken in advance.

But the applications to an IoT based elevator need not stop here. Relating back to the theme of global warming and climate change, corporate sustainability reporting can be established. How much solar energy vs. electrical energy has been used, how much energy and cost have been saved can be reported to the consumers through a screen panel inside the elevator. This can promote sustainable lifestyles within the office buildings as well, leading to more savings in other parts of the office if sustainability is encouraged in general. Reporting energy usage straight back to those in the elevator at any one time can allow for further cost saving measures and other sustainability initiatives to be launched in the workplace.

At first glance, the elevator may be suitable for locations with a longer duration of sunlight. However, this elevator can become a possibility anywhere. Otis (2015) first introduced a solar powered elevator in Paris in 2015 claiming it can receive up to 80% of its electricity requirement from solar energy between November and March, and 100% through the rest of the year. Given France can support such an elevator, this technology can be accessible by the wider EU, as well as financial centers to include London, New York and Hong Kong, and need not be limited to nations that have a longer duration of sunshine such as countries in the Middle East and Northern Africa.

A major problem faced by office workers today is wasting time. According to a study conducted by IBM in 2009, 16.6 years were spent cumulatively by New York City office workers waiting for the elevator across 12 months. We can explore IoT applications with the intention to save time. By extending IoT devices to detect

when a wave of workers will enter the office to send the elevator to the lobby or allow for calling the elevator through an app controlling the smart functionalities of the elevator, can significantly reduce this time.

In the medium and long run, revolutionary elevator companies can gain a competitive advantage by the help of digital transformation.

CONCLUSION

We present an elevator system and a case study for a Turkish elevator company which pushes for use of alternative renewable energy source, solar energy, in addition to electrical energy in elevators. By this way, it is possible to reduce the consumption of electrical energy and its negative impacts on the environment. The goals and innovative aspects of the proposed system are explained. Related studies in literature and patents are provided. The differences and advantages of the new elevator concept are examined. The techniques to be used and developed during the process are defined.

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KEY TERMS AND DEFINITIONS

Cloud: Virtual data storage servers available over the Internet which are supported and coordinated by cloud computing providers. The stored data can be retrieved on the cloud via Internet connectivity.

Data Mining: The method of investigating and identifying patterns, trends, correlations and establishing relationships in large databases to derive useful information from raw data and to forecast future outcomes. Data mining is the analysis step of the “knowledge discovery in databases” process and it can be used for Business Intelligence.

Internet of Things (IoT): A network of connected devices that can collect, send and receive electronic data and enable remote monitoring over the Internet without human intervention. The data is analyzed and transformed into useful information. Actions can be taken by learning from a process by the help of gathered data.

Lean Manufacturing: It is an approach to eliminate every type of waste (Muda) in manufacturing and service companies. Taiichi Ono is inventor of lean techniques in Toyota. It is also called TPS (Toyota Production System).

Renewable Energy: A type of energy which is obtained from natural resources such as sunlight, wind, rain, and geothermal heat.

Smart Building: A smart building is any structure that uses automated processes to automatically control the building's operations including heating, ventilation, air conditioning, lighting, lifting, security, and other systems.

Chapter 9

FinTech in the Saudi Context: Implications for the Industry and Skills Development

Faisal Abubotain

Ministry of Finance, Saudi Arabia

Petros Chamakiotis

ESCP Europe Business School, Spain

ABSTRACT

With the constant development in FinTech globally, Saudi Arabia is a late arrival in the FinTech world. However, the FinTech growth pace in Saudi is fast and not slowing down. This fast pace is confusing stakeholders, including bankers. This chapter unpacks how FinTech is developing in Saudi Arabia, considers the challenges and opportunities that FinTech may be facing in Saudi, and discusses how these changes may affect current bankers and how future bankers can be ready to enter the new market. The study draws on interviews with professionals in the banking and FinTech industries and makes two contributions: It suggests that FinTech is affecting retail and long-tail clients of banks (i.e., the effect on core banking operations, such as corporate banking and treasury). Findings also highlight that professionals should upgrade their knowledge around matters necessary to retain their jobs in the sector. The study has implications for future bankers (i.e., university students), suggesting that university curricula should be updated to include relevant knowledge and professional placements.

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INTRODUCTION

In an increasingly digitalized world, this chapter aims to explore the effects of digitalization on the set of skills of professionals, with an emphasis on adapting to such changes and preparing students to the changing market. While digitalization is impacting numerous industries—e.g. travel, music, media, (Mitchell, Gottfried, & Matsa, 2015, Bearne, 2016 & Gaskell, 2017)—the authors here study digitalization in the financial sector by focusing on an under-explored empirical context, that of FinTech in Saudi Arabia. This study is premised on the importance of the banking system in any given economy and the size of the Saudi economy in the region. Unlike FinTech in other contexts, the FinTech market in Saudi Arabia is different as the regulators push and give incentives to investors to innovate in this area by supporting business incubators and offering support packages to startups. This way, the regulators develop regulation in parallel to the development of FinTech services. Such packages include waivers on licensing fees and municipality fees among others. The authors adopt a qualitative case study approach involving two groups of participants (bankers and FinTech professionals) in order to develop an in-depth understanding of the phenomenon under study. Further to informing the extant literature, the chapter offers recommendations for academics, researchers, practitioners, students and universities. In what follows, the chapter begins with a literature review, which is followed by a presentation of the research study, and subsequently, a discussion of the study's findings and implications.

BACKGROUND

In this section, the authors review and explain what is currently known in the digitalization field and how it is disrupting different industries; discuss the relationship between digitalization and the financial sector (FinTech); and examine the relationship between education and technology. By doing so, they provide a broader view of why digitalization is seen as disruptive and revolutionary, how it affects the financial industry and in what sense, and explore how education is coping with such changes.

Digitalization and Digital Disruption

Digitalization is the action of integrating technologies into daily processes (Thomas, Srihari, & Kaur, 2015) and is evident in numerous industries; for example, we have seen how newspapers started offering e-versions of their content in addition to the regular printings. Digitalization is also evident in the travel agencies, with some businesses adopting online bookings, others failing to do so and eventually going

out of business, and also with new, born-global businesses emerging (Thakran & Verma, 2013).

Digital disruption, however, is the disturbance of the value of existing products and services caused by new technologies that introduce new business modules (Weill & Woerner, 2015). For instance, social media, such as Facebook and Twitter, have affected the news industry by disseminating news on their own multiplayer digital platforms (Newman, 2011). In the travel industry, unprecedented digital businesses, such as Airbnb, are disrupting travel operations worldwide by offering cheaper, customizable and more convenient accommodation solutions (Thakran & Verma, 2013). These examples support Gomber, Koch, & Siering's (2017) view that digital disruption—seen as something that happens over time (Karimi & Walter, 2015)—is using technology to offer a new product/service range to an existing market.

Barnatt (2001) makes a distinction between the first and the second digital revolutions; in his own words, "... *the First Digital Revolution is argued to have 2 been characterized largely by mass digitization, as more and more media, products and services were pushed into a binary, electronic format. In contrast, The Second Digital Revolution is distinguished by mass atomization — or, in other words, the everyday pulling of electronic, digital content into the perceptibly real world*" (p.2). Digital disruption is striking many industries, in transportation, where, for example, carsharing platforms such as Uber and Lyft are taking a large market share from taxis (Gaskell, 2017). The aforementioned author argues that although regular taxi income fell by 10%, the number of self-employed drivers grew by 50%. In the news industry, Twitter and Facebook are now the main players especially for younger parts of the population, i.e. the millennials (Mitchell, Gottfried, & Matsa, 2015). In tourism, online travel agencies such as Expedia and Kayak are taking over large market share from the traditional agency offices (Bearne, 2016). The music industry, apps such as Spotify and Soundcloud offer free streaming as well as subscriptions, are taking over the traditional album purchasing and are also pushing music labels out of the picture (Velasco, 2018).

Digitalizing the Financial Sector

Focusing more on the financial sector, banks have been undergoing internal digital transformation, e.g. by adopting new digital technologies themselves (Arner, Barberis, & Buckley, 2015). According to these authors' breakdown of FinTech (Table 1), technology companies were not initially envisioned to compete with the banking sector; this only began after the 2008 crisis. Some examples of such technology companies include: Bankers' Automated Clearing Services (BACS); Clearing House Interbank Payments System (CHIPS); and Society of Worldwide Interbank Financial Telecommunications (SWIFT), all of which were established

Table 1. FinTech timeline

FinTech Era	Era Features
FinTech 1.0 (1866-1967)	Started with laying the transatlantic telegraph cable, this was an important stem to a globalized financial system, however, banking remained analogue to a large extent
FinTech 2.0 (1967-2008)	Banking shifted completely from analogue to digital. Banks invested heavily in technology to gain competitive advantage
FinTech 3.0 (2008 – Present)	FinTech start-ups are appearing and disrupting the market

(Arner, Barberis, & Buckley, 2015)

between 1968 and 1973. Also, Internet banking (e-banking) was introduced to the banking systems by banks themselves (not non-banking companies attempting to disrupt the financial industry), where banks and IT solution companies worked together to create e-banking platforms. However, with the slowdown in the global economy that happened in 2008 and the decreasing trust in the banking system, FinTech startups emerged and started providing individual financial services. These FinTech start-ups were focused on the end-customer, providing one specific product/solution; hence, they cannot be considered financial institutions. This trait makes it easier for FinTech to be more innovative and agile than the traditional bank (Weill & Woerner, 2015). Sironi (2016) sees FinTech as a global phenomenon, positioned “*at the intersection between financial firms and technology providers, attempting to leverage on digital technology and advanced analytics to unbundle financial services and harness economies of scale by targeting long-tail consumers*” (p. 22).

FinTech companies provide several services including: payment services such as Apple Pay and Android Pay; peer-to-peer (P2P) lending platforms, such as Amazon Lending and Zopa; and P2P foreign exchange platforms, such as CurrencyFair and TransferWise. When comparing FinTech applications to the technologies that banks invested in throughout the years, it is evident that banks invested mostly in technologies that work in the background of their operations (back office) and less on the client-facing products (front office). This supports Philippon’s (2016) argument that banks’ innovations were not enough to improve the banking system’s efficiency. Post-crisis regulations were preventing technological innovations to avoid further system disruption (Krstić & Tešić, 2016). Not long after that, regulators realized the limitations of overregulating the system and softened those regulations to allow for a more flexible market (Krstić & Tešić, 2016).

The competition is of odd complexity, as FinTech start-ups seem unable to operate without banks to execute transactions in the background; FinTech does not threaten banks’ existence, but it is reshaping the whole industry in a way that existing banks will play a role of enablers in executing financial transactions rather

than managing banking operations throughout (Omarini, 2017). But what if banks are not satisfied with these developments? Banks have the advantage of large capital to invest in technologies and compete with these newcomers; however, for banks to compete with these FinTech companies, banks need to change their business models (Kotarba, 2016). A recent study by A.T. Kearney shows that for banks to be digitized and in turn compete with new FinTech start-ups, banks need to change many of their attributes and adopt a new set of standards and values (Jaubert, Marcu, Ullrich, Malbate, & Dela, 2014). The report suggests three values to be adopted by the institutions, as follows:

- **Client centricity** focuses mainly on overall customer experience as well as studying the role of branches. The report indicates three primary success factors in this area. Being more observant and practical to clients' needs, which urges banks to become more attentive to clients' needs instead of giving ready-made products. Banks also need to be ready to provide clients with what they need and be original in offering new solutions. And the final factor is to change the role of branches from the traditional set of services provided in the branch to a more digitized, high-value delivering branch (Jaubert, Marcu, Ullrich, Malbate, & Dela, 2014).
- **Being open to innovation** is also crucial for banks aiming to compete with these FinTech start-ups as they are continuously evolving to meet customer expectations. For a bank to be innovative, a need for internal (IT) and external (Marketing) understanding is key to integrate both aspects and provide more suitable products that reflect current market needs (Jaubert, Marcu, Ullrich, Malbate, & Dela, 2014). A pro-innovation culture that supports and provide incentives for innovation should be in place.
- **Organizational flexibility** is important as agility gives banks the ability to compete in such an environment (Tornjanski, Marinković, Săvoiu, & Čudanov, 2015). However, banks are very conservative when it comes to change, as the banking industry was quite stable for a very long time, which is reflected by the rigidness to change in the banking industry (Fasnacht, 2009). It is challenging to transform banks to be more agile due to the complexity of existing applications, constant changes in customer behavior and the increased amount of data, such as number of account holders, transactions, etc. This shows why such transformation cannot be made overnight, as banks have operated in a stable environment for a long time, which has generally resulted in a slow-paced change in the industry (Tornjanski, Marinković, Săvoiu, & Čudanov, 2015). Accenture (2018) suggest the following five characteristics of a more agile bank (Table 2).

Table 2. Having an Agile Bank

Characteristic	Definition
Customer First	Offering customers “what they need,” not “what the bank has,” hyper-personalized products and services.
Test, Learn, Tweak	Replacing complex distribution processes, continually adjusting offerings as the market dictates.
Revenue Ready	Transforming fixed costs into variable costs and investing savings in revenue generation opportunities
Right Challenging	Combining digital and physical channels to grow market share without traditional branches.
Fast Twitch	Flexing distribution, making channel decisions quickly and often

(Accenture, 2018)

Further to operations and regulations, digital transformation in the financial industry is likely to also affect job descriptions within banks. Jaubert, Marcu, Ullrich, Malbate, & Dela (2014) discusses job descriptions that combine both IT and marketing skills to meet market needs and promote innovation. However, there is limited evidence of studies that unpack how FinTech affects core aspects of banks, such as corporate banking, retail banking, and treasury management, among others. The extant literature on the current applications of FinTech shows that FinTech is not only involved in retail clients, but also corporates with the use of P2P lending platforms (crowdlending), funding platforms (crowdfunding) and Robo-Advisors, among other applications and platforms. When looking at corporate banking, it is argued that the relationship between the relationship manager (the bank) and the CEO & CFO (the client) has a significant role to play in relation to decision making for financing, for example. This reflects the subjective part of credit relationships and lending in banks that are hard to quantify. This raises the question of whether FinTech companies / applications are able to compete with such crucial decision-making professionals in corporate banking and other vital areas in banks, and whether new technologies can be developed to quantify qualitative attributes. Ultimately, this raises the question of what would be the required skills for such competition between Fintech and other banking professions?

Having said that, it is important to prepare students to the new financial industry and explore whether professionals need to learn about new technologies and how such knowledge can be obtained by both students and professionals. Education is key for the growth of any economy (Goldin & Katz, 2009). For the financial sector in particular, it is important for practitioners to have a solid background in analytics and general business, which is mainly obtained in universities and higher education institutions (Cornuel & Thomas, 2012). However, it has been argued that use of

information and communication technologies (ICTs) is taught as part of computer science or similar studies and not so much as part of business education (Picatoste, Pérez-Ortiz, & Ruesga-Benito, 2018). These authors argue that, in this current fourth industrial revolution, technology training is essential. Chuang (2017) and Hsiao, Shu, & Huang (2017) suggest that there are different ways to introduce ICTs skills to students, for instance by offering the knowledge in the form of tools rather than introducing separate curricula to students. This could be of benefit to students irrespective of field of study.

THE RESEARCH STUDY

In this section, the authors explain their research approach and the reason behind using such approach and discuss the research findings.

Methodological Approach

A case study approach was adopted whereby the banking industry in Saudi Arabia was selected in an effort to understand how FinTech is affecting the set of skills required the banking industry. Cavaye (1996) argues that case studies are appropriate when theoretical knowledge on a phenomenon is limited, as is the case of digitalization and FinTech in Saudi Arabia. The case study involved interviews with eight participants with experience in the Saudi banking sector and professionals working in FinTech companies in Saudi Arabia directly and indirectly. The interviews include bankers with more than fifteen years of experience in the financial sector in general and currently holding senior roles in corporate banking in their organizations, the reason of choosing corporate bankers is the exposure that a corporate banker gets from interacting with different clients from different industries. These bankers handle portfolios with companies from different industries that are either working on the FinTech infrastructure in Saudi or companies that are already affected by digitizing some of the roles in their operations. The interviews also included professionals who are working as consultants to FinTech companies and/or the regulators, entrepreneurs investing in FinTech companies, senior managers in FinTech companies and consultants to small and medium enterprises (SMEs) for implementing FinTech in their companies.

Table 3 above presents the participants along with their demo-biographical characteristics. The diverse backgrounds give a more general view to what is currently happening in the market and utilizing such to have a feel on where the FinTech tide may be taking the market. The interviews were structured to be completed within thirty-minutes, however, some interviews were extended to reach an hour depending

Table 3. Research participants' characteristics

	Pseudonym	Current Position	Expertise
Bankers	Omar	Area manager in corporate banking in one of the largest banks in Saudi.	15+ years in Investment Banking, Corporate Banking, Credit and Risk.
	Sami	Head of Corporate in one of the largest banks in Saudi	15+ years in investment Banking, Asset Management, Corporate Banking, Credit and Risk.
	Ahmed	Team Leader in corporate banking in a large bank in Saudi.	10+ years in Finance Department, Corporate Banking, Credit and Risk.
	Essam	Senior manager in finance and liquidity management in a leading Saudi bank.	10+ years in Finance and Liquidity Management, column writer specialized in Saudi economics.
FinTech Professionals	Mohammed	Head of Investment in IT solutions company.	5+ years in Investment at an Investment arm of a Technology company, Investment Banking, Investment at a Fintech company. Development of Technologies.
	Rashid	Supporting SMEs in finding suitable Fintech solutions.	5+ years in Technologies in payments services and Fintech in Saudi, Consulting Fintech start-up companies.
	Majed	Consulting Fintech start-ups and regulators.	10 + years investment Banking, Fintech Consultancy.
	Rakan	Working on a Fintech start-up.	5+ years in Corporate Banking, Consultancy, Start-ups entrepreneur.

on the course the discussions took. The authors used NVivo 12 to transcribe, code and analyze the interviews. The data were analyzed thematically and participants' names and organizations have been anonymized.

The Research Findings

Discussed in this section are the perceptions of the different groups of participants in the study. The findings explore the current market in parallel to the set of skills that current and prospective bankers need to acquire.

The Bankers' Perspective

Participants emphasized that FinTech as a concept is not new to the market; however, the current form of it is new. As shown in the Background section, FinTech has existed since the 1860's. Nevertheless, until the first decade of this century, technology was

used to give competitive advantage to existing market players, being banks, etc. (FinTech 1.0 & 2.0). However, in FinTech 3.0, IT companies entered the market as a single service provider, competing with banks and other financial service providers.

While interviewing the bankers, the authors noticed different views when it came to understanding FinTech. Some bankers viewed FinTech as a new phenomenon that may change the role of banks due to the following reasons:

- **Lower Capital Required:** FinTech companies are single service providers that depend on technology more than labor.
- **Lower Operational Costs:** FinTech companies are not banks; hence, their operational activities are much lower than banks, i.e. payment processing, Know Your Customer forms (KYCs).
- **Lower labor costs:** This is because of the single service structure and dependence on technology.
- **Less Bureaucracy:** Bureaucracy limits the agility of an entity, which is key for such companies, as it enables more innovation.

Omar also explained how banks may be more back-end oriented, giving up the front-office activities to FinTech:

Of course, if you think about FinTech, it has a lower cost, they will not be labor-intensive as banks. It will be eliminating the middle-man in some functions. It will be leaner and more efficient. There will be more regulations coming up on FinTech in the future. (Omar)

While the above quote reveals estimation that FinTech will acquire a large market share from banks' front-office activities, another view shared by some of the banking experienced participants in the study was that FinTech companies are likely to complement existing bank format by aligning their services to banks. Implying that banks may acquire or white-label these FinTech. By doing so, the competition is eliminated. In the following extract, Ahmed views FinTech as complements to banks:

No, FinTech complements the product offering of the banks. This is what we call "white labelling" using the banks at the back end but at the front FinTech is providing the platforms. There is no competition whatsoever, the banks still can make money from these products by aligning themselves to these FinTech. (Ahmed)

Nevertheless, it was agreed that FinTech will only succeed with the help and support of the regulators. Albeit the conservative approach of banking regulations in Saudi in the past, the regulators are currently proactive in the FinTech area and

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are pushing for more implementation and higher penetration while keeping their conservativeness by giving license to FinTech companies after studying all aspects of each specific application or service. The main force moving the regulators to be more proactive is the Vision 2030, which has the Financial Sector Development Program as one of its thirteen pillars:

The government has a driving force for development of the economy. The whole economy is depending on the government. The whole FinTech is part of Vision 2030 adopted by the crown prince. There is a dialogue between FinTech and regulators. (Omar)

In order to analyze the FinTech market, it is key to know why technology firms are entering the financial sector. Banks are large bureaucratic companies that are very rigid. Such rigidity restricted banks from upgrading their front-office products to be more customers oriented. On the other hand, FinTech companies are much agile, very small and are a single-service provider:

The financial sector lagged development on how business model is working, and services offer compared to other sectors. The banks flew large enough to make it difficult to come up with more customer oriented and service-oriented product offerings and FinTech being small companies digitally driven have been extremely successful and it's a trend that is expected to continue and it's the future. (Sami)

It was noticed that bankers believe that FinTech are not only threatening banks, but also bankers. Especially those who have been in the industry for a longer time, as the disruption to the sector requires a new set of skills that necessitates agility, which is opposite to the nature of the conventional banking system. A new form of bankers is expected to appear, they are expected to be tech-savvy:

Some of them will be dying breed. That's the norm of life. It is an inevitable change and people will have to upgrade themselves. This is a new industry that is likely to attract and create other sectors, which will have an impact on the number of people employed. But it will reduce the number of people. (Omar)

From the above, the authors noticed that FinTech is still vague for bankers. As mentioned in the previous section, for a long time, technology was used by banks to compete among each other, but was never used by non-banking companies, specifically technology companies. The change of competition nature had the banks in a shock-like stage especially that the Saudi banking industry is a conservative

one. Regardless of the conservative nature, Saudi Arabia is still the largest economy in the Middle East and thus, global FinTech are keen to enter the Saudi market:

Each geography and each country have its set of characteristics and features and no one FinTech can dominate. So, the central bank being tight on Saudi keeping the system closed so FinTech that will be developed within Saudi will have an advantage but at the same time we see large FinTech wanting to localize their solutions to Saudi Arabia. (Sami)

The financial technical knowledge has always been key for bankers, however, the current market changes are technological changes. Such changes require a new set of skills to be added in the banking industry. New areas are expected to rise in banks to allow banks to compete with FinTech and current bankers do not have the skills that enable them to adapt to such changes:

There are certain functions within banks that will have less impact than others. Generally speaking, banks will start having more people that are scientists, data analysts, computer engineers and much more robust and stronger IT and digital team than now. (Sami)

Business schools need to focus more on technological knowledge. The way business majors are taught haven't change much throughout the years, theories in finance, accounting and economics are not changing as frequent as computer science is. FinTech companies are technology companies providing financial services and in order to have a competitive advantage in this area, one needs to have both business technical skills and technological skills. However, the areas of concentration are not clear yet. Being tech-savvy is key, but one needs not forget the business technicalities:

They will be tech-savvy, basics of liquidity management. It is hard to picture the required set of skills. (Omar)

Omar also added that there should be business technologies curriculums added to business schools to prepare students for the market in its new form:

Business school will have to provide courses covering the tech aspects. (Omar)

Bankers have different views to the competitiveness of FinTech. Some consider it as a threat to banks, others believe they will complement banks and upgrade customer experience. Yet, there is an agreement that bankers need to learn more about new technologies if they want to lead in the new banking era. There is also a

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consensus regarding adding supporting curriculums in business schools that would give students the knowledge needed in the new banking market. The authors notice the effect of being in such conservative market for a long time in how bankers read the future of the market. There is a vague image of where this is going in the eyes of bankers, and this view will be cleared with more knowledge in modern technologies.

The FinTech Professionals' Perspective

FinTech professionals have a clearer view about FinTech than bankers, mainly because most of them were bankers who shifted to the tech field. By looking at FinTech's target market, it is clear that FinTech seek markets where they can scale; as the services are usually extremely cheap in price (Economies of scale). The Middle East is a very promising region for startups with room to innovate and create new products. The GCC are the richest countries in the region and many opportunities are arising continuously in the GCC. Saudi Arabia is by far the largest economy among the GCC with the largest population as well. The number of SMEs is also growing in parallel to the Saudi government's support to these SMEs by establishing several agencies and programs to support the growth of these SMEs:

Fintech generally look for markets where they can scale and in GCC, Saudi is the largest market which makes sense for FinTech who is looking to work in the GCC to consider Saudi Arabia in the region. (Majed)

The competition with banks is in areas with exposure to large populations, this means individuals and SMEs. The banking service that is most used by individuals is payment. The increasing number of payment gateways that also provide other Client-to-Client (C2C) transfer services is rising in Saudi Arabia (e-wallets). STC Pay for example is an e-wallet that provides transfers to other people using the application as well as cost monitoring for family members, etc. Banks are expected to lose their market share of such activity in the beginning; however, they will regain such market share by acquiring the most successful ones:

Yes, especially for payment gateways. They will be affecting banks. We will see many startups coming to this area competing, trying to excel and eventually be acquired by banks. (Rakan)

Another scalable market is the SME sector. SMEs usually are of low income to banks, the credit facilities required are relatively low, the Non-Interest-Bearing Income (NIBs) coming from the current accounts are relatively low as well and they have high operation cost on banks. FinTech solutions can be of use for these

companies. Below, Rashed gives an example of Points of Sale (POS) machines, another opportunity is P2P lending as well. SMEs are usually of higher risk to banks, meaning they are offered higher interest on their credit facilities. In this context, Rashed considered this as collaboration with banks rather than competition as many banks are not interested in dealing with such segment:

Banks are considering FinTech more of a collaboration rather than competition to take away parts of business that are high on operation and low in income such as; POS machines, etc. (Rashed)

It was established that a FinTech is a company that provides a single financial service; therefore, a FinTech cannot replace a bank. However, can multiple FinTech replace banks? Majed believes that FinTech are far from replacing banks:

There are very few FinTech which have become sort of banks, which are considered as challenge to banks in the financial industry. FinTech cannot become banks because they do not have the data base, the trust factor nor the scalability that a bank has. (Majed)

In Saudi Arabia, the central bank is driving and pushing for FinTech to enter the market and come up with several innovative services. This alone is a new approach in the market; as the Saudi central bank has been known for being a conservative one. The Saudi Arabian Monetary Agency (SAMA) and the Capital Market Authority (CMA) created a FinTech sandbox; where startups come and present their products, have it tested from several aspects before sending them to the market. An entity named FinTech Saudi was created to support the regulators and FinTech in this process:

The market is driven by the regulators. The regulators are creating a sandbox for innovators, but innovators should not step-out of the box in ways that provokes the regulators, something like creating crypto exchange. The regulator always concerns fraudulent activities and avoids anything that has a fraud risk or money laundry risk. (Mohamed)

Even though the main regulators are pushing and driving the market, existing regulations remain challenging to the market. FinTech, similar to banks, go under several regulators, these regulators are not yet ready for such market:

Needing to approach several governmental entities to obtain licenses, each with different requirement. There are no regulations in place for areas such as P2P. (Rakan)

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The above-mentioned quote takes into consideration all regulatory bodies and not only SAMA and CMA. Other related parties can be the Ministry of Commerce and Investments and the Ministry of Labor, among other parties.

The regulators are not the only conservative party in this paradigm. The market is very conservative as well. For a long time, SAMA has been pushing for a cashless society, which has not been a success so far; as the penetration on plastic cards remains low. To push the society to FinTech solutions is even more challenging than plastic cards:

Also, educating people about FinTech and to make them trust the technology, especially when it comes to money, people are hesitant, we've seen people being resistant technology was introduced to different sectors. The Saudi market is very conservative and traditional. (Rakan)

Current bankers should be educated in this area, such knowledge with existing experience can be used to create new ideas and give banks competitive advantage:

There needs to be an element of self-learning to be able to understand what's happening to the world. (Majed)

The new market does not lack financial technical skills, or technological technical skills. However, a combined set of skills is needed, someone who understands both aspects and how to utilize technologies to serve the financial industry. Such knowledge is expected to be taught in universities to have well equipped graduates:

The technical skills have been a challenge that is also being addressed with university partners. (Majed)

Universities should add new majors introduced into these universities. FinTech should be added to majors, majors such as "FinTech and Investment", etc. Mix and match new majors. (Rakan)

On the other side, another idea to equip students is by offering internships in FinTech companies and gain such knowledge hands-on:

I don't expect people to get such knowledge from Universities. Students need to go and work for FinTech companies and learn from them, do their internships there. (Mohamed)

FinTech professionals have a clearer view of the market, however, there is a push for regulators to improve the regulations, and they are. This push for more agility and innovation is new to the banking industry in the country, yet it is strong and there is support from the regulators and the government. Scalability is key for FinTech and the market has the potential for FinTech to grow given the support that SMEs and startups are getting from the government. Having a scalable market is not the only ingredient for a successful FinTech, FinTech needs to employ more capable people and these are people with both financial and technological knowledge. There are a few ways to prepare students for such market, the first is to educate them in universities by adding some sort of a business/financial technologies courses. The other way is to send students for internships in FinTech companies to learn hands-on.

SOLUTIONS AND RECOMMENDATIONS

In this section, the authors discuss the themes that emerged from the study and provide recommendations for industry practitioners, academics, students and universities. Two main themes emerged in the analysis: (a) FinTech target market, being scalable and less focused by banks; and (b) the changing set of skills of current and future practitioners, with the second theme being a direct result of the former, requiring rethinking in terms of the skillsets required by future employees in the sector. Discussed next are the theoretical contributions of the study, followed by practical recommendations.

Theoretical Contributions

A common theme between participants from both sectors was the disruptive nature of such innovation in the financial industry, especially the banking sector, reassuring Philippon's (2016) theory that the banking industry was focused on back-office improvements rather than front-office. Another common theme was the acquisition of FinTech by banks. By doing so, banks eliminate competition while also potentially affecting their bureaucratic nature pushing for more agility. This reflects Jaubert et al.'s (2014) study mentioned in the Background section.

The study also shows the effects of having a conservative banking system, despite its traditionally positive effect on the Saudi economy by protecting it from global economic crises such as the one in 2008. The conservative nature of the regulators was reflected on banks as well; the rigidity and resistance that bankers show to such change reflects the views of Fasnacht (2009). Despite the fact that the regulators are the ones pushing for FinTech penetration, their late adoption of this program reflects the conservative approach of the ecosystem, which is being forced to change

by country leaders. Hence, the FinTech sandbox is created to promote a top-bottom change on the ecosystem as a whole by supporting FinTech startups, entrepreneurs, banks and other stakeholders.

Another important outcome from the data is the lack of understanding of FinTech and its history. Many stakeholders are not familiar with the FinTech timeline suggested by Arner et al. (2015). This adds to the challenges that regulators face to increase the penetration of FinTech. Such a challenge comes from the public users of FinTech solutions. For many years, the regulator has been pushing for a cashless society and the penetration levels for plastic cards are not satisfactory to the regulators. FinTech is even more challenging.

As for banks' existence, the study shows that it is very unlikely for FinTech companies to be banks, supporting Omarini's (2017) suggestion that FinTech needs banks to operate; rather, FinTech will digitize and automate most banking operations. The study shows two main ways of gaining such knowledge in technology and information systems: (a) class-room teaching, i.e. university taught curricula for students and training sessions for practitioners; and (b) on-job training, i.e. internships for students in FinTech companies. Both findings reinforce the suggestions made by Chuang (2017) and Hsiao et al. (2017) that ICTs should be embraced within existing education curricula.

Practical Recommendations

With the fast pace of FinTech integration in the Saudi economy, it is inevitable that practitioners will start learning the new technological trends in order to gain competitive advantage in the new market. The data showed that FinTech is still in its early stages and is targeting the market that is overlooked by banks. Nevertheless, FinTech is creating new opportunities in the industry and practitioners need to learn more about technology to be able to compete. Banks are also expected to support their staff and provide learning and development programs in the area of FinTech to explore new ideas and ways to use new technologies in their interest.

University students also need learn more about the current trends and try to link them to their studies. Many schools are focusing more on FinTech and offer FinTech-specialized programs. However, not all knowledge can be gained from school; students should also gain hands-on, practical experience, for example by doing internships in FinTech companies. Universities are also expected to develop partnerships with FinTech companies to ease the process of their students' internships, as faculty will be integrating technology in their existing curricula to maximize their students' exposure to these trends.

FUTURE RESEARCH DIRECTIONS

The study presented has limitations which give rise to direction of future researches. For instance, a small group of participants took part, which may limit the generalization of the findings. A quantitative approach is likely to enable more statistically generalizable results. Even within the Middle Eastern context, the findings of this study may not be relevant, as the region has economies that are extremely poor and others that are significantly wealthier. A multi-case study approach involving regions with diverse levels of economic development may be useful to that end. A final remark here relates to who informs the results of a research study. This study has taken the case of bankers and FinTech professionals; it would therefore be useful if future researchers adopted a multi-perspective approach by considering other stakeholders in the industry—such as end-users and regulators—which would help to paint a richer picture of how digitalization and FinTech play out in the wider financial ecosystem.

CONCLUSION

The study was initiated to explore how FinTech is affecting the set of skills sought in bankers in the Saudi financial context in particular; an under-explored research context. The study offered a better understanding in the idiosyncrasies of FinTech in the selected context and identified implications for practitioners, educators and students, which were discussed in the previous sections alongside directions for future research.

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KEY TERMS AND DEFINITIONS

CMA: Capital Market Authority (in Saudi Arabia).

Digital Disruption: The change of the nature of an industry that is caused by digital technologies.

Digitalization: The use of digital technologies to upgrade processes.

FinTech: The use of technology in the financial industry.

Payment Gateway: An app that enables the user to pay through the mobile without the need for physical cash/card.

Peer-to-Peer Foreign Exchange Platforms: A platform connects two similar clients to exchange currencies, i.e. individuals to individuals, small companies to small companies.

Peer-to-Peer Lending: A platform that connects two similar clients to lend and borrow, i.e. individuals to individuals, small companies to small companies.

SAMA: Saudi Arabian Monetary Agency.

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About the Contributors

Gülây Ekren has been working as a lecturer at Sinop University, the Computer Technologies Department of Vocational School of Ayancik. She has a BA degree from Ege University, the Department of Computer and Instructional Technologies, and an MA degree from Gazi University, the Department of Management Information Systems. She also has an online MA degree from Anadolu University, the Department of Distance Education. She is now a doctoral student at Sakarya University, the Department of Management Information Systems. Her research interests are digital transformation, digitalization, management information systems, ERP systems and their implementation, agility, and industry 4.0.

Alptekin Erkollar is a Professor for management information Systems. Dr. Erkollar's research expertise includes management information systems, industry 4.0 and the factory of the future, production management, technology management, modeling of business systems and simulation. Some of his recent publications include 'Flextrains 4.0 – Smart Logistics for Smart Cities', 'Industry 4.0: Big Data Revolutions require Smart Technologies' and 'Sustainable Cities Need Smart Transportation: The Industry 4.0 Transportation Matrix'. He is an author/editor of several books, more than 200 refereed papers and an editorial board member of 13 international journals. Prof. Erkollar is editor of the international book series 'Enterprise and Business Management'.

Birgit Oberer is an Associate Professor for management information systems. Dr. Oberer's research expertise includes management information systems, innovation and technology management, Industry 4.0 as well as electronic government and its applications in companies, governments, and non-profit organizations. Some of her latest journal publications include 'Technology Management and the Change in the European Geodata market' and 'How to manage government? Innovation Through Open Government Data Portals', 'The Innovation Union Scoreboard - Helping Europe become more innovative', and 'I4.0 Connectivity: Smart Factory Communications'. Dr. Oberer serves as an invited reviewer for research projects for

the ETH Zurich, one of the leading international universities for technology and the natural sciences. Dr. Oberer is Co-Editor of the international book series 'Enterprise and Business Management'.

* * *

Faisal Abubotain, MBA, is an External Relationship Officer at the Debt Management Office at the Ministry of Finance in Saudi Arabia. Before that, he worked for three years as a corporate banker in Global Banking at SABB (an HSBC affiliate) handling multinational corporate. Faisal received his MBA from the University of Sussex and Bachelors Degree in Finance and Investments from Prince Sultan University.

Can Berk Acar is an Export Sales Engineer at Panoto Radiator Machinery Inc. in Istanbul. He helps in researching and developing new products, finds new markets and customers and helps to meet customer demands. He received Bachelor's Degree in Mechanical Engineering from Kocaeli University. He obtained master's degree in Engineering Management from Istanbul Technical University. He also interests chess and basketball professionally

Vildan Ateş is an Assist. Prof. Dr. in the Management Information Systems Department of Business School at Ankara Yıldırım Beyazıt University since March 2017. She was born in Antalya, Turkey. In 2010, she received her master's degree from the Management Information Systems Department of the Institute of Informatics at Gazi University. She received her Ph.D. degree in 2014 from the same school and the same department. Dr. Ateş worked as an IT Expert at Gazi University from 2009 to 2017. Her research interests include information management, IT security and risk management, educational technologies, human computer interaction, and e-commerce. She is married with two children.

Recep Benzer graduated from Istanbul University Engineering Faculty Computer Science Engineering Department. He received his Master's degree from Sakarya University Institute of Science and his Ph.D. from Gazi University Institute of Science. His research focuses on mathematical modeling, information system, artificial neural networks, expert systems, computer networks, forensic computing, software engineering, predictive modeling. He worked as an administrator in the communication project at the Turkish Armed Forces General Staff. He worked as project manager at Tubitak Project. His work is published in book, articles, and chapters. He is a fellow of The Turkey Chapter of Association For Information Systems (TRAIS).

About the Contributors

Semra Benzer graduated from Gazi University Education Faculty Biology Science Department. He received his Master's degree from Gazi University Institute of Science and his Ph.D. from Gazi University Institute of Science. Her research focuses on fisheries, environmental science, science education, limnology, ecotoxicology. Her work is published in book, articles, and chapters. He is a fellow of The Turkey Association of Limnology.

Sheena Lovia Boateng is the Executive Director of PearlRichards Foundation and a researcher at the University of Ghana. She holds a doctoral degree in marketing from the University of Ghana Business School. Her research and consultancy interests cover Relationship Marketing, Social Media, Digital Marketing, International Marketing and Retailing in Ghanaian and multinational companies. Her papers have been published in journals including the Journal of Financial Services Marketing, International Journal of Bank Marketing, E-Learning and Digital Media, and many others. She is the author of the book, Structural Equation Modelling Made Easy for Business and Social Science Research Using SPSS and AMOS.

Şule Bozkurt graduated from Gazi University Education Faculty Science Education Department. She is a Msc student at the Science Education at Gazi University Graduate School of Educational Science. She works as a teacher in the Turkish Ministry of National Education at Babatorun Secondary School in Hatay, Turkey.

Hanefi M. Calp received Ph. D. degree in 2017 from the Department of Management Information Systems at Gazi University, one of the most prestigious universities in Turkey. He works as Assistant Professor in the Department of Management Information Systems of the Faculty of Economics & Administrative Sciences of the Karadeniz Technical University. His research interest includes Management Information Systems, Artificial Neural Networks, Expert Systems, Fuzzy Logic, Risk Management, Risk Analysis, Human-Computer Interaction, Technology Management, Knowledge Management, Digital Transformation, and Project Management.

Ufuk Cebeci is an Associate Professor of Industrial Engineering at Istanbul Technical University. He graduated with a BS from Istanbul Technical University in 1984, a MBA 1988, and a PhD from Istanbul Technical University in Industrial Engineering in 1994. His current research interests include Quality Management, Lean Manufacturing, Strategic Management and New Product Management. His research papers have appeared in Int. Journal of Production Economics, Expert Systems with Applications, IEEE Transactions on Engineering Management and Journal of Enterprise Information Management.

Petros Chamakiotis, Ph.D., is an Associate Professor of Management at ESCP Europe Business School (Madrid Campus) and the Chair of the IFIP WG 9.5. He earned his PhD from the University of Bath and was earlier with the University of Sussex (2015-2019) and Royal Holloway, University of London (2013-2015). His research focuses on the management of digitalization, connectivity and digital work at large (e.g. online communities, virtual teams), primarily in the healthcare, engineering and financial services industries. He has published in: *New Technology, Work & Employment*; *Organizational Research Methods*; *Information Technology & People*; *International Journal of Information Management*; and *Creativity & Innovation Management*.

Zehra Düzgit is a member of Department of Industrial Engineering at Istanbul Bilgi University, Faculty of Engineering and Natural Sciences. She received a B.S. degree in Systems (Industrial) Engineering from Yeditepe University. She received a master's degree in Engineering Technology Management and a Ph.D. degree in Industrial Engineering from Bogazici University. Her current research interests include optimization techniques, production scheduling and meta-heuristics.

Batuhan Ersözlü is a Software Development Specialist at a global company in Turkey. He develops mobile and web apps for corporate in-house projects. Batuhan graduated from Yeditepe University, with bachelor's degrees in Computer and Science Engineering in 2015 and Istanbul Technical University, with master's degrees in Engineering Management in 2019. After graduating he lived in the capital city of Turkey, Ankara for 3 years and moved to Istanbul. He is currently working on volunteering works in support of animals and raise awareness in Turkey, innovation strategies in corporate companies and design principles in mobile apps.

Şahen Tokathoğlu is an MSc Energy Systems Engineer, working as a regional sales manager in the electricity sector. He received a B.S. degree in Energy Systems Engineering from Bahcesehir University, Istanbul. His engineering capstone project was about Microgrid Energy Systems in 2017. He received a master's degree in Engineering Management from Istanbul Technical University. His last study was about Porter's 5 Forces Model Application in Electricity Sector in 2019.

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