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**A STUDY ON THE IMPACT OF DIGITALIZATION ON
ORGANIZATIONAL PERFORMANCE OF
SUPERMARKET CHAINS OPERATING IN SRI LANKA**

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239108P

Degree of Master of Business Administration in Information Technology

Department of Computer Science and Engineering

University of Moratuwa

Sri Lanka

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The dissertation was submitted to the Department of Computer Science and Engineering of the University of Moratuwa in partial fulfilment of the requirement for the Degree of Master of Business Administration in Information Technology.

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DECLARATION

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LIST OF ABBREVIATIONS

Abbreviation	Description
CP	Customer Perspective
CS _D	Customer Experience Dimension of Digitalization
DG _i	Digitalization Index / Level of Digitalization
FP	Financial Perspective
FSIZE _{it}	Firm Size
IBP	Internal Business Process Perspective
LGP	Learning & Growth Perspective
OP _i	Organizational Performance index
OPS _D	Operational Dimension of Digitalization
PP _D	People Dimension of Digitalization
PS _D	Products/Services Dimension of Digitalization
ST _D	Strategy Dimension of Digitalization
TECH _D	Technology / Technological Infrastructure

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Abstract

The purpose of this study is to analyze whether there is a relationship between digitalization and organizational performance of supermarket chains operating in Sri Lanka. The scope of this study includes all supermarket chains during the period of 2023 and 2024. The main objective of this research is to empirically investigate the relationship between the level of digitalization and organizational performance measured in terms of the dimensions of the balanced scorecard model which include financial and non-financial performance indicators. Additionally, this study aims to assess the degree of digitalization of supermarket chains operating in Sri Lanka. Descriptive statistics have been used to assess the degree of digitalization, organizational performance; correlation and regression analyses were performed to examine the direct relationship between the level of digitalization and organizational performance. Based on the results of the study, a significant relationship could be seen between the level of digitalization and overall organizational performance of supermarket chains in Sri Lanka. However, out of the four balanced scorecard performance perspectives, only the internal business process and financial perspectives showed a significant relationship. An insignificant association was examined between the level of digitalization and the customer and learning & development perspectives of the balanced scorecard. In addition, the extent or the level of digitalization was established based on an international assessment model which was refined to fit into the Sri Lankan context based on the dimensions that have been identified as contributing factors in promoting digitalization across business sectors in Sri Lanka. This study will contribute to the extant literature by investigating the relationship between the above variables as empirical studies were scarce about the association between digitalization and organizational performance measured in various dimensions. Further, the refinement of the assessment model to measure the level of digitalization can also be identified as a contribution since similar models were scarce in the local context.

Key Words: Digitalization, Information Technology, Operating Performance, Balanced Scorecard, Supermarkets, Performance Dimensions

CHAPTER 01 - INTRODUCTION

1.1 Background

Digitalization has progressed over the past decades from a rather vague and theoretical idea into a transformative force. This has contributed to the development of the current economic landscape while functioning as a significant disruptor with an extensive range of outcomes (Bughin & Zeebroeck 2017).

Scuotto et al. (2019, p.3) defines digitalization as,

“The adoption of digital technologies to reshape a business model. The aim is to create value from the use of new, advanced technologies by making use of digital network dynamics and the great digital flow of information.”

Even though several phrases defining digitalization have been cited in literature, the definition provided by Scuotto et al. (2019) covers the holistic view of digitalization and its dynamics as it makes reference to the mechanism organizations need to embark on, in realizing its benefits. Furthermore, the notion of digitalization even goes beyond to incorporate the application of digital innovations and technologies to improve, refine and develop business models and processes. In consequence, organizations that operate whilst applying digital technologies and solutions are identified to be ‘digitally mature’. However, as explained by J. Scott Brennen and Daniel Kreiss, digitalization and digitization are two concepts which are intimately associated as described in a wide range of literature. According to Unruh and Kiron (2017), digitization encompasses the translation of the business product or service offering into a digital format while digitalization is about the phase of new business process and model development by capitalizing on the benefits of the digitized aspects of the business.

The emergence of the fourth industrial revolution (Industry 4.0) has been one of the driving forces for firms to embrace digitalization. This has enabled firms to capitalize on

the numerous opportunities which would revolutionize the business model and drastically contribute to the effective restructuring of the value chain. (Cenamor, Sjodin, & Parida 2017) Experts from the industry view digital transformation as a force that contributes positively to firms. As per the recent reports published by PricewaterhouseCoopers and the Boston Consulting Group, industry 4.0 is expected to contribute to overall efficiency by 15% to 20% and at the same time contribute nearly 20% to 25% of revenue over the five years to come. With the numbers associated with digitalization looking promising, this would significantly transform business entities and drive innovation while creating new revenue and value enhancement streams. (Gartner 2018)

In an era where digital transformation is gaining an increasingly important perspective, companies have recognized their unique prepositions and capabilities among numerous technological innovations which assist in the refinement of the competitive and economic landscape (Loebbecke & Picot 2015). Furthermore, digitalization has been instrumental in modifying the physical marketplace and transactions into virtual ones while contributing to the change of systems into being more crowd centric rather than being organizational centric, thus giving rise to the digital economy (Pangestu & Dewi 2017). Hence, digitalization has turned out to be one of the radical and fundamental contributors of business change via tools and digital elements such as internet of things, substantial use of data and forecasting analytics, engagements via social media platforms and embracing other transpiring technologies such as robotic process automation, blockchain and artificial intelligence. (Lenka, Parida & Wincent 2017)

The foreseen opportunities and the potential gains to organizations of adopting and leaning upon the impacts of digitalization have incentivized firms to test their respective business models in the light of digital technologies (Ridgway et al. 2013, cited in Ferreira & Ehie 2019). As a result, organizations which spearhead the creation of innovative technologies are constantly seen taking advantage of their business activities with the move to new levels of competition from which they can maximize their levels of profitability. (Scott et al. 2017) As stated by Yoo (2010 p. 121) the unmatched growth of increasingly digital

and innovative firms, irrespective of their scale is one of the best examples which can be quoted when it comes to signifying as to how rapidly the world of business can shift and how easily sector boundaries can become less distinct. An instance where the phenomena of sector boundaries becoming less distinct was proven was when Uber, profoundly known as a taxi hailing company moved into UberEATS, the food delivery business. Hence the advent of increasingly used digital technologies have pressurized firms to re-engineer themselves and foster change. This has resulted in businesses being faced with a crucial strategic decision that is either to adopt to the futuristic states of digitalization or to experience technological antiquity. (Weill & Woerner 2018)

In prior empirical studies, the associated impacts of digitalization on organizational performance have been examined. Wroblewski (2018, p. 38) highlights that digital maturity of firms in Sweden do have a positive impact to the operating performance of the firm. Bresnahan and Greenstein, (1996, p. 41) underlines that the benefits of digitalization would accrue over the years and such benefits would be realized in terms of enhanced asset turnover, improvements in return on assets, growth in net margins and growth in sales revenue. Bughin, LaBerge and Mellbye (2017) claims that firms which embrace digital transformation contribute to better customer interactions and experience better performance in terms of revenue growth, earnings before interest and tax growth and returns on investment. Im and Rai (2008) emphasizes in their research that firm growth in India is enabled by information technology which has contributed immensely in driving firm profitability while such moves are also prone to impact positively on organizational knowledge.

As cited in previous researches, irrespective of the industry organizations operate in, digitalization is said to create a significant impact that drives transformation and change in the respective industry (Gretton et al. 2004 cited in Lopez & Garrido 2019). However, when the level of diffusion of digitalization is taken into consideration, the retail sector stands out with traditional retail being transformed at a rapid pace while creating future

modes of multi-channels and decision-making using enablers of digitalization (Wiefel 2015). With a long history of digitalization in retailing, the transformation's relevance is becoming increasingly evident since implications of digitalization to the retail sector are vast and far reaching (Watson 2011, cited in Nicklas et al. 2016).

According to global business reporter Research and Markets, the global retail sector is said to represent nearly 32% of the world's gross domestic product. Narrowing down this impact on to a local perspective, according to the Sri Lanka Retail Forum (2019) the retail sector of Sri Lanka is said to account nearly 34% towards the gross domestic product where a considerable amount of contribution can be seen from the growing supermarkets segment of the retail sector (Sri Lanka Retailers' Association 2019). Hence, the supermarket chains in Sri Lanka can be seen as a segment with a significant contribution to the country's economy and also as one with lots of potential into the future. At the same time, the numerous impacts of digital concepts and tools on the sector are extensive and the entire retail sector is at a time where the diffusion of such digital elements into the business are happening at a relatively higher pace (Sri Lanka Retail Forum 2019).

Hence, this study intends to assess digitalization and its implications to organizational performance of supermarket chains operating in the retail sector of Sri Lanka.

1.2 Justification of the Research Issue

As the technology insurgence continues to transform the world at a rapid pace, embracing and adopting to digitalization have become some of the salient courses of action organizations opt for, in driving organizational performance (Unruh & Kiron 2017).

Preceding researches in the international context bring to light several findings in establishing relationships between digitalization and the resultant impacts on the financial performance of organizations. The observations presented by Westerman et. al (2012) states that firms maturing in either of the two dimensions of stronger digital and

transformation management intensity, can outperform industry competition in terms of financial performance. In other words, the level of profitability and the rate of sales generation are relatively higher for firms that have embraced the various elements of digitalization. Scott et. al (2017) in their research publication hypothesizes an insignificant relationship between digitalization and firm performance, where the only measure of performance has been the profit margin. Bughin et. al (2017) presented the fact that there exists a significant correlation between digital adoption levels and the revenue growth of the organization, where higher the level of digitalization in an organization would assist in gaining growth in revenue.

In discussing the connectivity of digitalization and organizational performance in Sri Lanka, Rassool and Dissanayake (2019, p.30) has highlighted the need for small and medium scaled enterprises to embrace digitalization in facilitating strategy reforms and developing more effective business models. Furthermore, McKinsey Global has computed the digital quotient score by analyzing a total of 50 organizations in Sri Lanka which operates across several industries ranging from retail, banking, manufacturing, hospitality, transport and logistics etc. Even though the computed digital quotient had not been linked to the respective organization's performance, the outcomes of the exercise as stated by De Bustis, Ganesan & Herath (2018) indicates that there exists impelling opportunities to improve and capitalize on the pillars of holistic digital transformation.

However, Coupette (2015) has underlined the fact that the modern use of embedded digital technologies have been instrumental in reaping success for organizations in a multi-dimensional perspective such as optimized internal business processes, reduced costs, enhanced worker productivity, lean and optimized supply chains, enhanced customer satisfaction and loyalty and so on. In consequence, digitalization has persuaded firms to be on the lookout for new business opportunities whereby the current business strategy can be critically reflected while enabling key management personnel to refine or alter their business models (Kiel et al., 2016). Hence, it builds evidence on the fact that digitalization

is a factor that modifies and drives organizational performance in multiple dimensions and not merely on one or two performance perspectives of the business.

Accordingly, the use of unilateral and conventional performance measure indicators would not provide the necessary information on organizational direction and performance when assessing the impacts of digitalization. (Szoka 2018) Furthermore, Kaplan and Norton (1992) stated that the available systems of financial indexes to assess organizational performance have been unable to demonstrate the performance dynamics which are essential to combat the modern knowledge-based competition. As a result, the balanced scorecard approach which assesses organizational performance in the multi-dimensional perspectives of financial, internal business process, customer and learning and growth (Kaplan & Norton, 1992) has been employed in assessing organizational performance.

Problem Statement

Based on the facts highlighted in section 1.2, the problem statement of this study is to establish whether a direct association exists between the extent of digitalization and overall organizational performance, assessed in terms of the four perspectives of the balanced scorecard, in supermarket chains operating in the retail sector of Sri Lanka.

1.3 Research Questions and Objectives

Research Questions

Building up from the problem statement, the research objectives of this study are as below:

1. What is the level of digitalization of supermarket chains operating in the retail sector in Sri Lanka?
2. What impact does digitalization have on overall firm performance of supermarket chains operating in the retail sector in Sri Lanka?

3. What is the impact of digitalization on different dimensions of organizational performance of supermarket chains operating in the retail sector in Sri Lanka?

Research Objectives

Stemming from the research questions discussed above, this study expects to accomplish the below mentioned objectives:

- To establish the level of digitalization of supermarket chains operating in the retail sector in Sri Lanka
- To examine the impacts of digitalization on overall firm performance of supermarket chains operating in the retail sector in Sri Lanka
- To assess the impact of digitalization on different dimensions of organizational performance of supermarket chains operating in the retail sector in Sri Lanka

1.4 Significance of the Study

Theoretical Significance

With the continuous development of the digital technology sphere accompanied with the rise in competition in the global marketplace, organizations have been constantly challenged to look at efficient solutions in meeting consumer needs while outperforming their rivals. In such a context, leveraging on the extensive benefits from the application of digital technologies and embracing the elements of digitalization is seen as a key opportunity for organizations (Garrido et al. 2018).

A few important theoretical implications have been addressed in this study on the phenomenon of digitalization in supermarket chains operating in the retail sector in Sri Lanka.

Considering the existing literature on digitalization (Legner et al. 2017; Buyukozkan and Gocer 2018), this study contributes to the ultimate process of digital transformation by assessing the level of digitalization of the companies and as to how organization capabilities and performance are impacted as a result of such. Further, we have deployed the Industry 4.0 digitalization metric as put forward by Schumacher, Erol and Sihn (2016) and customized certain digitalization measurement criteria in coming up with a much-condensed metric that suits to the retail sector of Sri Lanka. The metrics have been condensed with reference to the Digital Economy Strategy Blueprint (2018) of Sri Lanka. The industry 4.0 model has been developed using several methodological approaches such as conceptual modelling and systematic reviews of prior literature and as a result it is inclusive of several organizational aspects making it an all-inclusive model (Schumacher, Erol & Sihn 2016). Hence the framework which has been refined to assess the level of digitalization of supermarket chains operating in the retail sector in Sri Lanka is a representation of the contribution of this study to theory.

The derived indexes of digitalization have been analyzed against several performance dimensions of supermarket chains in Sri Lanka. This can be seen as one of the salient contributions from this study since a majority of prior studies have paid a limited focus in

attaching the impact of digitalization across the multiple performance dimensions of organizations. As highlighted by Coupette et.al (2015), digitalization is seen as a practice that impacts and improves performance of organizations from a multi-dimensional perspective. Hence the use of the balanced scorecard model (Kaplan & Norton 1992) has been adopted in assessing the multi-dimensional performance perspectives of retail sector organizations. As cited in previous researches, an index-based method has been deployed in quantifying organizational performance by assigning equal weights, thus signifying the relative importance of all four performance measurement dimensions for the retail sector as highlighted in the journal of international review of retail, distribution and consumer research (Dickinson et al. 2011).

Practical Significance

The emergence of digital technologies and the continuous rise in the level of global competition has driven both global and local supermarket chains to search for better and effective solutions that assist in meeting customer needs. Retailing as a business is said to experience major synergies with the transition to digital transformation. In such a context, digital technologies constitute a key opportunity which could be exploited by organizations in the supermarkets segment. The adoption of digital technologies is said to alter the way in which products and services are retailed and such technologies are none other than the enablers of digitalization. As a result, there is an urgent need for supermarket chains to initiate and adopt to the digital transformation of their business in order to thrive in the increasingly competitive environment.

Business strategy and the retailing value chain has had a significant impact from the cascading effects of digitalization. The application of digital technologies has compelled organizations to initiate the development and execution of a digital business strategy in the process of creating differential business value. Similarly, the supply chain too has been transformed in various ways with improvements in its processes and methods of value creation. At this level, having a comprehensive knowledge on the driving forces and the

impact of digital innovations would motivate organizations to experience the advantages of technological opportunities to further improve innovation levels and business performance. Hence, the level or the extent of digitalization would be of importance here since it provides insights on the level of digital technology adoption of the organization and call attention to the areas that require improvement in capitalizing the benefits of digitalization.

The adoption of digitalization by firms may not result in higher performance standards of the organization immediately in the short run. According to Bresnahan and Greenstein, (1996) the benefits of digitalization would accrue over the years and its real benefits would be reaped in the longer term as a result of the difficulties that persist within organizations in terms of blending in the new technologies and overcoming any negative impacts associated with such implementation and change. The benefits would be realized in terms of improvements in return on assets, improved asset turnover, increase in sales revenue and increase in net margins.

The phenomenon of digitalization is of practical importance for the management of the organization. They need to focus on the integration aspects of digitalization across the business operation from supply chain to sales and subsequently to after sales aspects, if any. This would facilitate the development of optimized supply chains and efficient business models which contribute to the creation of digital synergies which would ultimately be reflected via enhanced organizational performance. Hence, organizations should commit to digital transformation in its business settings to improve its value creation strategies and amplify its performance standards.

Furthermore, the benefits of digitalization would not be visible if financial performance metrics alone are used for performance assessment. As stated by Coupette (2015) the application of digital technologies has been influential in realizing success for organizations in a multi-dimensional perspective such as reduced costs, enhanced employee productivity, optimized internal business processes, enhanced customer satisfaction and so on. Hence it is clear that digitalization can be seen as a transformative

force which drives organizational performance in several dimensions and not solely on one or two defined business perspectives. Therefore, the balanced scorecard measures (Kaplan & Norton 1992) have been used in this study in assessing organizational performance so that the effects of digitalization are assessed based on multiple performance perspectives. It is believed that the assessment of performance from the perspectives of the balanced scorecard would provide more practical insights on the integration of digitalization into the identified organizational perspectives.

As John Chambers, the chairman of Cisco Systems stated, if organizations do not change to accommodate the disruption of new technologies, at least 40% of organizations would expire during the years to come. The best example for this from the local context would be the loss of market for Kangaroo cabs which was in existence for nearly four decades when startups like PickMe and Uber launched themselves in Sri Lanka by capitalizing on the disruptive digital technologies. Hence, it is crucial for organizations to fast adapt to the evolving digital technologies in sustaining business into the future.

1.5 Methodology

This study attempts to identify as to what sort of a relationship exists between the variables of digitalization and organizational performance measured in multiple dimensions and this can be identified by the employment of the quantitative approach of analysis.

Similar studies such as Servitization and digitalization: the influence on firm performance (Garrido et al. 2018), a maturity model for assessing industry 4.0 readiness and maturity of enterprises (Schumacher, Erol & Sihn 2016), Stages in digital business transformation: results of an empirical maturity study (Back & Berghaus 2016), Digitalization and firm performance (Wroblewski 2018) and several other articles and prior researches have deployed the quantitative approach in gaining insights into the relationship that exists among the concepts of digitalization and organizational performance. Therefore, by following the deductive approach while using objective measures the researcher intends to identify the relationship between the said variables.

The population for this study constitutes the executives of the seven supermarket chains operating in the retail sector in Sri Lanka. Hence the sample will constitute responses from 390 executives from the said seven organizations. The primary source of data collection is a structured questionnaire. Financial and non-financial information from the published reports for the financial period ended 2023/24 and 2024/25 of the selected companies would be collected as secondary sources.

Data collected from the structured questionnaire have been analyzed using IBM Statistical Package of Social Sciences (SPSS 23). After performing a data screening and cleaning, descriptive statistics and inferential statistics have been used mostly in describing data.

To assess the degree of digitalization measures of Central Tendency are used. Under Descriptive Statistics, measures of central tendency such as Mean, Median and Mode have been computed for further analysis of data.

To examine the relationship between digitalization and organizational performance, Bivariate Regression analysis are used. Under Inferential Statistics, measures such as Ordinary Least Square analysis are used to assess the relationships among the variables.

1.6 Scope of the Study

The purpose of this study is to assess the impact of digitalization on overall organizational performance measured using the four perspectives of the balanced scorecard. This study will be limited to the supermarket chains operating in the retail sector in Sri Lanka.

This study aims at assessing the level of digitalization of the selected companies using structured questionnaires and available secondary data and then assessing the impact of digitalization on different dimensions of organizational performance. A quantitative approach would be followed in deriving insights into the above relationship. Moreover, certain calculations, assumptions and selections will be made as consideration of a proper and realistic design.

Finally, this study aims to add empirical, practical and methodological significance as highlighted earlier and fulfil the existing research gap.

1.7 Limitations of the Study

While this study is aimed at contributing significantly to the theoretical and practical dimensions, certain limitations have been highlighted below that would be areas of improvement future studies may address.

Absence of generalization

This study assesses the digitalization aspects of the seven organizations operating in one specific industry which is the retail sector in Sri Lanka. Organizational size has been kept constant as a control variable and hence there is the possibility for the selected organizations to differ in size and at the same time differ in their market positioning and sales volumes handled. Thus, the recommendation for further research would be to evaluate the impact of digitalization on organizational performance on companies with varying features such as industry, size etc. Since digitalization in the context of the retail sector is a relatively new research area, this study can be taken as one that provides an overview on the implications of digitalization which would limit the generalizability of the findings to a certain extent especially when the generalization is outside the retail sector.

Further, there is a possibility that the analyzed results could have certain implications on the results generated as it may not provide a holistic picture of the variables studied. The relatively smaller population is itself susceptible to values that may be at the extreme and the data may be distorted if the performance of the firms are for some reasons or the other under-performing or over-performing. Therefore, the quality of this study would further benefit by using a higher number of data points. The geographical focus and scope of

using Sri Lankan supermarkets can also be identified as a limitation since they barely spearhead technological changes and digital aspects.

The indexes of digitalization and organizational performance have been derived at by summing up several items relevant to the respective index by using prior literature and findings as the basis for the derivation. There has been no framework developed explicitly in measuring digitalization in the retail sector and hence a generic model developed for digital maturity assessment has been used for this study. For example, digitalization aspects that are much closer to the Industry 4.0 setting in the retail sector across the globe such as cloud computing and artificial intelligence have not been given prominence which may not cover the aspect of digitalization from a holistic view from the calculated index. Hence, digitalization may not be adequately captured and reflected from the developed index. In the assessment of organizational performance too, only a handful of key performance indicators have been taken into consideration from the four balanced scorecard perspectives whereas there could be several others that maybe specific for our purpose. Further, like most survey-based studies conducted the analyses aspects are cross sectional which fails to identify the vital aspects supports the connectivity among the identified variables.

Secondary data has been used in measuring the dependent variable i.e. organizational performance. Hence one of the key limitations is the difficulty in assessing the reliability of data used and the inability to achieve a higher depth of data which otherwise would have been possible by the use of structured interviews and surveys.

The study does not assess the reasons or the factors that drive retail sector organizations to embrace the fundamental aspects of digitalization. There could be several factors, internal and external to the organization which drive this phenomenon and ultimately impact organizational performance. Further, according to prior literature, business model is assumed to play a key role in the inclusion of digital elements. However, the importance of the business model in introducing the elements of digitalization has not been considered in the study.

1.8 Chapter Structure

This thesis is organized as follows,

Chapter 1 includes the introduction to the selected topic. It identifies the background, the problem and the symptoms of the problem. Further, this chapter includes the research questions, research objectives and methodology used to achieve the aims through this study. Finally, this chapter discusses about the significance, scope and limitations of the study.

Chapter 2 extracts the broad theories and literature related to the topic. This section mainly focuses on the longstanding and interesting concepts such as digitalization, digitalization framework, implications of digitalization to the retail sector and organizational performance. This section highlights the nature of the relationships that exist as per prior research papers. Final review has been done on the gap of these related existing studies and on which area the research is going to be on.

Chapter 3 covers the research methodology. This section focuses on the research design and methods that will be used for this study. Selected research approach and the basis for selection, the conceptual framework, operationalization of the study, hypotheses relevant of the research study, population and study sample, sample size, selection of sample and data collection will be explained and justified.

Chapter 4 consists of data presentation and analysis. This chapter would elaborate more on how the data presentation and data analysis are carried out and what findings are generated from the analyzed data. Finally, it discusses whether the findings of the study are consistent with the literature survey.

Chapter 5 concludes the overall idea of the study. This chapter would provide the discussions, conclusions and recommendations for future studies that would lead to the continuation of the line of research.

1.9 Summary

The concept of digitalization has been one of the most discussed topics in recent times due to several factors and one of the sectors that is said to immerse into and embrace digitalization at a relatively fast pace is none other than the retail sector. Several reasons that are said to drive the adoption of digitalization across the retail sector are complexities and dynamism of consumer behavior, cashing on the potential benefits of technology to realize higher efficiencies, rapid entry of new digital platforms and mechanisms of consumer interaction and the availability of an extensive amount of data which can be capitalized on. To add onto it, one of the most unanticipated reason has also been the emergence of the global pandemic ‘COVID-19’ which has pushed organizations to embrace the concepts and tools of digitalization at a considerably faster pace. Hence it is evident that digitalization has a pivotal role to play in the retail sector in terms of assisting organizations in achieving their set goals and objectives.

Considering both the local and international contexts, there has been only a few academic works that describe on the effects of digitalization on organizational performance. Therefore, this study is carried out with a pioneering effort in understanding the above highlighted relationship thus contributing to the advanced comprehension of one of the most trending topics of the recent past which is ‘digitalization’. The intention would be to come up with a condensed, data-driven solution to the existing question of whether digitalization has an impact on organizational performance or not.

CHAPTER 02: LITERATURE REVIEW

2.1 Introduction

The focal point of this section are the concepts of digitalization, digital maturity, the supermarket chain segment of the retail sector and organizational performance perspectives. Furthermore, the association between digitalization and organizational performance will be investigated. This stresses the connectivity of digitalization to business and as to what type of a relationship exists as highlighted in prior researches.

2.2 The Meaning of Digitalization for Business

Technology has had a key influence in triggering business change and altering business connections. This has contributed to drive restructuring and optimization of the business supply chain by the promotion of efficient production, design, marketing, distribution and service methods. The emergence of technology has concurrently triggered a digital transformation which is being adopted by organizations operating across industries (Weill & Woerner 2018). As business organizations strive to improve performance and establish themselves in the modern competitive market, digitalization has been identified as one of the few driving forces which assist business organizations in this regard. The application of big data analytics, internet of things (IoT), artificial intelligence techniques, cloud computing etc. have been identified as some of the key enablers of digitalization within an organization (Teece 2013). For example, the integration of digital solutions has enabled organizations to assess market intelligence and customer preferences and thereby cater with a product or service offering which is differentiated and well positioned based on consumer needs. Therefore, digitalization provides insights into contemporary ways of working to fulfill the requirements of demanding consumers who are in the lookout for customized solutions and this has compelled organizations to switch from selling standalone products to providing integrated solutions, geared towards meeting the ever-growing consumer needs (Davies 2004 cited in Bjorkdahi & Holmen 2018)

Hence, considering the potential advantages of digitalization, creative and innovative digital

solutions are considered to be drivers of digitalization in diverse business roles such as customer service, sales & marketing, logistics and human resource management. (Fitzgerald et al. 2014)

2.3 The concept of Digitalization

In recent times, digitalization has held upon several dynamics of transformation in a variety of business sectors which certainly has affected the way in which products are manufactured and retailed (Angela et al. 2018). The framework for digitalization is digitization, which is the process that converts analogue data into digital data while exploiting digital opportunities. (Rachinger et al. 2018)

As highlighted earlier in the text, Scuotto et al. (2019, p.3) defines digitalization as,

“The adoption of digital technologies to modify a business model. The aim is to create a value from the use of new, advanced technologies by exploiting digital network dynamics and the giant digital flow of information.”

Fitzgerald et al. (2014) have identified digitalization as a transformative and phenomenal concept adopted by businesses in recent times while it has been primarily about the endorsement of digital technologies across industries with the intention of improving performance and capabilities.

According to Rybarsky (2019), the evolution of digitalization dates to the 1970s where computers were used for the first time by large corporations and universities. Computing was democratized only after the origin of the personal computer in the 1980s during which several early adopters began to explore the opportunities of networking and collaboration. With the invention of the World Wide Web (WWW) in the mid-1990s, things transformed where it became one of the trending applications for networking and socialization. As the internet initiated to make conventional media obsolete in the late-1990s, the new economy

bubble was formed where more of television and media content started to become digitized. It was during this time where YouTube, Skype, iTunes and online retailers like Amazon began to dominate digitalization as search engines, social sites and other networks that provided multiple ways of interactions with digital objects. This contributed to the birth of social networks in the mid-2000s (Rybarsky 2019).

It was in the 2005 – 2010 era where data and information channels began to gain increased momentum. With the emergence of digital equipment such as the smartphone, sensors and the internet of things (IoT), living and urban spaces began to be connected and this gave rise to the generation of an enormous amount of data which organizations attempt to analyze and monitor consumer behavior. In other words, this is known as the dawn of the big data era where massive amounts of organized and unorganized data are analyzed to unearth strategic information for business decision making. This has laid the platform for the phenomenon of digitalization to continually evolve since the current context includes the emergence of omni-channels, high level forecasting based on trend analyses, applications of block chain, collision with massive quantities of data and so on (Rybarsky 2019).

According to Scuotto et al. (2019), organizations embrace digitalization in order to generate value from the application of modern, advanced technologies by capitalizing on the flows of digital information and the dimensions of the digital network. This has resulted into a trend phenomenon that has contributed to the transformation of the economy into a world which is based on digitalization technologies (Romdhane, Loukil & Kammoun, 2019). In an era of high levels of literacy and the presence of highly sophisticated consumers, the level of digital activity such as the use of smart equipment, social media, e-commerce sites and online interactions have increased rapidly due to the fact that digital technologies have integrated into everyday life (Fors 2013). Hence, digitalization is growing and fast approaching while challenging the physical environment to digitize everything possible (Tilson et al. 2010).

2.4 The Digitalization Framework and Assessment of Digitalization in Organizations

The Digitalization Framework

The digitalization framework which assists in gaining a better understanding on digitalization was presented by Unruh and Kiron (2017). The framework had clearly distinguished between the terms digitization, digitalization and digital transformation with the view of assisting organizational policy makers and managers in assessing the use of digital technology.

The framework for understanding the concept of digitalization as presented by Unruh and Kiron (2017) is depicted in Figure 1.



Figure 2.1 - Digitalization Framework

Source: Unruh and Kiron (2017)

The basic level of digitization includes the conversion of the product or service offering into a digital format whereas digitalization consists of the phase where new business processes and models are developed by exploiting on the benefits of the digitized product or service offerings. The resultant phase is digital transformation whereby societies, economies and organizations integrate technologies and undergo a restructuring exercise. (Unruh and Kiron, 2017)

Measurement of Digitalization

With an increasing level of attention being placed on the aspects of digitalization and its implications to organizational performance, the use of models and scores have been at the center of discussion when it comes to assessing the level of digitalization i.e. the level of adoption of digital technologies (Chanias & Hess 2016) of organizations. Prior researches highlight the fact that similar models of assessment have been used in functions like human resources, new product development, digitalization (Anderson & William 2018), information technology (Buglione 2016 cited in Shabani 2019) etc.

According to Tilson et al (2010), assessment metric of digitalization is important for inquiry since it would provide key insights on various paths adopted by organizations in obtaining a comprehensive understanding on the sociotechnical practice of digitalization. A review of literature revealed that several researchers and authors have come up with various frameworks which assist in the process of establishing the level or the extent of digitalization for a specific organization. For example, Deloitte in partnership with the TM Forum has developed a tool that assesses digital maturity which is known as the ‘Digital Maturity Model – 2018’, Schumacher, Erol & Sihn (2016) developed the industry 4.0 in assessing the level of digitalization, Acatech presented the ‘Industry 4.0 maturity index model’ in 2017 (Schuh et al. 2017), McKinsey developed the ‘Digital Quotient’ in 2015 (Catlin, Scanlan & Willmott 2015) while Westerman et al. (2014) developed a metric which measures digital mastery in light of the two areas of digital leadership and digital capability.

Out of the above metrics, the model put forward by Deloitte (2018) and the industry 4.0 model put forward by Schumacher, Erol & Sihn (2016) have been referred quite frequently amongst the literature. The main reason behind the said phenomena has been due to the comprehensive nature of the stated metrics as they have measured digitalization as a holistic and multi-disciplinary concept which impacts several organizational aspects (Schumacher, Erol & Sihn 2016; Deloitte 2018).

2.5 Digitalization and Organizational Performance

As organizations attempt to address the dynamics of digitalization in improving its competitiveness, digital technologies have been in the forefront that bring about value creation and revenue generation opportunities which needs to be exploited by organizations in competing successfully in the market (Sklyar et al. 2019). The potential impacts of digitalization to organizations would depend on the extent to which they adopt themselves and employ enablers of digitalization while continuously thriving to realize its benefits. Several organizational metrics provide signals in terms of whether the potential benefits of digitalization have been realized by the organization or not and one such indicator would be organizational performance which is a combination of product offering and operating procedures (Brynjolfsson and Hitt, 2000 ; Kryvinska et al. 2014).

Organizational performance is identified as one of the popular metrics used in the process of assessing an organization's direction, strategy and success. At the same time, it has also had a profound effect on organizational behavior (Carolynne & Satorra 2019). In setting up the link between digitalization and organizational performance, several studies have cited its related impacts.

According to Bughin, LaBerge and Mellbye (2017), businesses that adopt digital transformation lead to improved consumer experiences and stronger sales growth resulting in enhanced organizational performance. Im and Rai (2008) emphasized the fact that organizational growth in India is driven by information technology, which has made an immense contribution to driving organizational profitability. The 2017 IBM analytics webcast indicates that companies who are willing to take advantage of their digitalization capacity can better implement business strategies in terms of sales growth and improved operational efficiencies compared to that of their respective rivals. Wroblewski 2018 argues that digital maturity of Swedish organizations has a positive effect on the

company's operating results. An assessment of the relationship between the application of digital technologies and organizational performance at specific sector levels was identified to be positive in sectors that were examined (Gretton et al., 2004). Among other researchers, Moshiri and Simpson (2011), Koc and Bozdag (2009), Enríquez et al. (2015) and Cardona et al. (2013) have also put forward a positive relationship between digitalization and organizational performance.

As highlighted above, an evaluation of the existing literature on the implications of digitalization on organizational performance revealed the fact that digitalization has been mapped against a defined organizational performance perspective and then generalized to overall performance without assessing the multi-dimensional performance perspectives of organizations. Organizational performance in its broader sense would not be the ideal metric that captures the potential impacts of digitalization since the existing literature recognizes the fact that digital technologies impact organizational performance across various variables due to changes in its product offerings and operational processes (Kryvinska et al. 2014). According to Coupette et.al (2015), digitalization is a phenomenon that alters and improves organizational performance from a multi-dimensional perspective and not just one or two performance perspectives of the company. For example, potential impacts of digitalization include cost reduction schemes, optimized operational processes, better employee productivity, improved customer satisfaction and loyalty, lean supply chains and so on. Hence, it is evident on the fact that digitalization would impact on several organizational performance perspectives before being reflected in its overall capacity.

One of the models developed to assess organizational performance from a multi-dimensional perspective is the balanced scorecard where it has been developed as a performance measurement tool while addressing the limitations of dependency on traditional performance measures which are highly biased to the financial aspect of it (Kaplan and Norton 1992). Thus, the balanced scorecard model integrates financial as well as non-financial measures in assessing organizational performance. The performance measurement perspectives are namely customer, financial, learning and growth and

internal business process (Kaplan and Norton, 1992). The balanced scorecard model is shown in Figure 2.2

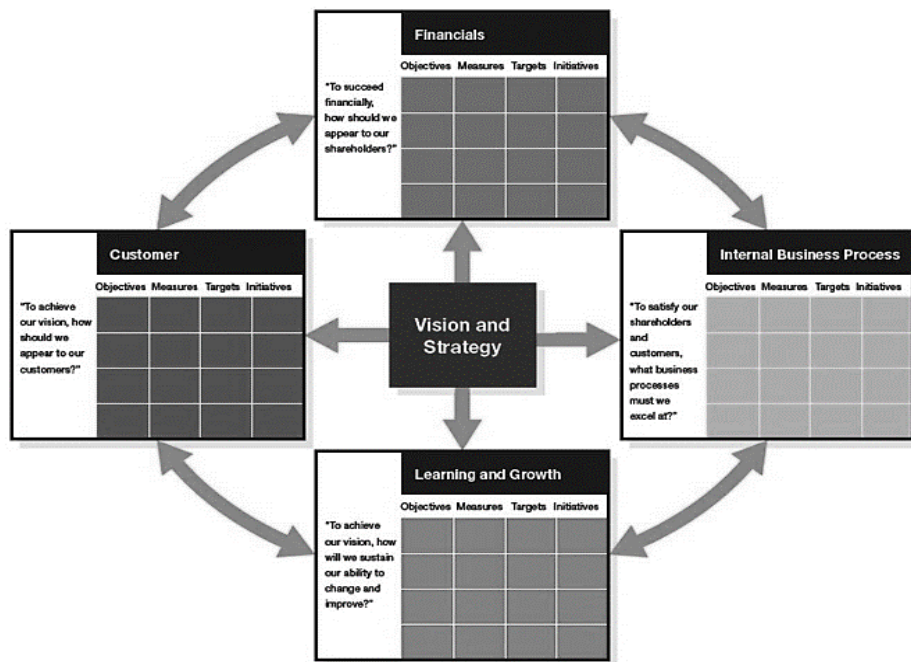


Figure 2.2 - Balanced Scorecard developed by Kaplan and Norton

Source: Kaplan and Norton (1992)

According to Waggoner, D.B. and A.D. Neely (1999), performance assessment from a balanced scorecard approach would provide important insights for analyzing and defining the management plan, as well as allowing for a proper understanding of successful and present conditions that affect a company's development. Hence, in recent times, several organizations have tried to manage organizational performance using a balanced scorecard approach which captures and measures performance in various dimensions as highlighted above.

2.6 Implications of Digitalization to the Retail Sector

As business sectors of the economy are being heavily impacted by modern technological developments, the said technological disruption has had a notable impact on the retail sector (Gartner 2018). As a result of the aforementioned, the past two decades have witnessed encouraging transformations in the retail sector, especially in the supermarkets segment of it. In terms of the prospective value of digitalization to the sector, the world economic forum (Digital Transformation of Industries, 2016) has stated that digitalization could impact operating profits of the retail sector by up to 20% and that it would be primarily a function of the level of digitalization of the sector. At the same time, research from McKinsey Global has assessed digitalization of sectors in the US economy and has stated that the retail trade is positioned at the moderate stage while it is poised for growth at a rapid pace (Gandhi, Khanna and Ramaswamy, 2016).

The rate of change of the supermarkets segment of the retail sector has been phenomenal and thereby such organizations have been compelled to evaluate and adapt to changes in terms of monitoring consumer behavior, operating inventory, marketing products and managing its supply chains (Wiefel 2015). Hence, digitalization would provide opportunities for supermarket chains in terms of better customer engagement, operational cost reductions, a motivated workforce, a higher customer acquisition potential and along with various other advantages that have a forward-looking outlook from the perspectives of revenue and margins (Deloitte 2017). Therefore, the main intention behind similar companies obliging to the ever-evolving element of digitalization has been to enhance organizational performance whilst meeting the sophisticated demands of retail shoppers (Hanninen, Smedlund & Mitronen 2017).

Deloitte (2017) has identified the functional aspects of the business that could exploit the opportunities of digitalization in retail sector organizations. They can be summarized as demonstrated below in Figure 2.3.

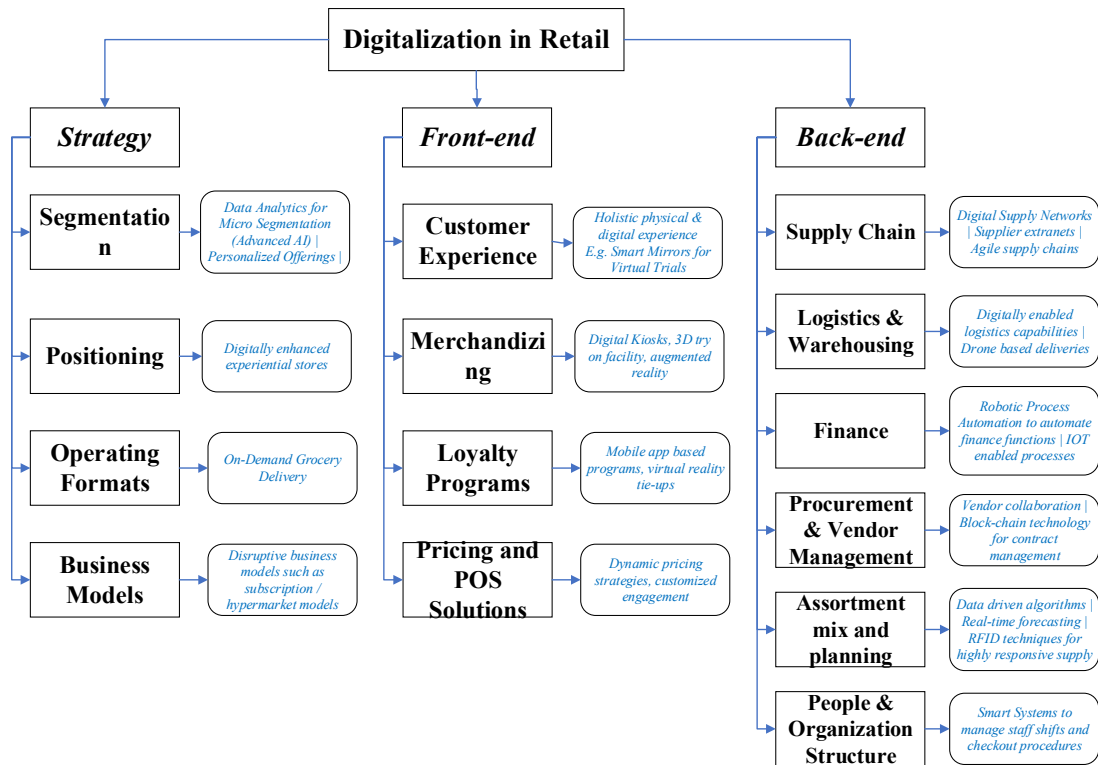


Figure 2.3 - Functional areas of digitalization in retail

Source: Disruptions in Retail through Digital Transformation (Deloitte 2017)

In terms of strategy, digitalization has had a profound impact on the supermarket chains. In exploiting the potentials of digitalization, almost all the supermarket chains have embarked on corporate journeys by developing and rolling out a digital strategy (MBD Consulting, 2019). According to Gonzalez (2015), a digital strategy is a set of exercises that enables organizations to compete successfully in the digitalized world. It is also a process of dynamic actions and decisions which define organizational priorities in the digital sphere. Simultaneously, a digital strategy would integrate digital propositions into the organization's business model, operations, strategy and culture. As per the findings of Deloitte (2017), most of the retail sector organizations incorporate digitalization into organizational strategy by the application of data analytic techniques, offering experiential stores which are digitally augmented, the use of digitally enabled business models and by facilitating multi-channel retailing. Therefore, irrespective of organizational size and

capacity, if the organization's intention is to remain competitive, the integration of a digital strategy into its corporate strategy is key in terms of delivering a competitive advantage (Venkatraman et al. 2013).

Given the current context on the front-end aspects of retail, shopping does not happen primarily online or in-store. For the modern supermarket store to be successful in its trade, they need to link customers' various shopping channels to give each customer a more comprehensive view as well as a stronger end to end user experience. Enablers of digitalization are seen as key elements that assist the retail organizations in this regard. They can be used to improve the in-store shopping experience by integration with customer service quality aspects, attractive store ambience, better product display solutions and the product purchase experience. (Wiefel, 2015) Hence, the retailers who reap success in terms of providing targeted customer interactions would be the ones that exploit the recent trends of digitalization and incorporate the unique shopping habits of the modern consumer. Ultimately, this would drive operational efficiency as well as customer loyalty.

The backend operation of the retail sector has had a significant impact due to the cascading effects of digitalization. With the integration of more and more digital devices, the back-end operations have embraced rapid changes such as online product ordering, usage of radio frequency tags to manage inventory, interactive navigation applications to manage distribution and digital financial platforms to facilitate financing (Herhausen et al. 2015). Hence, the advent of digital mobile devices has been instrumental in the continuous development of solutions that enhance the back-end operations of retail which span from mix-planning to supply chain and financing (Colla & Lapoule 2012). Therefore, in exploiting the opportunities of digitalization, supermarket chains in the retail sector have taken measures to digitalize their offerings by the incorporation of digital dimensions such as radio frequency tags, QR codes, EAN codes etc. which successfully combines the offline and online activities. As a result, this has contributed towards efficient

management of products throughout its cycle of inbound receipt to sell out (Bahn et al. 2015).

As highlighted in literature, the use of biased and traditional performance indicators would not be the way forward when it comes to assessing the impacts of digitalization upon organizational performance (Szoka 2018). Therefore, as presented by Kaplan and Norton (1992), the ideal situation would be to assess organizational performance considering the financial, internal business process, customer and learning & growth perspectives. It would promote a comprehensive approach in assessing digitalization and performance of organizations since the balanced scorecard reflects perspectives on which digitalization has an impact.

As highlighted earlier, there exists only a very limited amount of studies which had examined the impact of digitalization on the balanced scorecard performance measures of an organization in the local as well as the global context. Hence, this can be taken up as an opportunity for research for further studies. This study aims to come up with facts and findings as a contribution to literature on the relationship highlighted above, especially in relation to a developing country like Sri Lanka while assessing the impacts of digitalization on organizational performance of supermarket chains.

CHAPTER 03: RESEARCH DESIGN AND METHODS

3.1 Introduction

This section will comprehensively elaborate the research design and the method that will be used to carry out the study. The first part of the section will be describing the research approach and the basis for selection. Population and study sample, sample size and selection of sample, and sources and collection of data will be discussed in the second part of the section. Conceptual diagram will be elaborated in the third part. The fourth part will be on the hypothesis relevant for the study. Operationalization aspect will be discussed in the fifth part. Finally, the data analysis strategies will be explained and justified.

3.2 Research Approach

Quantitative paradigm with a positivistic approach will be used in this study since the objective of the study is to analyze the level of digitalization and organizational performance. Similar studies in this field have conducted using the same approach. Servitization and digitalization: the influence on firm performance (Garrido et al. 2018), Digitalization and firm performance (Wroblewski 2018) and several other articles and prior researches have used a similar approach. Therefore, by following the deductive approach while using objective measures the researcher intends to identify the relationship between these variables.

3.3 Population and Study Sample

The supermarket chains operating in the retail sector of Sri Lanka and the executives working in the same have been considered as the population and the sample will constitute of responses from 390 executives who are part of the seven supermarket chains. Source of data collection will be a structured questionnaire and information from published reports relating to 2023/24.

3.4 Conceptual Framework

The diagram illustrated below depicts as to how the relationship between digitalization and organizational performance of supermarket chains operating in Sri Lanka is intended to be examined.

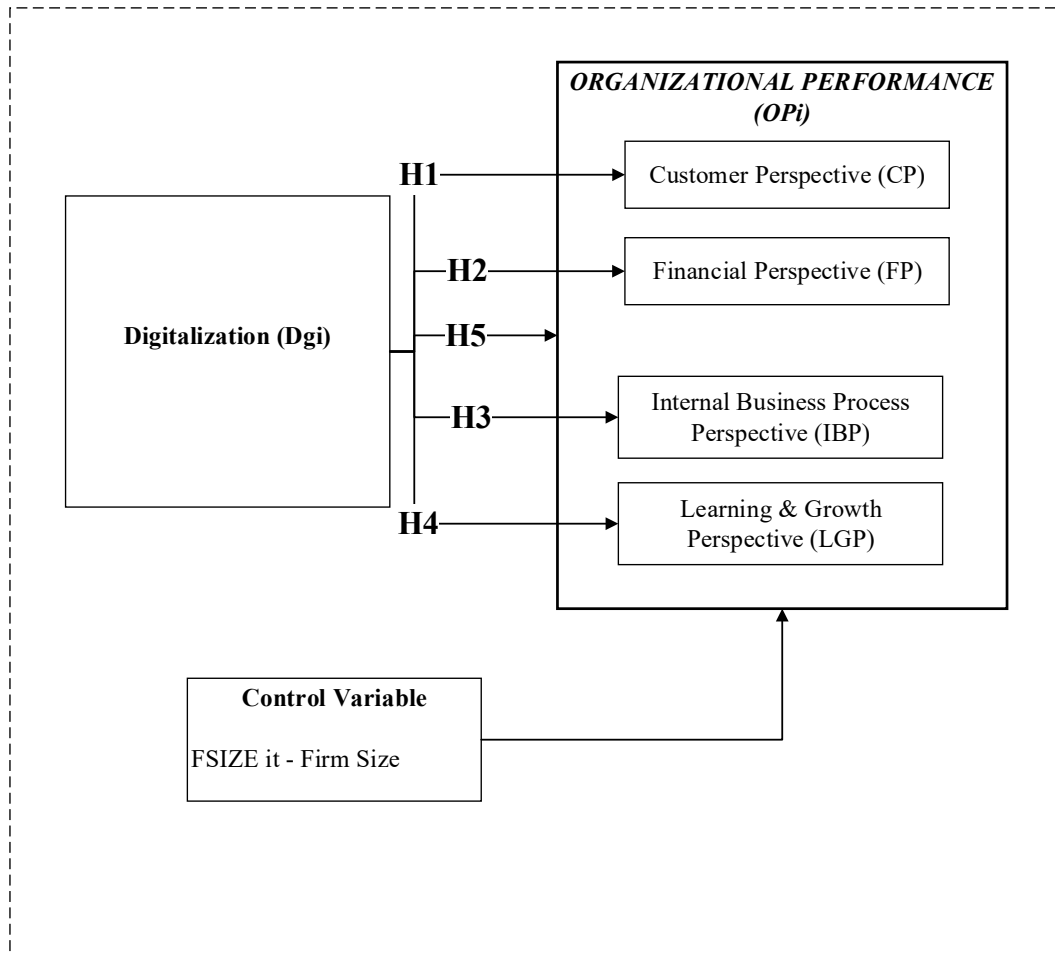


Figure 3.1 - Conceptual framework

3.5 Hypothesis

Based on the conceptual framework demonstrated above, the following hypotheses are developed.

Hypothesis H1:

There is a positive impact to the customer perspective of organizational performance as a result of embracing digitalization in supermarket chains operating in the retail sector in Sri Lanka

Hypothesis H2:

There is a positive impact to the financial perspective of organizational performance as a result of embracing digitalization in supermarket chains operating in the retail sector in Sri Lanka

Hypothesis H3:

There is a positive impact to the internal business process perspective of organizational performance as a result of embracing digitalization in supermarket chains operating in the retail sector in Sri Lanka

Hypothesis H4:

There is a positive impact to the learning and growth perspective of organizational performance as a result of embracing digitalization in supermarket chains operating in the retail sector in Sri Lanka

Hypothesis H5:

There is a positive impact to overall organizational performance as a result of embracing digitalization in supermarket chains operating in the retail sector in Sri Lanka

3.6 Operationalization

Variables of the conceptual diagram is defined in table 2

Table 3.6.1 - Operationalization Table

Variable Code	Variable Name	Measurement	Source
DG_i – Digitalization			
<i>TEC_D</i>	Technology	Availability of ICT infrastructure, IT systems based on digitalization and extent of system agility	Schumacher, Erol & Siha (2016) Benchmarking : An International Journal
<i>PP_D</i>	People	Skills, Level of ICT competency of employees, decision making with the aid of data insights and acceptance of new technologies	
<i>OPS_D</i>	Operations	Product customization, use of process automation, number of digitized elements in the product portfolio, real time changes to meet changes in demand, the level of digitization of the horizontal and vertical value chains	
<i>ST_D</i>	Strategy	Strategy availability in conducting business digitally using innovative ways, the use of data and networks as a differentiator, availability of value generating digital initiatives	
<i>PS_D</i>	Products / Services	Digitized product/service offering, deployment of data analysis techniques for customizations and product relevant services	

Table 3.6.1 cont.

CS_D	Customer Experience	Customer engagements using digital platforms, usage of digitized customer touch points by focusing on customer value and customer benefits derived from product/service personalization.	
<i>Control Variable(s)</i>			
$FSIZE_{it}$	Organization Size	The natural logarithm of total assets of the year for firm i and period t .	
OP_i – Organizational Performance			
FP	Financial Perspective	▪ Growth in Revenue ▪ Operating Profit Margin	Kaplan and Norton (1996) Szoka (2018)
CP	Customer Perspective	▪ Customer Satisfaction Score ▪ Market Share	
IBP	Internal Business Process Perspective	▪ Percentage of New Stores Opened ▪ Level of relative process automation	
LGP	Learning & Growth Perspective	▪ Investment in Research and Development ▪ Employee retention rate	

3.7 Data Analysis Strategies and Justification

Digitalization

According to prior literature, (Anderson & William 2018 cited in Shabani 2019; Schumacher, Erol & Sihn 2016; Kane et al. 2017 cited in Khater, Zaki & Abdelaal 2018; Klotzer & Pflaum 2017) several aspects of digitalization has been assessed in developing a model to measure digital maturity within an organization and the Industry 4.0 maturity model (Schumacher, Erol & Sihn 2016) can be identified as one of the widely used maturity assessment models in measuring the extent of digitalization in an organization. The maturity dimensions have been grouped into nine dimensions whereby several maturity items under each dimension have been considered for the assessment.

In quantifying the concept of digitalization of the supermarket chains in the Sri Lankan context, six key dimensions out of the above will be taken into consideration, where these dimensions have been identified as contributing factors in promoting digitalization in any sector (Sri Lanka Digital Economy Strategy Blueprint 2018).

The six dimensions that will be taken into consideration are as follows:

- Technology
- People
- Operations
- Strategy
- Products
- Customers

The table below provides an outline of the identified aspects with certain exemplary items that would be considered:

Table 3.7.1 - Dimensions of the digitalization index

Dimension	Exemplary Maturity Item
Strategy (ST)	Availability of a strategy to run the business digitally using innovative ways, usage of network and data as one of the key differentiators, introduction of digital initiatives focused at generating value for the business
Customers (CS)	Customer convenience and satisfaction from product/service personalization, use of digital interfaces for customer engagement, deployment of digitized customer touch points and continuous focus on generating customer value
People (PP)	Employee skills and levels of ICT competency, decision making facilitated using data and the rate of adoption to new technologies
Products (PS)	Smart product/services, digitized offerings, deployment of data analytics for product/service individualization and other services based on data
Technology (TEC)	Availability of ICT resources and infrastructure, IT systems that facilitate running of digital technologies and tools and system agility
Operations (OPS)	Extent of process decentralization, collaborations among departments, use of digital tools in operating and managing the horizontal and the vertical value chains

Source: Schumacher, Erol & Sihn. 2016

Development of the Digitalization Index:

To measure, identify and develop the organization's digitalization score, a 3-step procedure would be followed (Schumacher, Erol & Sihn 2016) as depicted below in Figure 3.2

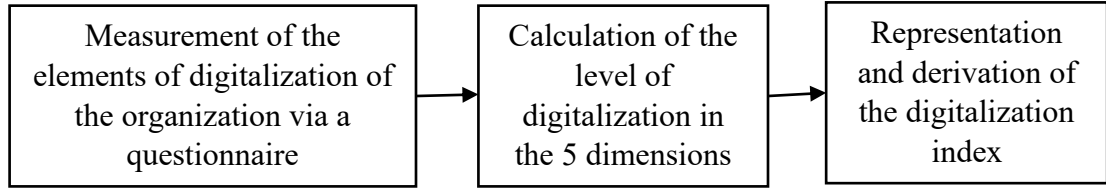


Figure 3.2 – Three step procedure in developing the digitalization index

Source: Schumacher, Erol & Sihm 2016

The measurement of the extent of digitalization within the organization will be done by using a structured questionnaire that includes close-ended questions varying from one to seven per dimension (Refer appendix 01). The questionnaire is based on the industry 4.0 assessment of digital operations developed and presented by PricewaterhouseCoopers (2016). Each question would require its response on a Likert scale spanning from ‘one’ (not distinct) to ‘five’ (very distinct). The responses received for the said questionnaire would be the input for the computation and presentation of the digitalization index.

Hence, the digitalization index of each dimension (M_D) would result from the calculation of the weighted average of all the maturity items (M_{DI}) within its related dimension. Each maturity item would be given an equal weightage (g_{DI}).

$$M_D = M_{DI} \cdot g_{DI} \text{ where } g_{DI} = \frac{1}{n}$$

- M_D = Digitalization index of the respective dimension
- M_{DI} = Measurement item under each dimension
- g_{DI} = Weighting factor
- n = Number of measurement items

The dimension indexes thus computed would be assigned an equal weightage to form up the final digitalization index (DG_I) which is,

$$DG_i = \frac{1}{6} \cdot (ST_D + CS_D + PP_D + PS_D + OPS_D + TEC_D)$$

Organizational Performance

As recognized in prior literature, the impact of digitalization has had a profound impact on organizational performance across various performance dimensions (Coupette et al. 2015; Kryvinska et al. 2014). Hence, the balanced scorecard method of performance assessment will be used in assessing organizational performance.

According to Evans' observations in 2017 (cited in Bonn, Osei & Agyeman 2017), any one of the metrics of the balanced scorecard should not be given dominance when it comes to assessing overall organizational performance. Therefore, he suggests the use of weighted indexes that would allow the scorecard to be balanced given the fact that there could be a few instances where certain perspectives will have to be weighted higher relative to the others due to industry related factors.

As cited in previous researches, Fakhari, Hematian and Danaei (2017) has assessed organizational performance based on balanced scorecard measures by assigning relative weights to each key performance indicator relevant to each balanced scorecard perspective. Basak et al. (2017) has assessed performance of companies operating in the machine tools industry by assigning scores to each perspective of the balanced scorecard. Hence, a similar scoring approach adopted by Basak et al. (2017) will be used in this study.

Equal weights would be provided for each perspective of the balanced scorecard when assessing the overall organizational performance index due to the relative equal importance of all four dimensions for the retail sector as presented in the journal of international review of retail, distribution and consumer research (Dickinson et al. 2011).

Therefore, indexes will be developed for each individual balanced scorecard perspective based on the key performance indicators of each and the four indexes relating to the four perspectives would be combined together to form the overall organizational performance index.

Performance index of each perspective:

$$P_I = g_{KPI} \cdot \sum_{i=1}^n (KPI)_i$$

where $g_{KPI} = \frac{1}{n_{KPI}}$

- P_I – performance index of the respective balanced scorecard perspective
- KPI – key performance indicator(s) relevant to each perspective
- g_{KPI} – KPI weighting factor of each perspective
- n_{KPI} – number of KPIs assessed for each perspective

Overall organizational performance index:

$$OP_i = \frac{1}{4} \times \sum (FP_I + CP_I + IBP_i + LGP_i)$$

3.8 Summary

This section mainly focused on the research design and the methodology that will be used for the study. The research approach was discussed in the first part and the second part covered the population and study sample. Later the conceptual diagram was illustrated, and the fourth section developed the hypothesis relevant for the study. Operational aspect was covered in the fifth part and data analysis strategies were presented.

CHAPTER 04: ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter starts with the explanation of the study sample followed by the results of descriptive statistics in measuring the level of digitalization. Next, a regression analysis is performed to identify the relationship among the identified variables and to establish the direct relationship between digitalization and organizational performance. The section concludes upon presentation of a brief summary of the research results.

4.2 Overview

The population for this study constitutes the executives of the seven supermarket chains operating in the retail sector in Sri Lanka. Hence the sample will constitute responses from 390 executives from the said seven organizations.

4.3 Descriptive Statistics

In summarizing the findings of this research, the use of descriptive statistics can be considered as one of the precise exercises where measures of central tendency and dispersion have been computed with regards to the variables of the study for further analysis.

4.3.1 Descriptive Statistics for the level of Digitalization

The level of digitalization could be established as the key independent variable of the study. The main indicator used to measure the level of digitalization has been created using the digitalization index (DG_i) which has been detailed out in Chapter 03 – Research Design and Methods. The following table presents the key descriptive statistics pertaining to the level of digitalization in supermarket chains operating in Sri Lanka.

Table 4.3.1.1 - Descriptive Statistics of the Digitalization Index

	N	Mini mum	Maxi mum	Mean	Median	Std. Deviati on	Skew ness	Kurtosis
<i>Strategy (ST_D)</i>	390	3.8	4.1	3.937	3.900	.0731	.595	.489
<i>Customer (CS_D)</i>	390	3.6	4.0	3.825	3.800	.0860	-.671	1.510
<i>Products (PS_D)</i>	390	3.4	4.0	3.804	3.800	.1447	-.909	1.164
<i>People (PP_D)</i>	390	3.5	4.0	3.823	3.800	.1133	-.624	1.267
<i>Operations (OPS_D)</i>	390	2.9	3.8	3.546	3.600	.2263	-1.962	3.048
<i>Technological Infrastructure (TEC_D)</i>	390	2.6	3.7	3.426	3.500	.2273	-2.212	5.202
<i>Digitalization Index (DG_i)</i>	390	3.4	3.9	3.727	3.758	.1189	-1.947	2.882

As per the study, the digitalization index (DG_i) was computed covering the key dimensions such as strategy, customer experience, products/services, operations and technological infrastructure. The mean value of the computed index amounts to 3.727. However, there is a standard deviation of 11.89% with regards to the application and tools of digitalization across super-market chains in Sri Lanka. The reasons contributing to the relatively higher level of standard deviation is that the level of digitalization and application of digital tools differ based on the physical presence and the scope of the

operations and hence the government owned local supermarket chain showed significant deviations from the derived average levels due to its relatively lower application of digital tools and applications across its operations.

When creating the digitalization index (DG_i), the 7 supermarket chains operating in Sri Lanka have been taken into consideration out of which the incorporation of digitalized aspects into organizational strategy (3.937) has the highest mean value since almost all of the supermarket chains accepted the fact that the respective organizations operate with a digital vision in making alterations to its business model as and when required whilst ensuring that proper guidance and prominence are provided by its leadership teams with respect to such changes driven by the verticals of digitalization. In contrast, the technological infrastructure aspect of digitalization has the lowest mean value (3.526). However, taking into consideration all the aspects of digitalization, the technological infrastructure dimension consists with the highest standard deviation (22.73%) while the lowest standard deviation is reported by the strategy dimension (7.3%). The elements covering the technological infrastructure dimension of digitalization included aspects such as the level of maturity of IT & data architecture, Industry 4.0 applications and several other advanced infrastructure capabilities. With Sri Lanka still at an infant stage in such applications and infrastructure, it was observed that capabilities pertaining to the same were at a relatively lower level.

The minimum values of the respective dimensions related to digitalization ranged from 2.6 to 3.8 whereas the maximum values ranged from 3.7 to 4.1 out of a Likert scale of 1 to 5. Most of the minimum values were observed from responses of the government owned supermarket chain where the tools and application of digitalization solutions are at a very infant stage. The maximum values were prominently observed in the 2 key supermarket chains spread across Sri Lanka where the combined outlet coverage is around 530 stores. The extensive physical presence coupled along with the digital landscape embraced as part of the 'new normal' post the pandemic era have contributed to the relatively higher-

level adoption of digital tools and applications across its strategic and operational verticals.

4.3.2 Descriptive Statistics on the Level of Organizational Performance

As described under research methodology, the organizational performance has been computed based on key performance indicators pertaining to the four performance perspectives of the balanced scorecard. The resultant descriptive statistical measures of the performance data are illustrated below in Table 4.3.2.1

Table 4.3.2.1 - Descriptive statistics of Organizational Performance

	Minimum	Maximum	Mean	Median	Std. Deviation
Financial Perspective - FP	0.30%	11.70%	8.3658%	10.6000%	4.10323%
Customer Perspective - CP	36.50%	60.00%	46.1429%	45.0000%	7.57581%
Internal Business Process Perspective - IBP	7.45%	39.33%	22.6445%	20.0976%	11.94145%
Learning Growth Perspective - LGP	31.70%	44.25%	38.9643%	39.2000%	3.92393%
Organizational Performance Index - OP_i	.2	.4	.296	.301	.0607

As per the above table, the mean value of the organizational performance index is at 29.6% where the minimum and maximum values are 20% and 40% respectively while the

standard deviation stands at 6.07%. Further breaking down the standard deviation into the 4 performance perspectives, it is quite visible that it ranges from 4% to 12%. The significant figures of the standard deviation can be mostly attached to the performance of the government owned supermarket chain and the overall reduction in performance of supermarkets in Sri Lanka due to the several adverse economic consequences and external factors since the supermarket customer penetration rate in Sri Lanka has not shown significant growth in the years under consideration.

4.3.3 Descriptive Statistics of the Control Variable

The control variable identified in this study is the firm size. It is useful to recognize the descriptive nature of the variables as they could result in an impact in several situations when examining the relationship among the core variables of this study, which are digitalization and organizational performance. The Table 4.3.3.1 below presents the key descriptive measures pertaining to the control variable.

Table 4.3.3.1 - Descriptive statistics of the Control Variable

	Minimu m	Maximu m	Mean	Median	Std. Deviation	Skewness	Kurtosis
FSIZE _{it}	2446548 900.0	5695847 2800.0	1703584 8663.97 1	1025000 000	1873593 4851.18 34	2.052	4.514

4.4 Correlation Analysis

The main objective of this study is to explore the relationship between digitalization and organizational performance measured using multiple perspectives of the balanced scorecard. The statistical measure of correlation measures the degree to which changes of a particular variable predict changes of the other variable. In this scenario, the Pearson correlation coefficient has been computed and analyzed to identify the relationships between independent, dependent and control variables and the table below summarizes the results.

Table 4.4.1 - Correlation Analysis

	FP	CP	IBP	LGP	OP_i	DG_i	FSIZE_{it}
FP	1						
CP	-.026	1					
IBP	.629	-.566	1				
LGP	.237	-.389	.687	1			
OP _i	.850*	.346	.434	.318	1		
DG _i	.651*	.193	.446*	.122	.767*	1	
FSIZE _{it}	-.049	.941**	-.492	-.483	.222	.163	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

It can be seen that there is a significant positive correlation between organizational performance (OP_i) and digitalization (DG_i) according to the correlation analysis as shown above.

Further breaking down organizational performance into 4 measures of the balanced scorecard, it can be seen that only 2 perspectives show statistical significance in terms of the correlation. This implies that digitalization would have a positive impact on the financial and internal business process performance perspectives of supermarket chains in Sri Lanka.

4.5 Regression Analysis

For Overall Organizational Performance

All these findings on the relationship between DG_i and OP_i indicate the necessity for a regression analysis to be carried out further. To identify the direct relationship between the level of digitalization and organizational performance, a regression model has been used to enable the test variables and control variables to assess the hypothesis built in this study. A comprehensive analysis has been performed to identify and assess the relationship hypothesized in H5: “There is a positive impact to overall organizational performance as a result of embracing digitalization in supermarket chains operating in Sri Lanka”.

As the first step, a binary regression analysis was performed to assess the relationship of digitalization (independent variable) and the control variable of firm size ($FSIZE_{it}$) towards organizational performance (dependent variable). Hence, the regression formula can be presented as follows:

$$OP_i = \alpha + \beta_1 DG_i + \beta_2 FSIZE_{it} + \varepsilon$$

Table 4.5.1 - Regression Analysis of OP_i and DG_i

Dependent Variable: OPI				
	B	Std. Error	t	Sig.
(Constant)	-0.405	.270	-1.502	.003
DG_i	.193	.072	2.673	.044
$FSIZE_{it}$	-4.766	.000	-2.908	.173

The following formula can be formed based on the above regression analysis:

$$OP_i = -0.405 + 0.193DG_i - 4.766FSIZE_{it}$$

For the Balanced Scorecard Performance Perspectives

$$P_i = \alpha + \beta_1 DG_i + \beta_2 FSIZE_{it}$$

Table 4.5.2 - Regression Analysis between balanced scorecard dimensions and DGi

	Dependent Variable: FP			Dependent Variable: CP			Dependent Variable: IBP			Dependent Variable: LGP		
	B	t	Sig.	B	t	Sig.	B	t	Sig.	B	t	Sig.
(Constant)	-77.874	-1.62	.004	34.544	.781	.479	-190.822	-1.321	.007	18.176	.350	.744
<i>DG_i</i>	23.315	1.800	.048	2.833	.824	.824	60.393	1.552	.041	6.684	.477	.658
<i>FSIZE_{it}</i>	-3.570	-.424	.117	4.259	5.496	.005	4.213	1.665	.171	-1.090	-1.197	.298

The following formulas can be derived based on the above table:

$$FP = -77.874 + 23.315DG_i - 3.570FSIZE_{it}$$

$$CP = 34.544 + 2.833DG_i + 4.259FSIZE_{it}$$

$$IBP = -190.822 + 60.393DG_i + 4.213FSIZE_{it}$$

$$LGP = 18.176 + 6.684DG_i - 1.090FSIZE_{it}$$

4.6 Summary of Hypothesis Testing Results

The hypotheses tested in this study are summarized in the table below, which corresponds to the organizational performance dimensions that were looked at. Every hypothesis was developed to evaluate how digitalization affected a certain performance metric in Supermarket chains operating in Sri Lanka. The table shows if a statistically significant association between digitalization and each of the corresponding dimensions was found based on the statistical study that was done. The data analysis's outcome is shown in the "Result" column, and the acceptance or rejection of the hypothesis is shown in the "Decision" column. This contributes to the overall interpretation of the study's findings by offering a clear presentation of the domains in which digitalization has shown a measurable impact on organizational performance.

Table 4.6.1 - Summary of Hypothesis Testing Results

Hypothesis	Statement	Result	Decision
H1	There is a positive impact to the customer perspective of organizational performance as a result of embracing digitalization in supermarket chains operating in the retail sector in Sri Lanka.	No statistically significant relationship	Rejected
H2	There is a positive impact to the financial perspective of organizational performance as a result of embracing digitalization in supermarket chains operating in the retail sector in Sri Lanka.	Statistically significant positive relationship	Accepted
H3	There is a positive impact to the internal business process perspective	Statistically significant	Accepted

	of organizational performance as a result of embracing digitalization in supermarket chains operating in the retail sector in Sri Lanka.	positive relationship	
H4	There is a positive impact to the learning and growth perspective of organizational performance as a result of embracing digitalization in supermarket chains operating in the retail sector in Sri Lanka.	No statistically significant relationship	Rejected
H5	There is a positive impact to overall organizational performance as a result of embracing digitalization in supermarket chains operating in the retail sector in Sri Lanka.	Statistically significant positive relationship	Accepted

4.7 Discussion

The first objective of this study was to assess the level of digitalization of supermarket chains operating in Sri Lanka. When it comes to the assessment of the level of digitalization in supermarket chains, results highlight that the average level of digitalization is at a rate of 3.727 out of an absolute score of 5. The assessment index was adopted from the Industry 4.0 assessment model put forward by Schumacher et.al. (2016) and refined to fit into the Sri Lankan context based on the dimensions that have been identified as contributing factors in promoting digitalization across business sectors in Sri Lanka. Even though findings of a similar nature in the Sri Lankan context is non evident, Wroblewski (2018) in his research to assess the impact of digitalization on organizational performance highlights that firms in Sweden have an average digitalization index of 82%. Hence, the level of digitalization in supermarket chains of Sri Lanka highlighted through this study gives us an indication that there is further scope for development in the sphere of digitalization to reach an accepted level of maturity after which several unearthed synergies and benefits could be realized. The findings of this study therefore suggest a pressing need for Sri Lankan supermarket chains to accelerate their digital transformation efforts. By advancing to higher levels of digital maturity, these organizations can unlock a host of strategic advantages, including increased operational efficiency, enhanced customer experience, improved data-driven decision-making, and long-term competitiveness. The current level of digitalization, while encouraging, serves as a midpoint in a longer journey towards digital excellence. With continued investment, policy support, and organizational commitment, there is substantial potential for supermarket chains in Sri Lanka to realize the full spectrum of benefits that digitalization offers.

The second objective of this study was to assess the impacts of digitalization on overall performance of supermarket chains operating in Sri Lanka. It was brought to light that there is a positive moderate correlation or a statistically significant relationship between

the indexes of organizational performance and digitalization. Hence the null hypothesis pertaining to the objective (H5) could be rejected due to the existence of the statistically significant relationship. The holistic nature of the digitalization index and performance index have been instrumental in deriving this relationship and confirming the hypothesis laid out under H5. Therefore, a positive impact on overall organizational performance could be observed in supermarket chains operating in Sri Lanka with the adoption of the elements of digitalization across its business verticals such as strategy, customer experience, operations, products and technological infrastructure. The positive relationship uncovered through the analysis underscores the strategic value of embracing digital transformation within the retail sector. Specifically, it suggests that supermarket chains in Sri Lanka stand to gain considerable performance enhancements by integrating digital technologies and practices across multiple functional areas. By embedding digital capabilities into these business verticals, organizations can create more agile, efficient, and customer-responsive operations, which in turn contributes to stronger business outcomes.

Moreover, the findings support the broader narrative observed in global research, where digitalization has consistently been linked to improvements in key performance indicators such as profitability, market responsiveness, process efficiency, and customer satisfaction. In the Sri Lankan retail context, this study adds to the emerging body of knowledge by providing localized empirical evidence that supports the global trend. It confirms that digitalization is not merely a technological upgrade but a transformative force capable of reshaping business performance.

In summary, the results of this study reinforce the notion that digitalization plays a critical role in driving organizational success. Supermarket chains in Sri Lanka that proactively invest in digital strategies and infrastructure are likely to experience tangible performance improvements. Therefore, this research highlights a compelling case for decision-makers to prioritize digital transformation as a core component of their strategic agenda to remain competitive and sustainable in a rapidly evolving business environment.

The third objective of the research was to identify the impact of digitalization on different dimensions of organizational performance of modern retail trade organizations in Sri Lanka.

According to findings highlighted in the literature survey, several outcomes namely, a positive relationship and no relationship situations between digitalization and organizational performance were identified. The hypotheses pertaining to this objective are laid out under H1, H2, H3 and H4. In this study, it was pointed out that the financial (H2) and internal business process (H4) dimensions of organizational performance had a statistically significant relationship to the independent variable of digitalization relative to the rest of the performance dimensions. Hence there is no statistical evidence to reject the null hypotheses of H1 and H3 of this study.

The empirical results from this study provided a more nuanced understanding of how digitalization affects each performance dimension within the context of Sri Lankan retail. Specifically, the analysis demonstrated that two performance dimensions which are financial performance (H2) and internal business processes (H4) showed a statistically significant positive relationships with the level of digitalization. This suggests that digital technologies and practices, when effectively implemented, have the potential to enhance financial outcomes such as profitability, revenue growth, and cost efficiency, as well as streamline and optimize internal operations through automation, process integration, and improved decision-making capabilities.

On the other hand, the remaining two dimensions that is customer perspective (H1) and the learning and growth perspective (H3) did not exhibit statistically significant correlations with the digitalization index. Consequently, there was insufficient evidence to reject the null hypotheses associated with H1 and H3. This outcome implies that, within the current maturity level of digitalization in Sri Lankan supermarket chains, the tangible benefits of digitalization may not yet be fully translating into enhanced customer satisfaction or improvements in employee development and organizational learning. Several factors could contribute to this, including gaps in customer-facing digital

initiatives, limited employee upskilling efforts, or the relatively early stage of digital adoption in these specific areas.

These results underline the significance of a deliberate and well-rounded approach to digital transformation and show the selective effects of digitalisation across several organisational aspects. Although the early and more obvious results include financial advantages and operational efficiency, in order to achieve comprehensive performance improvements, additional focus may be required to fortify digital initiatives in areas like staff capability development and customer engagement.

In summary, the results indicate that digitalization, though beneficial, does not uniformly enhance all aspects of organizational performance. Supermarket chains operating in the retail sector in Sri Lanka should therefore consider tailoring their digital strategies to target underperforming dimensions more effectively. By doing so, they can maximize the value derived from digital investments and foster a more comprehensive transformation across their performance landscape.

CHAPTER 05: CONCLUSION

5.1 Introduction

This chapter is inclusive of the conclusion and a summary of the research problem, objectives and methodology of the study. The subsequent sections have elaborated the main findings related to this study pertaining to the relevant research objective along with its practical and theoretical implications. The last section of this chapter discusses the constraints or the limitations of this study and possible directions for subsequent research.

5.2 Summary

According to prior literature, mostly from the international context, it is generally argued that with the adoption of digital tools and application, there will be a positive impact on organizational performance. Upon analysis of the local and international context, it was found that there is a dearth of studies that emphasizes the relationship or the association between the level of digitalization and performance of business organizations measured in various performance dimensions. Stemming from that, it has been considered as an opportunity and this study is conducted with the pioneering effort in understanding the above-mentioned relationship.

Therefore, this study is aimed at achieving three objectives which are, assessing the degree of digitalization, examining the relationship between digitalization and overall organizational performance and examining the relationship between digitalization and the individual performance dimensions measured via the balanced scorecard approach. In achieving the said objectives, positivistic paradigm and quantitative methodology was used as the research approach.

Taking into consideration the entire population of the supermarket chains operating in Sri Lanka, over 35 observations were taken via structured questionnaires and available published information. To measure direction of the relationship among digitalization and organizational performance, a correlation and a regression analysis were performed.

5.3 Main Findings and Conclusion

5.3.1 To assess the level of digitalization of supermarket chains operating in Sri Lanka

The first objective of this study was to assess the level of digitalization of supermarket chains operating in Sri Lanka. When it comes to the assessment of the level of digitalization in supermarket chains, results highlight that the average level of digitalization is at a rate of 3.727 out of an absolute score of 5. The assessment index was adopted from the Industry 4.0 assessment model put forward by Schumacher et.al. (2016) and refined to fit into the Sri Lankan context based on the dimensions that have been identified as contributing factors in promoting digitalization across business sectors in Sri Lanka.

5.3.2 To examine the impact of digitalization on overall performance of supermarket chains operating in the retail sector in Sri Lanka

The second objective of this study was to assess the impacts of digitalization on overall performance of supermarket chains operating in Sri Lanka. It was brought to light that there is a positive moderate correlation or a statistically significant relationship between the indexes of organizational performance and digitalization. Hence the null hypothesis pertaining to the objective (H5) could be rejected due to the existence of the statistically significant relationship. The holistic nature of the digitalization index and performance index have been instrumental in deriving this relationship and confirming the hypothesis laid out under H5.

5.3.3 To examine the impact of digitalization on different dimensions of organizational performance of supermarket chains operating in the retail sector in Sri Lanka

The third objective of the research was to identify the impact of digitalization on different dimensions of organizational performance of supermarket chains in Sri Lanka. The hypotheses related to this objective are laid out under H1, H2, H3 and H4 and it was pointed out that the financial (H2) and internal business process (H4) dimensions of organizational performance had a statistically significant relationship to the independent variable of digitalization relative to the rest of the performance dimensions. Hence there is no statistical evidence to reject the null hypotheses of H1 and H3 of this study.

5.4 Implications

When analyzing the local and international context, it was found that there is a dearth of studies that emphasizes the relationship between digitalization and overall performance of organizations where performance is measured in various dimensions related to the business. Further, the index to measure the level of digitalization was adopted from the international context and customized to fit into the local context so that the content and the scope covered is aligned to what is practiced locally. Therefore, considering this as an opportunity, this study is conducted with the pioneering effort in understanding the above-mentioned relationship whilst contributing to the extant literature.

Empirical studies suggest that the adoption of digitalization or the deployment of digital tools and applications have significant inferences for organizational performance. Therefore, the outcomes of this research would offer assistance to decision makers and the management in establishing the depth or the levels of digitalized applications they should adopt or maintain. Moreover, this study will lay some foundation by revealing the significant relationship between digitalization and the individual performance dimensions of organizations on which more comprehensive evaluation could be built.

5.5 Limitations and Future Research Directions

While this study is aimed at contributing significantly to the theoretical and practical dimensions, certain limitations such as absence of generalization. The relatively smaller population is itself susceptible to values that may be at the extreme and the data may be distorted if the performance of the firms are for some reasons or the other under-performing or over-performing. The indexes of digitalization and organizational performance have been derived at by summing up several items relevant to the respective index by using prior literature and findings as the basis for the derivation. Hence, the indexes used may not adequately capture and reflect the intended observations for further analysis on this topic. Further, like most survey-based studies conducted the analyses aspects are cross sectional which fails to identify the vital aspects supports the connectivity among the identified variables.

Thus, the recommendation for further research would be to evaluate the impact of digitalization on organizational performance on companies with varying features such as industry, size etc. Since digitalization in the context of the retail sector is a relatively new research area, this study can be taken as one that provides an overview on the implications of digitalization and further analysis can be built upon this to unearth potential impacts of digitalization to the overall business model. Furthermore, the measurement index of digitalization could be studied further to incorporate potential drivers of digitalization in the local context and attach them with possible cause and effect variables in order to identify other potential resultant outcomes which are driven by digitalization.

LIST OF REFERENCES

Alexandru, SR 2017, *The impact of Big Data, Sustainability, and Digitalization on Company Performance*, De Gruyter Publishers, China.

Bahn, KD, Granzin, KL, Tokman, M 2015, 'End-user contribution to logistics value co-creation: a series of exploratory studies', *Journal of Marketing Channels*, vol. 22, no. 1, pp. 3 – 26.

Baines, TS, Bustinza, OF, Bigdeli, AZ & Shi, VG 2017, 'Servitization: Revisiting the State-of-the-art and Research Priorities', *International Journal of Operations & Production Management*, vol. 27, no. 2, pp. 256 – 278.

Berghaus, Sabine and Back, Andrea, "Stages in Digital Business Transformation: Results of an Empirical Maturity Study" (2016). MCIS 2016 Proceedings. 22.
<http://aisel.aisnet.org/mcis2016/22>

Bharadwaj, A, Sawy, O, Pavlou, P & Venkatraman, N 2013, 'Digital Business Strategy: Towards a next generation of insights', *MIS Quarterly*, vol. 37, no. 2, pp. 471 – 482.

Bharadwaj, A, Sawy, OA, Pavlou, PA & Venkatraman, N 2013, 'Digital Business Strategy: Toward a Next Generation of Insights', *MIS Quarterly*, vol. 37, no. 2, pp. 314 – 332.

Bjorkdahi, J & Holmen, M 2018, 'Exploiting the control revolution by means of digitalization: Value creation, value capture, and downstream movements', *Journal of Industrial and Corporate Change*, vol. 12, no. 5, pp. 234 – 252

Bonn, J, Osei, C & Agyeman, B 2017, 'Using Balanced Scorecard for Managing Performance in Selected Ghanaian Banks', *International Journal of Business and Management*, vol.12, no. 12, pp. 204 – 218

Brennen, S & Kreiss, D 2014, *Digitalization and Digitization*, viewed 20 March 2020, <http://culturedigitally.org/2014/09/digitalization-and-digitization/>

Bresnahan, T & Greenstein, S 1999, 'Technological Competition and the Structure of the Computer Industry', *The Journal of Industrial Economics*, vol. 47, no. 1, pp. 1 – 40.

Brynjolfsson, E & Hitt, LM 2000, 'Beyond Computation: Information Technology, Organizational Transformation and Business Performance', *The Journal of Economic Perspectives*, vol. 14, no. 4, pp. 23 – 48.

Brynjolfsson, E & McElheran, K 2016, 'The Rapid Adoption of Data-Driven Decision-Making', *The American Economic Review*, vol. 106, no. 5, pp. 133 – 139.

Brynjolfsson, E 1994, 'Information Assets, Technology, and Organization', *Management Science*, vol. 40, no. 12, pp. 1645 – 1662.

Bughin, J, LaBerge, L & Mellbye, A 2017, *The case for digital reinvention*, E-book, McKinsey Digital Publishing, New York, available at <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/mckinsey-digital-insights/digital-mckinsey-insights-number-1>

Bustis, AD, Ganesan, V & Herath, G 2018, Unlocking Sri Lanka's Digital Opportunity, viewed 28 January 2019, <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/unlocking-sri-lankas-digital-opportunity>

Buyukozkan, G & Gocer, F 2018, 'Digital Supply Chain: Literature review and a proposed framework for future research', *Journal of computers in industry*, vol. 97, no. 4, pp. 157 – 177

Cardona, M, Kretschmer, T & Strobel, T 2013, 'ICT and productivity: conclusions from the empirical literature', *Journal of Information Economics and Policy*, vol. 25, no. 3, pp. 109-125.

Caroline, P & Satorra, SP 2019, 'How are digital technologies changing innovation?' viewed 20 June 2020, https://www.researchgate.net/publication/334593576_HOW_ARE_DIGITAL_TECHNOLOGIES_CHANGING_INNOVATION

Cenamora, J, Sjödin, D & Parida, V 2017, 'Adopting a platform approach in Servitization: Leveraging the value of digitalization', *International journal of Production Economics*, vol. 10, no. 2, pp. 34 – 47.

Chanias, Simon and Hess, Thomas, "Understanding Digital Transformation Strategy Formation: insights from Europe's automotive industry" (2016). PACIS 2016 Proceedings. 296 <http://aisel.aisnet.org/pacis2016/296>

Colla, E & Lapoule, P 2012, 'E-commerce: exploring the critical success factors', *Journal of retail & distribution management*, vol. 40, no. 11, pp. 842 – 864

Constine, J 2017, *Uber eats Uber Eats, embedding it in the main app*, viewed 26 January 2019, <https://techcrunch.com/2019/06/04/uber-eats-uber-eats/>

Coupette, J 2015, 'Digitization: Its expectations and implementation', *Journal of Innovation, Organization and Management*, vol. 1, no. 2, pp. 69-75.

Daily Financial Times 2019, *Sri Lanka Retail Forum 2019 to strategise on 'The Retail Revolution'*, viewed 20 June 2020, <http://www.ft.lk/marketing/Sri-Lanka-Retail-Forum-2019-to-strategise-on-The-Retail-Revolution/54-688445#:~:text=Sri%20Lanka's%20retail%20sector%20accounts,National%20Economy%20of%20the%20country.>

Dekimpe, MG 2019, 'Retailing and Retailing Research in the age of big data analytics', *International Journal of Research in Marketing*, vol. 4, no. 4, pp. 72 – 90.

Dickinson, R, Gable, M & Thomas, R 2011, 'An application of the balanced scorecard in retailing', *Journal of international review of retail, distribution and consumer research*, vol. 9, no. 1, pp. 41 – 67

Deloitte 2017, *Disruptions in retail through digital transformation*, viewed 20 March 2020, <https://www2.deloitte.com/content/dam/Deloitte/in/Documents/CIP/in-cip-disruptions-in-retail-noexp.pdf>

Deloitte 2018, *Digital Maturity Model – achieving digital maturity to drive growth*, viewed 15 March 2020,
<https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Technology-Media-Telecommunications/deloitte-digital-maturity-model.pdf>

Enríquez, LA, Cuevas-Vargas, H & Adame, MG 2015, 'The impact of information and communication technologies on the competitiveness: evidence of manufacturing SMEs in Aguascalientes', *International Review of Management & Business Research*, vol. 4, no. 3, pp. 758-770.

Eremina, Y, Lace, N & Bistrova, J 2019, 'Digital Maturity and Corporate Performance: The Case of the Baltic States', *Journal of Open Innovation*, vol. 54, no. 5, pp. 52 – 70.

Fakhari, A, Hematian, H & Danaei, A 2017, 'Evaluation of Hadid firm's performance using the balanced scorecard (BSC) model', *Arabian journal of business and management review (Oman chapter)*, vol. 6, no. 8, pp. 49 – 62.

Ferreira, MDF & Ehie, I 2019, 'Conceptual Development of Supply Chain Digitalization Framework', *IFAC – PapersOnLine Journal*, vol. 52, no. 13, pp. 2338 – 2342

Fitzgerald, M. 2014, *Your Digital Journey Is Being Mapped By Your Customers*, E-book, MIT Sloan Management Review Publishing, Cambridge, available at
<https://www.slideshare.net/capgemini/mit-digital-journey-2014>

Fors, CA 2013, *The Ontology of the Subject in Digitalization*, E-book, IGI Global Publishing, Pennsylvania, available at <https://www.igi-global.com/chapter/ontology-subject-digitalization/70347>

Gandhi, P, Khanna, S & Ramaswamy, S 2016, *Which Industries are the Most Digital (and Why)?* viewed 10 February 2020, <https://hbr.org/2016/04/a-chart-that-shows-which-industries-are-the-most-digital-and-why>

Gartner 2018, *Industries rank digital business as one of their top 10 business objectives*, viewed 10 February 2020, <https://www.gartner.com/smarterwithgartner/is-digital-a-priority-for-your-industry/>

German Marshall Fund of the United States 2018, *Transatlantic Policy Challenges of the Digital Energy Nexus*, Chase, P & Berzina, K, New York.

Gonzalez, F 2014, 'Reinventing the company in the digital age' E-book, BBVA Publishing, Spain, available at <https://www.bbvaopenmind.com/wp-content/uploads/2015/01/BBVA-OpenMind-Transforming-an-Analog-Company-into-a-Digital-Company-The-Case-of-BBVA-Francisco-Gonzalez.pdf.pdf>

Gustafsson, E, Jonsson, P & Holmstrom, J 2019, 'Digital product fitting in retail supply chains: maturity levels and potential outcomes', *Supply Chain Management: an international journal*, vol. 24, no. 5, pp. 122 – 140.

Hagberg, J, Sundstrom, M & Nicklas, E 2016, 'The digitalization of retailing: an exploratory framework', *International Journal of Retail & Distribution Management*, vol. 44, no. 8, pp. 694-712

Hanninen, M, Smedlund, A, Mitronen, L 2017, 'Digitalization in retailing: Multi-sided platforms as drivers of industry transformation', *Baltic Journal of Management*, vol. 5, no. 2, pp. 21 – 32.

Herhausen, D, Binder, J, Schoegel, M & Herrman, A 2015, 'Integrating Bricks with Clicks: Retailer-Level and Channel-Level Outcomes of Online–Offline Channel Integration', *Journal of Retailing*, vol. 91, no. 2, pp. 315 – 342

Herhausen, D, Binder, J, Schogel, M, & Herrmann, A 2015, 'Integrating bricks with clicks: retailer-level and channel-level outcomes of online–offline channel integration', *Journal of Retailing*, vol. 91, no. 2, pp. 309 – 325.

Im, G & Rai, A 2008, 'Knowledge sharing ambidexterity in long term organizational relationships', *Management Science*, vol. 54, no. 7, pp. 210 – 224.

International Business Machines Corporation, *IBM Analytics*, Bob Picciano, New York. IS Research Agenda', *Information Systems Research*, vol. 21, no. 4, pp. 748 – 759.

Kaba, S & Ozalpmann, D 2019, *Digitalization in Cinema in Turkey: A Meta-Analysis*, E-book, IGI Global Publishing, Pennsylvania, available at <https://www.igi-global.com/chapter/digitalization-in-cinema-in-turkey/216241>

Kaplan, RS & Norton, DP 1992, 'The Balanced Scorecard—Measures that Drive Performance': Harvard Business Review, viewed 18 May 2020, <https://hbr.org/1992/01/the-balanced-scorecard-measures-that-drive-performance-2>

Khater, M, Zaki, M & Abdelaal, MHI 2018, 'Digital Business Transformation and Strategy: What Do We Know So Far?', viewed 15 June 2020, https://www.researchgate.net/publication/322340970_Digital_Business_Transformation_and_Strategy_What_Do_We_Know_So_Far

Khin, S & Char, T 2018 'Digital Technology, digital capability and organizational performance', *International Journal of Innovation Science*, vol. 6, no. 4, pp. 1757 – 2223.

Kiel, D & Arnold, C 2016, 'The Impact of the Industrial Internet of Things on Established Business Models', *Conference Papers – International Association for Management of Technology Conference, At Orlando, Florida*, pp. 75 – 90.

Klotzer, C & Pflaum, A 2017, 'Toward the Development of a Maturity Model for Digitalization within the Manufacturing Industry's Supply Chain' *Conference Papers - Hawaii International Conference on System Sciences (HICSS) 2017*, pp. 72 – 85

Koc, T & Bozdog, E. 2009, 'The impact of AMT practices on firm performance in manufacturing SMEs', *Journal of Robotics & Computer-Integrated Manufacturing*, vol. 25 No. 2, pp. 303-313.

Kryvinska, N, Strauss, C, Gregus, M & Kaczor, S 2014, 'Servitization Strategies and Product-Service-Systems', *Conference Papers - IEEE 10th World Congress on Services*, pp. 25 – 32

Kshatriya, A, Dharmadhikari, V, Srivastava, D & Basak, PC (2017), 'Strategic Performance Measurement using balanced scorecard – a case of machine tool industry', *Journal of foundations of management*, vol. 9, no. 10, pp. 75 – 85

Kuusisto, M 2018 'Organizational Effects of Digitalization - A Literature Review', *International Journal of Organization Theory and Behavior*, vol. 20, no. 3, pp. 341 – 362.

Legner, C, Eymann, T, Hess, T & Matt, C 2017, 'Digitalization: Opportunity and Challenge for the Business and Information Systems Engineering Community', *Journal of business & information systems engineering*, vol. 59, no. 4, pp. 301 – 308

Lenka, S & Parida, V 2017, 'Digitalization Capabilities as enablers of value co-creation in servitizing firms: Digitalization Capabilities', *Psychology and Marketing*, vol. 34, no. 1, pp. 92 – 100.

Loebbecke, C & Picot, A 2015, 'Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda', *The Journal of Strategic Information Systems*, vol. 24, no. 3, pp. 149 – 157.

Luz, M, Pena, M, María, J, Lopez, S & Garrido, E 2019, 'Servitization and digitalization in manufacturing: the influence on firm performance', *Journal of Business and Industrial Marketing*, vol. 5, no. 2, pp. 235 – 252.

Martinez, F 2019 'Process excellence the key for digitalization', *Business Process Management Journal*, vol. 25, no. 7, pp. 1716 – 1733.

Melville, N, Kraemer, K & Gurbaxani, V 2004, 'Information Technology and Organizational Performance: An Integrative Model of IT Business Value', *MIS Quarterly*, vol. 28, no. 2, pp. 283 – 322.

Ministry of Telecommunications & Development infrastructure 2018, *Sri Lanka Digital Economy Strategy Blueprint*, viewed 26 March 2020, http://www.mdiit.gov.lk/index.php/en/component/jdownloads/send/2-policies/77-sri-lanka-digital-economy-strategy?option=com_jdownloads

Mithas, S, Ramasubbu, N & Sambamurthy, V 2011, 'How Information Management Capability Influences Firm Performance', *MIS Quarterly*, vol. 35, no. 1, pp. 237 – 256.

Mithas, S, Tafti, A & Mitchell, W 2013, 'How a Firm's Competitive Environment and Digital Strategic Posture Influence Digital Business Strategy', *MIS Quarterly*, vol. 37, no. 2, pp. 511 – 536.

Mithas, S, Tafti, A, Bardhan, I & Goh, JM 2012, 'Information Technology and Firm Profitability: Mechanisms and Empirical Evidence', *MIS Quarterly*, vol. 36, no. 1, pp. 205 – 224.

Moshiri, S & Simpson, W 2011, 'Information technology and the changing workplace in Canada: firm-level evidence', *Journal of Industrial & Corporate Change*, vol. 20 no. 6, pp. 1601-1636.

Norwegian Institute for International Affairs (NUPI) 2016, *Digital dividends in developing countries*, Schia, NN, Norway.

Pangestu, M & Dewi, G 2017, *Indonesia and the digital economy: creative destruction, opportunities and challenges*, Highwire Publishers, United States

Parida, V, Sjodin, D & Reim, W 2019, *Reviewing Literature on Digitalization, Business Model Innovation, and Sustainable Industry: Past Achievements and Future Promises*, MDPI Publishers, Switzerland.

PricewaterhouseCoopers 2016, *Industry 4.0 – Building the Digital Enterprise*, viewed 10 June 2020, <https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf>

Queiroz, MM, Pereira, SCF, Telles, R & Machado, MC 2019, 'Industry 4.0 and digital supply chain capabilities: A framework for understanding digitalization challenges and opportunities', *Production and Inventory Management Journal*, vol. 2, no. 3, pp. 112 – 130.

Rachinger, M, Rauter, R, Müller, C, Vorraber, W & Schirgi, E 2018 'Digitalization and its influence on business model innovation', *Journal of Manufacturing Technology Management*, vol. 30, no. 8, pp. 1143 – 1160.

Rader, D 2019, 'Digital Maturity – the new competitive goal', *Strategy & Leadership*, vol. 47, no. 5, pp. 28 – 35.

Raisch, S, Birkinshaw, J, Probst, G & Tushman, M 2009, 'Organizational Ambidexterity: Balancing Exploitation and Exploration for Sustained Performance', *Organization Science*, vol. 20, no. 4, pp. 685 – 695.

Rassool, R & Dissanayake, D 2019 'Digital Transformation for Small & Medium Enterprises (SMEs): with special focus on Sri Lankan context as an Emerging

Economy', *International Journal of Business and Management Review*, vol. 7, no. 4, pp. 59 – 76.

Reinartz, W, Weigand, N & Imschloss, M 2019, 'The impact of digital transformation in the retailing value chain', *International Journal of Research in Marketing*, vol. 2, no. 5, pp. 90 – 110.

Roman, T 2019, 'Digital Transformation Maturity: A Systematic Review of Literature' *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, vol. 67, no. 6, pp. 1673–1687.

Romdhane, YB, Loukil, S & Kammoun, S 2019, *Economic African Development in the context of FinTech*, E-book, IGI Global Publishing, Pennsylvania, available at <https://www.igi-global.com/chapter/economic-african-development-in-the-context-of-fintech/245986>

Ruiz-Alba, FL, Guesalaga, R, Ayestarán, R & Mediano, FM 2019, 'Interfunctional coordination: the role of digitalization', *Journal of Business & Industrial Marketing*, vol. 4, no. 1 pp. 141 – 152.

Rybarsky, J 2019, *The History of Digitalization in Five Phases*, viewed 15 March 2020, <http://www.ctrl-verlust.net/the-history-of-digitalisation-in-five-phases/>

Schumacher, A, Erol, S & Sihn, W 2016, 'A maturity model for assessing industry 4.0 readiness and maturity of enterprises', *Benchmarking: An International Journal*, vol. 8, no. 12, pp. 102 – 112

Scott, SV, Reenen, JV & Zachariadis, M 2017, 'The long-term effect of digital innovation on bank performance: An empirical study of SWIFT adoption in financial services', *Research Policy*, vol. 46, no. 4, pp. 984 – 1004.

Scuotto, V, Serravalle, F, Murray, A & Viassone, M 2019, *The Shift towards a Digital Business Model: A Strategic Decision for the female Entrepreneur*, E-book, IGI Global Publishing, Pennsylvania, available at <https://www.igi-global.com/chapter/the-shift-towards-a-digital-business-model/220028>

Shabani, R 2019, *A suggested framework for measuring digital maturity in construction projects in Norway*, viewed 30 March 2020, <https://ntnuopen.ntnu.no/ntnu-xmlui/bitstream/handle/11250/2623336/no.ntnu:inspera:2557974.pdf?sequence=1>

Sheikhshoei, F, Naghshineh, N, Alidousti, S & Nakhoda, M 2017, 'Design of a digital library maturity model (DLMM)', *The Electronic Library*, vol. 36, no. 4, pp. 607 – 619.

Sklyar, A, Tronvoll, B, Kowalkowski, C & Sorhammar, D 2019, 'Organizing for digital servitization: A service ecosystem perspective', *Journal of Business Research*, vol. 104, no. 18, pp. 450 – 460

Sri Lanka Retailers' Association 2020, *Revitalizing Retail through Shop for Sri Lanka Campaign*, viewed 25 June 2020, <https://slra.lk/revitalizing-retail-through-shop-for-sri-lanka-campaign/>

Szoka, K 2018, *The appearance of Digitalization among the viewpoints*

of Balanced Scorecard, E-book, International Institute of Social and Economic Sciences Publishing, Spain, available at <https://iises.net/proceedings/iises-annual-conference-sevilla/table-of-content/detail?article=the-appearance-of-digitalisation-among-the-viewpoints-of-balanced-scorecard>

Tambe, P 2014, 'Big Data Investment, Skills, and Firm Value', *Management Science*, vol. 60, no. 6, pp. 1452 – 1469.

Teece, D, Pisano, G & Shuen, A 1997, 'Dynamic Capabilities and Strategic Management', *Strategic Management Journal*, vol. 18, no. 7, pp. 509 – 533.

Teece, DJ 2013, 'A dynamic capabilities based entrepreneurial theory of multinational enterprise', *Journal of International Business Studies*, vol. 45, no. 1, pp. 142 – 157.

The Ministry of Telecommunications & Development Infrastructure, *Sri Lanka Digital Economy Strategy Blueprint*, Colombo.

The United Nations Conference on Trade and Development, *Digital Economy Report (DER)*, Geneva.

The World Bank Group 2016, *World Development Report 2016: Digital Dividends*, Washington.

Tilson, D, Lyytinen, K & Sorensen, C 2010, 'Digital Infrastructures: The Missing Unruh, G & Kiron D 2017, *Digital Transformation on Purpose*, E-book, MIT Sloan Management Review Publishing, Cambridge, available at <https://sloanreview.mit.edu/article/digital-transformation-on-purpose/>

Weill, P & Woerner, SL 2015, *Thriving in an increasingly digital ecosystem*, E-book, MIT Sloan Management Review Publishing, Cambridge, available at <https://sloanreview.mit.edu/article/thriving-in-an-increasingly-digital-ecosystem/>

Westerman, G, Bonnet, D & McAfee, A 2012, *The Advantages of Digital Maturity*, E-book, MIT Sloan Management Review Publishing, Cambridge, available at <https://sloanreview.mit.edu/article/the-advantages-of-digital-maturity/>

Wiefel, M 2015, 'Digitalization: The impact on traditional retail and the future model of multichannel', *International Journal of Scientific and Research Publications*, vol. 5, no. 3, pp. 10 – 27.

Winter, R, Marx, F, Lahrmann, G & Wortmann, F 2011, 'Business Intelligence Maturity: Development and Evaluation of a Theoretical Model', *Conference Papers – 44th Hawaii International Conference on System Sciences (HICSS)*, pp. 51 – 60.

Wroblewski, JB 2018, *Digitalization and Firm Performance*, viewed 10 January 2020, <http://lup.lub.lu.se/luur/download?func=downloadFile&recordId=8945868&fileId=8945877>

Yoo, Y 2010, *Digitalization and Innovation*, viewed 22 March 2020, https://www.researchgate.net/publication/48926382_Digitalization_and_Innovation

Youngjin, Y, Henfridsson, O & Lyytinen, K 2010, 'The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research', *Information Systems Research*, vol. 21, no. 4, pp. 724 – 735.

Zeebroeck, JB 2017, *The Best Response to Digital Disruption*, viewed 25 January 2020, <https://sloanreview.mit.edu/article/the-right-response-to-digital-disruption/>

Zheng, T, Ardolino, M, Bacchetti, A, Perona, M & Zanardini, M 2019, 'The impacts of Industry 4.0: a descriptive survey in the Italian manufacturing sector', *Journal of Manufacturing Technology Management*, vol. 30, no. 10, pp. 521 – 540.

APPENDICES

Appendix A – Structured Questionnaire to assess the level of digitalization

The ratings of the questionnaire are arranged as follows:

1	2	3	4	5
Absent	Less Distinct	Neutral	Distinct	Very Distinct

Table 7.1 - Questionnaire to measure the level of digitalization

Reference	Dimensions of Digitalization	Rating				
		1	2	3	4	5
A	A. STRATEGY					
A.1	The organization operates with a digital vision to align its business model in response to the new needs of the market	☐	☐	☐	☐	☐
A.2	Efforts are being made by the leadership to convey the digital vision across all levels within the organization	☐	☐	☐	☐	☐
A.3	Availability of a team that is dedicated to lead the change and digital transformation of the organization	☐	☐	☐	☐	☐
A.4	A business area is present which is prioritized in appraising digital investments	☐	☐	☐	☐	☐

A.5	A separate budget is allocated to fund the adoption of digital technologies	☐	☐	☐	☐	☐
A.6	The level of importance of data analysis and usage (customer data, product or machine generated data) for the business model	☐	☐	☐	☐	☐
B	B. CUSTOMER EXPERIENCE	1	2	3	4	5
B.1	The organization monitors and understands the changing customer demands in the market	☐	☐	☐	☐	☐
B.2	The level of integration of multiple channels (<i>website, social media platforms etc.</i>) during customer interactions for communications such as news, feedback, managing after sales services etc.?	☐	☐	☐	☐	☐
B.3	The extent of customer data analysis with the intention of improving customer insights (<i>e. g. tailor made offerings to customers based on personal profiles, credit rating, preferences etc.</i>)	☐	☐	☐	☐	☐
B.4	Customer usage data are obtained as inputs in continuously improving solutions and services offered	☐	☐	☐	☐	☐
B.5	The organizational ability of providing a customized / personalized solution to customers	☐	☐	☐	☐	☐
C	C. PRODUCTS / SERVICES	1	2	3	4	5
C.1	The organization's ability to innovate given the dynamic nature of changing market requirements	☐	☐	☐	☐	☐

C.2	The organization anchors on digital technology in leading new product/service innovations (<i>e.g. 3D Printing, modelling, virtualization etc.</i>)	☐	☐	☐	☐	☐
C.3	Customers have access to new service models which have been enabled by digital technologies	☐	☐	☐	☐	☐
C.4	Product usage information can be traced based on real time data availability	☐	☐	☐	☐	☐
C.5	A governance and risk strategy is in place to account for any risks arising from a connected product environment	☐	☐	☐	☐	☐
D	D. PEOPLE	1	2	3	4	5
D.1	A team of experts have been positioned to drive and promote digital adoption across the organization	☐	☐	☐	☐	☐
D.2	Employees have the ability to make use of the application of digital tools for collaboration and connectivity	☐	☐	☐	☐	☐
D.3	Employee idea generation on ‘digital transformation’ are encouraged	☐	☐	☐	☐	☐
D.4	The average level of ICT competency of employees	☐	☐	☐	☐	☐
D.5	The level of usage of digital tools for knowledge management, skill enhancement and learning & development	☐	☐	☐	☐	☐
E	E. OPERATIONS	1	2	3	4	5

E.1	All production / operations infrastructure are connected, and data is available to support and facilitate the decision making process	☐	☐	☐	☐	☐
E.2	Availability of integrated platforms that provide visibility and accessibility by several users / stakeholders	☐	☐	☐	☐	☐
E.3	The ability for departments / functional units to collaborate easily via digital channels	☐	☐	☐	☐	☐
E.4	The degree of average product digitization in the product portfolio (<i>e.g. Radio frequency tags (RFID) for identification, availability of sensors, IoT connections, smart features etc.</i>)	☐	☐	☐	☐	☐
E.5	The degree / level of digitization of the horizontal value chain (<i>i.e. the processes starting from customer order placement to supplier coordination and logistics aspects to after sales service</i>)	☐	☐	☐	☐	☐
E.6	The relative usefulness of new technologies such as social media, data analytics and cloud computing in acting as enablers of the business operation	☐	☐	☐	☐	☐
F	F. TECHNOLOGY	1	2	3	4	5
F.1	The degree of availability of an IT enabled planning and steering process which covers the end to end processes from sales forecasting, production / distribution to stores planning and logistics	☐	☐	☐	☐	☐

F.2	The extent to which the existing IT architecture of the organization address the overall requirements of digitization and elements of Industry 4.0	☐	☐	☐	☐	☐
F.3	The level of maturity of IT and data architectures which enables to collect, accumulate and translate real-time product and customer data	☐	☐	☐	☐	☐
F.4	The level of integration of IT with stakeholders such as customers, suppliers and fulfillment partners	☐	☐	☐	☐	☐
F.5	The rating of the organization's capabilities and resources related to Industry 4.0 (<i>e.g. data analytics, IoT, CPS, HMI, production security, digital PLM etc.</i>)	☐	☐	☐	☐	☐
F.6	The rating of the level of overall adoption of the elements of digitalization in the organization	☐	☐	☐	☐	☐

Source: PricewaterhouseCoopers 2016