CRITICAL SUCCESS FACTORS FOR DIGITAL INNOVATION AND ORGANIZATIONAL PERFORMANCE : A CROSS INDUSTRY ANALYSIS FROM SRI LANKA

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Abstract

Despite the growing importance of digital innovation driving organizations towards digital transformations and improved performance, empirical studies examining the determinants of digital innovation and the relationship between digital innovation and organizational performance are scarce, leading to a knowledge gap within the context. In prior studies, it was observed that the findings were inconsistent, and that researchers have primarily examined digital innovation from a technical perspective. Hence, this research focused on identifying the critical success factors affecting digital innovation and examining the relationship between digital innovation and organizational performance from technological, managerial, and organizational perspectives.

Past literature between 2010 and 2020 revealed the existence of six factors affecting digital innovation. Dynamic Capabilities Theory was used to classify managerial and organizational factors and Resource Based View was used to identify technological factors. Managerial factors included transformational leadership and top management support. Organizational factors included open communication, organizational culture, and organizational learning. Technological factors included digital capability. Based on the literature review, the conceptual framework and hypotheses were developed. A self-administered online survey questionnaire was used for the data collection. The conceptual model was empirically tested by analyzing the data collected from managerial-level employees of organizations belonging to industry, trade, and services sectors within the Western province, that are engaged in digital innovation processes within their organizations. A single organization was the unit of analysis, and the sample was 135 respondents. Data were primarily analyzed using PLS-SEM.

The findings revealed that amongst the six factors identified, digital capability and organizational learning had a positive and significant effect on digital innovation. Further, the study could establish a positive and significant effect of digital innovation on organizational performance.

The study has some important theoretical contributions. Since there is a dearth of research in the context of digital innovation, this study helps to fill the existing knowledge gap in this context. Especially, this study could reveal six factors classified under technological, managerial, and organizational perspectives, while the previous studies had primarily focused on the technical perspective. In addition, the study has some practical implications as well. Since the study revealed that digital innovation has a significant effect on organizational performance, organizations could explore the possibilities for improving their digital innovation processes to enhance organizational performance. As per the findings of the study, the organizations need to focus more on digital capability and organizational learning to improve on digital innovation within organizations, which in turn will help them to enhance their organizational performance.

Keywords: Sri Lanka, Digital innovation, Organizational performance, Dynamic Capabilities, Digital capabilities

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List of Abbreviations

RBV - Resource Based View

COM – Open Communication

CUL – Organizational Culture

DCT – Dynamic Capabilities Theory

DC – Digital Capability

DI – Digital Innovation

HTMT- Heterotrait-Monotrait

IS – Information Systems

OL – Organizational Learning

PLS – SEM – Partial Least Squares – Structural Equation Modelling

SEM – Structural Equation Model

TL – Transformational Leadership

TMS – Top Management Support

VIF- Variance Influence Factor

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1. INTRODUCTION

1.1 Background

One of the major challenges faced by contemporary firms in the current dynamic environment is the need to embrace digitalization opportunities permitted by novel technologies (Butschan et al., 2018; Ghosh et al., 2017; Loebbecke & Picot, 2015; Richter et al., 2018) and driving the organization towards a digital transformation through the exploitation of these technologies (Warner & Wäger, 2019). Among many such breakthrough technologies which have made transformation possible are big data analytics, augmented reality, mobile devices, blockchain and robotics etc. In contrast to early technologies which have usually transformed analog business processes to digital ones, these modern technologies have reinvented new business models and value propositions for customers (Sousa-Zomer et al., 2020). With these changes, traditional firms also have faced the urgency to digitalize their products, services, and internal business processes, in order to retain their competitiveness in the market (Liu et al., 2011; Vial, 2019). It is also highlighted through many studies that as opposed to the performance gains resulted by digital transformations, there are many organisations that do not succeed in their transformation initiatives, showing a 60% – 85% range failure rate . Researchers have admitted that it is necessary for organisations to possess resources and capabilities that are imperative to competing in a digital age (Liu et al., 2011; Vial, 2019; Warner & Wäger, 2019).

When observing from this point of view, digital innovation could be understood as "the creation of (and consequent change in) market offerings, business processes, or models that result from the use of digital technologies" (Nambisan et al., 2017, p. 224). Due to the growing focus on digitalization, digital innovation has also become an emerging area of research interest since there is an increasing demand for new digital solutions (Lyytinen et al., 2016; Wroblewski, 2018). When considering the benefits offered by digitalization, innovative digital solutions can be considered as important factors enabling the

digitalization of business processes through multiple functions such as marketing, human resource management, customer service, production, and logistics etc. Hence, it can be stated that unless an organization embraces innovative digital solutions, various systems and the support of IT firms, they are not completely ready for a digital transformation (Wroblewski, 2018).

The advent of new digital technologies and platforms have also necessitated organizations to develop innovative business solutions (Mancha & Shankaranarayanan, 2020). Further, it is a widely – accepted fact that innovation is regarded as a cornerstone of success for any contemporary organization, which has the capability of driving an organization towards achieving sustainable competitive advantage (Calantone et al., 2002). In addition, a significant amount of literature has provided evidence that there is a positive relationship between innovation and the organizational performance (Artz et al., 2010; Choi et al., 2013; Clercq et al., 2011; J. Naranjo-Valencia et al., 2016; Rosenbusch et al., 2011; Valmohammadi, 2017). Several researches have stressed the need to explore factors which augment and enable organizational innovation, due to the vital nature of innovation in aiding organizational effectiveness, evolution, survival and competitiveness (Woodman et al., 1993). In both academic and industry-related literature, it is a widely accepted fact that digital transformations contribute to sustained performance of the organization (Dalenogare et al., 2018; Kane et al., 2015; Tortorella et al., 2020; Vial, 2019). Studies conducted at industry level have recognized numerous organizational level and individual level aspects which result in successful digital transformation and, consequently, better organizational performance (Westerman et al., 2014). Further, according to Westerman et al., firms which have successfully engaged in digital transformation initiatives have been reported to demonstrate a higher performance within operational and market domains.

As identified above, since it is evident that a significant contribution is made by digital innovation for the performance of organizations, this study aimed to explore the factors

which influenced digital innovation as well as its impact on the performance of an organization.

1.2 Problem Statement, research questions and research objectives

Although there is an increased research interest for digital innovation, literature relating to the same has still not evolved up to the same level. Majority of the research studies on digital innovation do not view innovation from a managerial perspective, rather, they look at it from a technical, architectural or information system perspective (Lyytinen et al., 2016; Wroblewski, 2018). Moreover, even though researchers have found that there are capabilities which are helpful for firms in rapidly changing environments (Peteraf et al., 2013), the organizational level aspects that are incidental in creating these capabilities, and how they relate to an organization's performance, have not yet been tested (Loon et al., 2020). Further, even though many recent researchers have made suggestions on specific dynamic capabilities and sub capabilities which enable firms to compete successfully in the digital environment, how these capabilities are related to sustained firm performance is yet an unexplored area (Kane et al., 2015). With reference to digital technology, little evidence has been found which explain the relationship between digital innovation and organizational performance (Khin & Ho, 2018). In the empirical context, too, consistent findings regarding the relationship between factors related to digital innovation and performance have not been well-established (Khin & Ho, 2018). For example, it has been suggested that digital maturity has a weak, negative relationship with firm operating performance (Laforet, 2011; Wroblewski, 2018). Some studies have posited that digital innovation has a non-significant, positive relationship with organizational performance (Vinzi et al., 2010). Some others have also argued that digital innovation has a significant, positive relationship with organizational performance (Naranjo-Valencia et al., 2016; Valmohammadi, 2017). Through the inspection of the above, it was evident that, most of the studies concerning digital innovation and organizational performance have been conducted in the international context, however,

the findings of those studies cannot be generalized to the context or Sri Lanka since its demographic, economic, social, and cultural background is distinct from the context of countries such as the USA, China, UAE, Taiwan, Iran, Sweden, Spain and Indonesia where studies of this nature were frequently found.

Therefore, due to the dearth in studies related to digital innovation within organizations, the lack of studies identifying managerial and organizational level determinants of digital innovation, inconsistent findings of previous studies in the domain, and due to the difficulty in generalizing the findings of previous studies done in different countries to the Sri Lankan context, a need arises to determine the antecedents of digital innovation and the relationship between digital innovation and organizational performance within the context of Sri Lanka. Based on the above research gaps identified, the researcher developed the following research questions to be explored through this study:

1. What are the critical success factors for digital innovation?
2. What is the impact of those factors on digital innovation?
3. What is the impact of digital innovation on organizational performance?

Thus, this research aimed to contribute to the existing literature by addressing the questions identified above and forming a discussion on which factors influence the digital innovation of organizations the most, at organizational, managerial, and technological levels, and how digital innovation was related to the performance of an organization.

Accordingly, this study consisted of the following specific objectives:

1. To identify the critical success factors for digital innovation
2. To assess the impact of identified critical success factors on digital innovation
3. To assess the impact of digital innovation on organizational performance

1.3 Significance / contribution

This paper aimed to contribute to the field of digital innovation research in the following manner:

1.3.1 Theoretical significance

In the current context, a lack of adequate theoretical foundation, sound models and literature to investigate the antecedents of digital innovation and organizational performance has been mentioned in several studies (Vial, 2019 ; Loon et al, 2020 ; Khin, 2018) Through this study, it was intended to make contributions to the current body of knowledge related to digital innovation. To fulfill this, the study employed two sound theories in order to develop a unique, comprehensive conceptual framework which expressed the relationships between factors influencing digital innovation and the relationship between digital innovation and the performance of an organization. This framework was empirically tested in order to fill the literature gap in the domain, by drawing justifications from past literature as necessary. This framework will provide a guidance for the future researchers in the domain in understanding the critical success factors affecting digital innovation and how digital innovation relates to organizational performance.

1.3.2 Practical significance

Based on the findings, this study developed a conversation about how to educate the management and the future workforce on the positive impact of digital innovation for organizational performance, and how it could be leveraged at organizational, managerial, and technological levels. The findings will further encourage organizations to exploit the opportunities presented by novel digital technologies and digital transformation trends within their respective industries to further enhance their digital capabilities to become leaders in innovation and to improve organizational performance.

1.3.3 Empirical significance

Digital innovation and digital transformation have been considered as emerging research areas, hence there is a dearth of adequate studies to provide a strong empirical background and ample room and a requirement for further investigations within the domain (Dalenogare et al., 2018; Frank et al., 2018; Khin & Ho, 2018). Many researchers in this domain have focused attention on the building blocks of digital innovation in a non-academic context (Kane et al., 2015). Further, there is a limitation of validated frameworks that are helpful in analyzing digital transformations (Schallmo et al., 2017). Hence, this study reviewed the relevant literature, designed a new theoretical framework, and evaluated it in order to identify the factors which acted as significant influencers of digital innovation.

1.3.4 Methodological significance

Certain studies done within this domain have used analytical techniques such as frequency analysis, percentage analysis etc. to determine the relationship various factors and digital innovation as well as the relationship between digital innovation and organizational performance (Naidoo & Hoque, 2018; Zennouche et al., 2014), which are not sound techniques to conduct a study of this nature. However, this study has used Structural Equation Modelling (SEM) which is considered as a powerful, multivariate technique used to test and evaluate multivariate causal relationships (Hair et al., 2011). Most previous research that have been conducted thus far in this domain have conducted their studies concerning a single industry (Gunday et al., 2011; Nguyen et al., 2019; Lita et al., 2020; Rajapathirana & Hui, 2017; Scheler, 2013; Uzkurt et al., 2013), and the need for performing cross-industry research have been highlighted in several studies (Khin & Ho, 2018; Lanzolla et al., 2018). Hence, to conduct this study, organizations which are in a process of adapting digital innovation initiatives within different economic sectors in Sri Lanka were selected. As followed by many studies which have investigated similar relationships within the digital innovation domain, the current study, too, followed a

deductive research approach. Survey questionnaires were the primary technique for gathering data (Sousa-Zomer et al., 2020; Mancha & Shankaranarayan, 2020; Khin & Ho, 2018).

1.4 Chapter organization

The remainder of this study is organized as follows. The second chapter elaborates on a comprehensive literature review concerning past studies from ten years along with the key theories employed within the domain. Through this, it was expected to understand and describe the key variables affecting digital innovation and the relationships that exist between them, key concepts highlighted within the study and a summary of the nature of the past studies conducted within the domain. The third chapter elaborates on the methodology adapted by the study in detail. Here, the research approach is described, the conceptual framework based on the identified relationships among the variables is presented and based on the relationships presented, the associated hypotheses are proposed. The third chapter further describes the nature of the population and sample of the study, data gathering techniques, and methods of data analysis. The fourth chapter follows through with the detailed data analysis and discussion of the findings of the data analysis, by relating the findings of the study to existing literature. The fifth and final chapter of the study focuses on the key findings, limitations, and the implications of the study. Directions for future research are presented finally in this chapter.

2. LITERATURE REVIEW

2.1 Introduction

The literature review was compiled with the intention of providing the theoretical background required to support the study. Hence, this chapter aimed to introduce the definitions of major concepts and the theoretical background used within the study, and the empirical findings of past literature with reference to the research problem identified to consequently build the roadmap required for the next stages of the study.

2.2 Definition of major concepts

2.2.1 Innovation

Innovation is a concept which has gained considerable attention within the context of developing countries (Lukes & Stephan, 2017). In general terms, innovation has been identified as the generation and adaption of new ideas or behaviors (Rao, 2016). According to (Janssen, 2004), it can be further defined as an initiation, deliberate introduction and application of novel and valuable ideas, procedures and products that are useful for the organization. Further, innovation has been recognized as a factor which facilitates innovative processes to produce new products, services, technologies, and concepts (Sutanto, 2017). When referring to previous literature, innovation has been classified into different types under different domains. Damanpour and Gopalakrishnan (2001) have introduced a widely - used classification which is valid to-date, which identifies 3 classifications of innovation: “administrative vs technical”, “product vs process” and “radical vs incremental”. Another classification has been introduced by Kitchell (1995) which classifies innovation as product-related, technology-related, and behavior-related. In all these contexts, it needs to be kept in mind that innovation is not confined to start-up organisations and can have its inception within a mature organization as well (Mancha & Shankaranarayanan, 2020).

2.2.2 Digital innovation

In scientific literature, the concept of digitalization of the innovation process has gained growing attention lately (Brem & Viardot, 2017). As highlighted in various studies, the rapid growth of digital technologies has paved way for major improvements in many business processes (Galati & Bigliardi, 2019; Levine & Prietula, 2014; Yoo et al., 2012) A major role in the innovation domain has been played by the growth in digital technologies (Holmström & Partanen, 2014; Hylving, 2015). Here, the term "digital innovation" has been identified as "the creation of (and consequent change in) market offerings, business processes, or models that result from the use of digital technologies" (Nambisan et al., 2017, p.224). Digital innovation, according to Kohli and Melville (2019), relates to design concepts, however, needs to be viewed more holistically surpassing design science, focusing on a broader set of concepts. The need to have a strong ground on digital innovation has been highlighted by Fichman et al. (2014) and the requirement of digital talent, having rudimentary knowledge on modern digital technologies and the capability of learning and experimenting on the same in order to deliver value, has been highlighted by Mancha and Shankaranarayanan (2020). In their study, they have regarded digital innovation alike with entrepreneurial opportunity. They have also highlighted the necessity of organizations to undergo digital transformation, which, when influenced properly, translates into digital innovation. Thus, digital innovation is known to associate with digital data, comprehension of the digital landscape, understanding on the available technologies and awareness as to how they can generate business value (Mancha & Shankaranarayanan, 2020).

Kohli and Melville (2019) have posited that digital innovation does not emerge in an enclosed environment. They have further suggested that digital innovation could be considered as a strategic initiative which emerges and operationalizes within the IT function of an organization. Fichman et al. (2014) have further suggested that digital

innovation has the capability of transforming an organization by developing novel business models. Digital innovation has been also known to make certain changes in the competitive environment in which they operate (Vaia et al., 2012).

The capability of an organization to innovate and react to dynamic environmental conditions have been regarded as a crucial catalyst of organizational performance since past (Barney,1991) . Digital innovation has been equally regarded as a vital ingredient for organizational success in the current digital age as well (Nambisan et al. 2017). Several studies have examined a cross-industry perspective in identifying the antecedents of digital innovation and firm performance in different countries (Sousa-Zomer et al., 2020). According to Bughin and Zeebroeck (2017), when compared with average firms, organisations which try to fully exploit their digital capability have received better gains and higher returns. Although many studies have supported the positive impact innovation has on firm performance, there have also been several studies which have suggested of a negative impact product innovation has on firm performance (Laforet, 2011). There have been varied findings regarding digital innovation and organizational performance when it comes to the digital technology landscape. For example, Westerman et al. (2014) have found that for organizations having above-average values of innovation, profitability and revenue generating capacity are higher.

2.3 Theoretical background

2.3.1 Resource-based view (RBV)

Resource-based view (RBV) has been largely accepted and used within studies concerning innovation to clarify how competitive advantage and superior performance is achieved by certain organizations. According to Barney (1986), superior firm performance is resulted by firm-specific resources and skills which are rare and difficult for imitation by competing firms. According to RBV, differences in business performance is said to have been caused due to the differences in the resource base owned by organizations

(Henderson & Cockburn, 1994). Grant (1991) further emphasizes that the heterogeneity among organisations mainly emerge from factors that are internal to the organization. As emphasized by Murray et al. (2011) the accumulated knowledge and abilities which result in an increase in the value of resources and the usage of resources, are termed as capabilities.

The following Table 2.1 shows the evolution of the RBV over the years and the major contribution to the development of the theory.

Table 2. 1: Evolution of the RBV

Authors (year)	**Major Contribution**
Penrose (1959)	Emphasizes a company's internal resources. The resources of a company determine its growth, which is constrained by management resources
Andrews (1971)	Management of internal resources is emphasized
Lippman and Rumelt (1982)	Rich links between uniqueness and causal ambiguity produce long-term economic advantage
Wernerfelt (1984)	Firms are viewed as bundles of resources. Technological capabilities recognized as firm resources
Rumelt (1984)	The firm's strategic theory is founded on the concept of resource bundles
Barney (1986)	The characteristics of the factors market determine a company's ability to earn rents

Rumelt (1987)	Firms viewed as rent-seekers. The significance of isolating rent-earning mechanisms of firms
Rumelt (1987), Dierickx and Cool (1989)	a summary of the challenges to imitability (e.g., causal ambiguity and isolating mechanisms like asset interconnectedness, asset stock efficiencies, etc.) that prevent (or make it very expensive) replication by competitors
Day and Wensley (1988), Aaker (1989), Grant (1991), Wernerfelt (1989)	Firm resources are the core idea in strategic formulation models, and they are the sources of long-term competitive advantage.
Prahalad and Hamel (1990)	Corporate strategy and diversification are driven by core strengths. Core competencies should be exploited and leveraged by businesses. Corporations should diversify into related businesses that can utilize and strengthen the organization's core competencies
Hansen and Wernerfelt (1989), Rumelt (1991)	Empirical research that backs up the idea that firm-specific resources or organizational elements are more relevant than industry variables in explaining superior business performance
Barney (1991)	If key strategic resources are limited, difficult to replicate, non-substitutable, and valued, they can be sources of strategic competitive advantage. Technological capabilities recognized as tangible aspects of the resources and capabilities of a firm

Conner (1991)	The resource-based theory of the firm is compared with other strategic approaches from economics. Assumptions of the resource-based theory and its implications on rent earning strategies are explained
Peteraf (1993)	A resource-based, holistic framework for strategic competitive advantage. Proposes that corporations achieve higher performance by renting scarce and efficient resources and/or gaining market power in product markets
Day (1994)	Strategic competitive advantage framework based on capabilities. Differentiates between capabilities that are outside-in, spanning, and inside-out. Identifies technological capabilities as a distinctive capability possessed by a firm.
Collis and Montgomery (1995)	Presents a managerially oriented review of the RBV
Grant (1996)	A knowledge-based perspective emerges, which views knowledge as a key or strategic asset for businesses
Teece et al (1997)	Competitive advantages from dynamic capabilities

Adapted from Olavarrieta and Ellinger (1997), Mahoney (2004).

2.3.2 Dynamic capabilities theory (DCT)

The dynamic capabilities framework (Teece et al., 1997) , in contrast to resource-based view, is useful in explaining how sustained competitive advantage is attained by organizations along with superior organizational performance. This theory supersedes the

perspective of resource-based view by drawing attention to the modification of resources so that they match with the external environment, ensuring the survival of the firm in turn (Schilke et al., 2018). These different types of resources can be understood as the basis on which the organization builds and shapes to achieve its goals (Helfat, 2007; Winter, 2003). This view of dynamic capabilities has gained focus since it creates a way of attaining competitive advantage under dynamic conditions (Schilke et al., 2018). A variety of processes and routines that serve as foundations for dynamic capabilities have been identified in the current literature on strategy, innovation, and organization, as well as the new research on dynamic capabilities (Teece, 2007).

Dynamic capabilities have been identified as one of the most heavily researched, at the same time debated theories in contemporary literature (Bendig et al., 2017). According to Teece (2007), DCT provides a persuasive framework to analyse how strategic actions impact the performance of the organization. It also suggests that managerial capabilities and organizational capabilities could assist an organization to outstand its competition and at the same time improve its innovation capability. He further postulates that DCT focuses attention on the importance of the implementation of actions and processes which leads the organization to the adaptation and reorganization of itself to fit with the dynamic environmental conditions.

Drawing on the DCT, the following Table 2.2 shows how dynamic capabilities have been defined over the past by different authors who have contributed to the advancement of the theory.

Table 2. 2: Definitions of dynamic capability and contributions to DCT

Author	**Definition/ Contribution**
Teece and Pisano (1994, p. 537)	Timely responsiveness and rapid and flexible product innovation, along with the management

	capability to effectively coordinate and redeploy internal and external competences
Teece et al. (1997, p. 516)	The firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments.
Eisenhardt and Martin (2000, p. 1006)	The firm's processes that use resources-specifically the processes to integrate, reconfigure, gain, and release resources-to match and even create market change; dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die. Organizational processes and routines and managerial decision-making abilities identified as dynamic capabilities of a firm.
Teece (2000, p. 36)	The ability to sense and then seize opportunities quickly and proficiently.
Teece et al. (1997, p. 123)	The ability to create, extend or modify, integrate, build, reconfigure and/or sense, seize and transform firm's operating capabilities.
Griffith and Harvey (2001, p. 597)	Dynamic Capabilities is a combination of resources that are difficult-to-imitate, including effective coordination of inter-organizational relationships, on a global basis that can provide a firm competitive advantage.
Zollo and Winter (2002, p. 340)	A dynamic capability is a learned and stable pattern of collective activity through which the organization systematically generates and

	modifies its operating routines in pursuit of improved effectiveness.
Lee et al. (2002, p. 734)	Dynamic capabilities are conceived as a source of sustainable advantage in Schumpeterian regimes of rapid change
Adner and Helfat (2003, p. 1012)	The capabilities with which managers build, integrate, and reconfigure organizational resources and competences.
Helfat and Peteraf (2003, p. 999)	Dynamic capabilities do not directly affect output for the firm in which they reside, but indirectly contribute to the output of the firm through an impact in operational capabilities
Winter (2003, p. 991)	Those (capabilities) that operate to extend, modify, or create ordinary capabilities.
Zahra et al. (2006, p. 918)	The abilities to reconfigure a firm's resources and routines in the manner envisioned and deemed appropriate by its principal decision-maker(s).
Helfat et al., (2007, p. 83)	The capacity of an organization to purposefully create, extend or modify its resource base
Helfat et al. (2009, p. 4)	The ability to perform a task in least minimally acceptable manner.
Ambrosini and Bowman (2009, p. 88)	Ability to cope with the fast-changing market environment and properly change companies' sources according to the time and situation to satisfy customers' needs.

Teece (2007, p. 1319)	Dynamic capabilities can be disaggregated in the capacity (a) to sense and shape opportunities and threats, (b) to seize opportunities, and (c) to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise's intangible and tangible assets. Organizational and managerial processes recognized as dynamic capabilities of a firm.
Pavlou and El Sawy (2011, p. 239)	Dynamic capabilities have been proposed as a means for addressing turbulent environments by helping managers extend, modify, and reconfigure existing operational capabilities into newness that better match the environment.
Beck and Wiersema (2013)	Managerial capabilities identified as dynamic capabilities of a firm.
Wang et al. (2013)	Organizational capabilities recognized as dynamic capabilities of a firm
Helfat and Martin (2015, p. 1)	The capabilities with which managers create, extend, and modify the ways in which firms make a living-helps to explain the relationship between the quality of managerial decisions, strategic change, and organizational performance. Managerial abilities identified as a key dynamic capability of a firm.

Adapted from: Albort-Morant et al. (2018), Schilke et al. (2018)

Based on the above, it was understood that the term dynamic capabilities, with reference to DCT, have been used to interpret meanings encompassing organizational skills, routines, processes, capabilities, characteristics, learning patterns, as well as managerial skills.

Helfat and Peteraf (2009) have illustrated the logical flow of the prominent versions of the DCT based on previous literature, as shown in Figure 2.1.

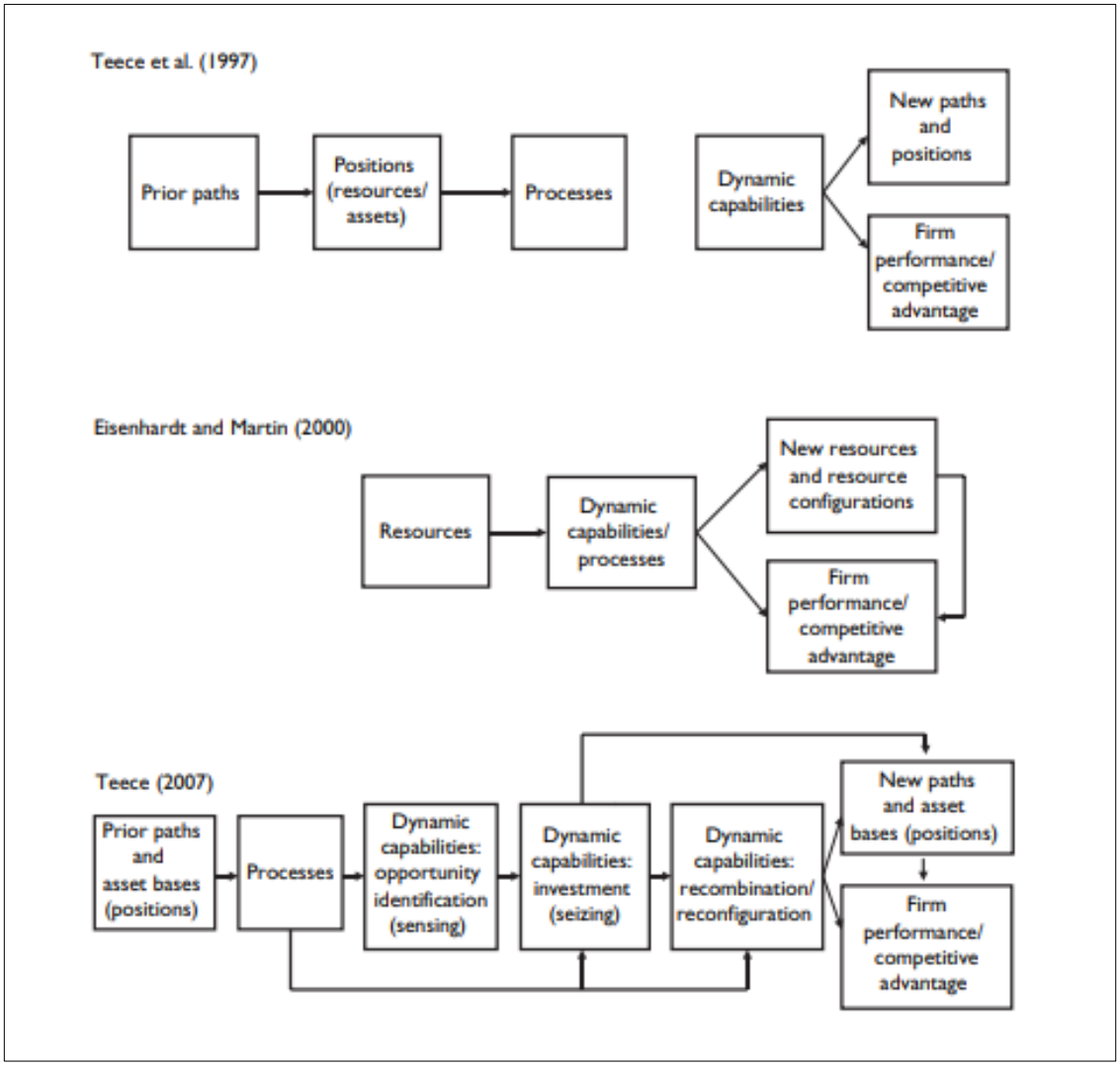

Figure 2. 1: Evolution of the DCT

Based on the above, this study, focused on the definition provided by Teece et al. (1997, p.516), where dynamic capabilities have been defined as "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments". Hence, the essence of the DCT, as proposed by Teece et al. is that:

- The dynamic capabilities concept expands the traditional resource-based view. They introduce the concepts of organizational capabilities, organization -specific resources, and routines to analyze the non-imitable competitive advantage sources.
- A difference exists between undifferentiated factors of production and resources. Resources are assets that are organization-specific and integrated into organizational processes such as routines, patterns of practice and learning.
- Organizational processes can be identified as processes for coordination, integration, reconfiguration, and learning.
- It is difficult to self-replicate of organizational knowledge, capabilities, and routines within the organization. Further, they are even more difficult to be imitated by competitors due to their complexity and tacit nature.

Thus, the emergence of DCT has been as a response to the criticism raised against the RBV. The key argument has been that the RBV has a rather static approach and the inadequate foundation in supporting how strategic adaptation occurs in line with the changing business environment (Priem & Butler, 2001; Schilke et al., 2018; Winter, 2003).

Based on the above, the researcher drew the theoretical inspirations from both RBV and DCT to support the conceptual framework of the study. The following section includes a detailed description of past literature which have examined the factors affecting digital innovation and the relationship between digital innovation and organizational performance.

2.4 Empirical studies on factors affecting digital innovation

Klein et al (2001) have conducted a study on implementation of computerized manufacturing technologies in an organizational context. The key independent variables considered for the study have been management support and financial resources availability, while innovation effectiveness has been considered as the dependent variable. Structural Equation Modelling (SEM) has been the analysis method adapted and this study has been conducted covering 1219 respondents in 39 manufacturing plants. The

theoretical basis has been provided by organizational climate theory and change theory. The findings of the study have suggested that management support does not have a significant effect on implementing innovation and innovation implementation policies within an organization.

Tohidi et al. (2011), in their study on measuring organizational learning capability and how it affects firm innovation, have collected data from 18 Iranian Tile Manufacturing Companies, covering a sample size of 173. Here, they have used a five-dimensional model to measure organizational learning, namely, managerial commitment, experimentation, risk-taking, openness and interaction with the external environment, and knowledge transfer and integration, which in turn is related with organizational innovation. They have not specified one single theory based for their study, rather, have gained inspiration from psychological views, sociological views, and organizational theories in explaining organizational learning. Structural Equation Modelling (SEM) has been the analysis method and the findings have suggested that organizational learning capability has a positive impact on innovation.

García-Morales et al. (2011) have conducted a study on the impact of internal communication on technological proactivity, organizational learning, and organizational innovation in the context of European and American-based technological firms. Here, internal communication has been the independent latent variable, technological proactiveness the first-grade dependent latent variable and organizational learning, organizational innovation and organizational performance have been the second-grade dependent variables. The sample has been 164 respondents from the above domain. SEM been used as the method of analysis and the theoretical background has been provided by the social exchange theory (Barker & Camarata, 1998). The results have indicated that internal communication positively influences organizational learning and innovation, while organizational innovation has a positive influence on organizational performance.

Linke and Zerfass (2011), in their study on developing a framework for implementing an innovative culture within organizations with reference to internal communication, have identified internal communication as having paramount importance in fostering such culture. This study has taken a mixed approach where an interview and survey-based qualitative approach and a quantitative survey have both been administered within the pharmaceutical sector within Germany. The sample of the case study has been a pharmaceutical firm. The study has added a new perspective to the existing knowledge through a combination of theories from organizational culture (Schein, 2004), change theory (Kotter, 1996), and innovation communication.

Hu et al. (2012) in their study to evaluate the effect of transformational leadership on organizational creativity and innovation, have highlighted that there is a direct and indirect effect on organizational creativity and innovation from transformational leadership, according to the empirical analysis they have done considering past literature. The dimensions of transformational leadership in this study have been derived from the theory of transformational leadership introduced by Bass and Avolio (1990).

Kim et al. (2012), in their study to explore quality management practices and their influence on types of innovation. The study has been conducted focusing Canada where the sample size has been 223 firms in manufacturing and service sector firms that were ISO 9001 certified. SEM has been used for testing of the measurement model. The QM practices developed by Saraph et al. (1989) have provided the theoretical basis for developing the independent variables in the conceptual model. Here, radical product innovation, radical process innovation, incremental product innovation, incremental process innovation and administrative innovation have been regarded as the types of innovation and the key independent variable has been management leadership. They have highlighted that management leadership and support indirectly influence innovation within the organization.

Basoglu et al. (2013), in their study on exploring the impact of communication on innovation, have followed a qualitative approach of research including face-to-face interviews covered with survey questionnaires (semi structured). The sample interviewees for the case study have been selected from a banking firm in Turkey. Theoretical foundation has been provided from the social network analysis (Scott, 1991). The research framework has identified teamwork and leadership as determinants of communication and communication has been identified to have a relationship with innovation. One of the key findings of their studies has been that the quality of communication within the organization has a positive impact on the innovativeness of the organization.

Hsiao et al. (2014) have conducted a study to determine organizational learning acts as a mediator between support for innovation and organizational innovation. In this study, three main variables have been considered, support for innovation, organizational learning, and organizational innovation, where the relationship between support for innovation and organizational innovation, support for innovation and organizational learning, organizational learning, and organizational innovation, as well as the mediating effect of organizational learning in the relationship between support for innovation and organizational innovation have been explored. Theoretical inspiration has been drawn from transformational leadership theory and organizational learning theory. The survey has been conducted focusing technological colleges in Taiwan, where 322 participants have been included in the sample. SEM approach has been used as the method of analysis, and the conclusions have indicated that organizational learning is a determining factor of organizational innovation. The study has further indicated that support for innovation has a positive impact on organizational learning and innovation.

Scheler (2013), in her study regarding driving innovation in service organizations, has stated that monitoring the competition arising from environment, institutionalization of interaction and exchange, top management commitment, systematic approaches and environmental pressure as conducive for innovation within the airline industry. This study

has taken a qualitative approach where 24 key informants covering the airline industry have been interviewed. The theoretical framework of the study has been developed using the service-dominant logic perspective (S-D logic) (Vargo & Lusch, 2004).

Uzkurt et al. (2013) have investigated the mediating impact of innovation on the connection between organizational culture and performance. The study has focused the banking industry on Turkey and inspected a total of 154 responses. A regression analysis has been used for the study and the results have suggested that while culture and innovation had positive and direct impact on the firm performance, organizational culture was found to have an insignificant relationship with firm performance when associated with innovation.

Zennouche et al. (2014) have undertaken an extensive literature survey over a period of twelve years to investigate and summarise the determinants which promote or deter innovation at individual, group, and organizational levels. Their findings have indicated that, at individual level, personality, motivation, and cognition influence innovation while at group level structure, climate, leadership, and task influence innovation. At organizational level, structure, culture, and strategy have been identified as influencing factors.

Westerman et al. (2014), have conducted a survey-based qualitative research on how large companies in the world are using dynamic, novel digital technologies within their businesses. The study has involved 150 executives from 50 companies from different countries in the world. Their findings suggest that firms identified as “Digital Masters” outperformed the rest of the competition and their correlation analysis has indicated that the firms which have excelled in digital capability and leadership capability lead to better firm performance.

Mokhber et al. (2015) have conducted a study on the relationship between transformational leadership and organizational innovation where 219 managers from 63

companies in Iran have been selected as the sample. Transformational leadership theory has provided the theoretical basis for this study. Here, idealized influence, attributed charisma, inspirational motivation, intellectual stimulation, and individualized consideration have been regarded as the dimensions of transformational leadership. The impact of each of those variables on organizational innovation has been inspected in the study. SEM has been used as the method of analysis. Findings have proposed that some dimensions of transformational leadership positively impact organizational innovation.

Shaar et al. (2015) have conducted a study to determine how top management support directly and indirectly supports innovation. They have collected data from 210 industrial companies in Jordan. The respondents have been middle and top management position holders in these companies. Top management support has been the main independent variable in this study while it has explored the direct effect from top management support on product innovation and process innovation. The study has also explored the mediating effect of the synergy between organizational structure and information technology in the relationship between top management support and product and process innovation, respectively. The study has concluded that that the top management support directly affects the product innovation and process innovation of a company. SEM has been used for the purpose of data analysis in this study.

Jaiswal and Dhar (2015), Have conducted their study on transformational leadership, innovation climate and employee creativity. They have examined the role of transformational leadership in predicting creative behavior of employees and the mediating role of an innovation climate and the moderating role of creative self-efficacy. Transformational leadership has been the independent variable of the study, Innovation climate has been regarded as the mediator and employee creativity has been regarded as the dependent variable of this study. The moderating effect of creative self -efficacy has been examined in the relationship between innovation climate and employee creativity. The study has been based on an extension of the theory of self-efficacy (Bandura, 1997)

and creative self-efficacy (Tierney & Farmer, 2002). The study has been conducted in India, considering 372 employees within the hotel sector. A linear regression model has been adapted for the analysis. They have highlighted that; transformational leaders could promote an innovative climate within the organization.

Naranjo-Valencia et al. (2016) have conducted a study to explore the links between organizational culture, innovation, and performance of organizations. The study has been conducted concentrating on industrial companies in Spain, collecting information from 446 CEOs by way of face-to-face interviews. They have employed a hierarchical regression analysis in their study. Through their findings, they have suggested that clan cultures and market cultures do not have a significant influence on innovation. Their findings further suggest that culture can either foster or hinder innovation within organizations, based on the values supported by the culture.

A study by Khalili (2016) has tried to establish a relationship between transformational leadership and the creativity and innovation. He has further investigated the mediating effect of employees' perceptions regarding a supportive innovation climate. The context of study has been multiple industries in Iran and a sample of 1,172 employees has been examined for the study. Transformational leadership theory has been used as the theoretical base of the study. SEM has been used as the basis of analysis. The findings have suggested of a significant and positive relationship between transformational leadership and the creativity and innovation of employees. The study has further suggested that employees' perceptions on a supportive innovation climate has a moderate effect on the creativity and innovation of employees.

A study has been conducted by Mokhber et al. (2017) aiming to understand the effect of transformational leadership on organizational innovation concerning 63 companies out of top 100 companies in Iran. Their framework has tried to determine how organizational support for idea generating, risk-taking and decision-making moderates the relationship between transformational leadership and organizational innovation. PLS analysis has been

used as the method of analysis for this study, and transformational leadership theory has provided the theoretical basis. They have found out that there is a positive relationship between transformational leadership and organizational innovation.

Rajapathirana and Hui (2017), have conducted a study to determine the relationship between innovation capability, innovation type, and firm performance where firm performance has been classified into innovation performance, market performance and financial performance. They have conducted this study based on the insurance industry in Sri Lanka. 379 Senior Managers have been considered as the sample size of this study. The theoretical context on innovation the have been derived from the OECD (2005). SEM has been adapted as the analytical method and the results have indicated that effective management innovation capabilities are incidental in delivering innovation outcomes, hence, better performance.

Sutanto (2017) has examined the impact of the organizational learning capability and creativity on organizational innovation within the context of universities in East-Java, Indonesia. This has been a quantitative research which has employed multiple linear regression for the analysis. 179 university lecturers have been the sample of the study. Organizational learning capability and organizational creativity have been the independent variables considered in the conceptual model where organizational innovation has been regarded as the dependent variable. The findings have indicated that organizational learning capability and organizational creativity both significantly and positively influence organizational innovation.

Chen et al. (2018) have conducted a study on the fit between organizational culture and innovation strategy, and their implications on innovation performance. The study has been based on configuration theory. Organizational culture and innovation strategy have been the independent variables of the conceptual model while culture and strategy fit has acted as a mediating variable. Innovation performance has been the dependent variable of the study. Data for the study has been collected from 183 Chinese firms, and a multiple

regression analysis has been performed. The findings have suggested that in organizations which demonstrate an ambidextrous innovation strategy, the fit between organizational culture and innovation strategy is not significantly associated with innovation speed and innovation quality.

A study by Wiesböck and Hess (2018) has attempted to build a theoretical conceptualization of an organization's digital innovation capabilities, centered by digital technology. The study has followed a conceptual research approach to hypothesize on the digital innovation capability of an organization, using a digital technology viewpoint, using existing theories on digital innovations. The findings of the research have suggested that digital innovation capability is formulated with digitalization capabilities and digital transformation capabilities.

Khin and Ho (2018) have conducted a study on how digital orientation and digital capability impact innovation and the effect of digital innovation when it acts as a mediator between organizational performance, digital orientation, and digital capability. The organizational performance has been regarded with respect to financial and non-financial performance. The study has been conducted in Malaysia considering 105 respondents in small to medium scale IT firms. The main theory used for this study is RBV and the DCT. The method of analysis used has been SEM and the findings have posited that digital orientation and digital capability have a positive impact on digital innovation, and that the digital innovation has a mediating effect on technology orientation and digital capability.

Hinings et al. (2018) have tried to view digital innovation and transformation from an institutional perspective, based on the institutional theories. This study has followed a conceptual research approach, which has comprehensively examined the existing literature. They have suggested that digital innovation involves new methods of organizing, institutional infrastructure, and other institutional components.

A study by Nguyen et al. (2019) has examined the relationship between organizational culture and employee commitment on employee innovation. The study has been conducted in the Vietnamese IT industry, considering a total of 319 IT professionals. Componential theory (Amabile, 2013) and social exchange theory (Homans, 1958) have been used as the theoretical foundations for the study. Multiple regression analysis has been used for the analysis of the study and the results have indicated that the organizational culture and commitment influence significantly and positively for employee innovation.

A study by Ghasemzadeh et al. (2019) has explored the impact of innovation culture on the relationship between organizational learning and innovation performance. This study has been based on the results of 625 questionnaires distributed among pharmaceutical companies in Iran. The independent variable considered in the conceptual model has been organizational learning and the innovation culture has been the moderating variable of the study, while innovation performance has been the dependent variable. Here, innovation performance has been measured in terms of product innovation, process innovation and objective innovation. The theoretical foundation has been set by the contingency theory and the organizational learning theory. SEM has been the basis of analysis of this study. The findings of the study have posited that organizational learning has a positive, significant association with product and process innovation, however, innovation culture does not have a significant and positive impact on innovation when innovation is objectively measured.

Sousa-Zomer et al. (2020) have contributed to the literature by examining the antecedents of digital transformation capability and its impact on firm competitive advantage and performance. Like Khin and Ho, they have followed SEM as the method of analysis and the context of study has been the USA. DCT and digital transformation theories have provided the theoretical grounds. The first order constructs in the study have been digital-savvy skills, digital intensity and conditions for action and interaction. The second order construct has been digital transforming capability and performance has been the

dependent variable. The conceptual model has been tested by using a sample of 427 large scale companies covering different sectors, through the data gathered by multiple databases. The study has identified that digital-savvy skills, digital intensity and context for action and interaction enable the capability to digital transformation.

A study conducted to understand the impact of entrepreneurial orientation and the organizational culture on organizational innovation and performance Lita et al. (2020), undertaken in the context of SMEs on the creative industry Indonesia, has suggested entrepreneurial orientation and organizational culture to have a significant influence innovation, which, subsequently, influences performance. Entrepreneurial orientation, organizational culture, organizational innovation, and organizational performance have been the constructs used in the study. However, this study has also suggested that innovation neither impacts significantly on performance, nor does it mediate the relationship between entrepreneurial orientation and organizational performance. This study has followed a PLS approach for the analysis, considering a sample of 183 respondents. The main theoretical background for this study has been derived from the RBV.

A study done by Montreuil et al. (2020), has attempted to identify the key managerial and organizational factors impacting the organizational capability to innovate. In this study, A systematic review of research articles which were published during 1991-2018 has been conducted, which has led to the identification of five key determinants impacting the organizational capability to innovate, namely: organizational capability to innovate, leadership, support, communication, culture, and learning. DCT has provided the theoretical framework of the study. The findings of this study have further highlighted that the determinants of the organizational capability to innovate can be broadly classified into three sections: human aspects, procedural aspects, and environmental aspects.

Another study conducted by Mancha and Shankaranarayanan (2020), has explored the factors affecting digital innovativeness. This study has attempted to link four key

characteristics with a theoretical model, namely, entrepreneurial orientation, digital literacy, entrepreneurial self-efficacy, and digital technology self-efficacy which in turn impacts digital innovation. They have used Self-Efficacy Theory (Bandura, 1986) and Experiential Learning Model (Kolb, 1984) as the foundations of their research. The findings of the research have suggested that individual digital innovativeness coupled with individual beliefs on competency are directly related to the digital innovativeness of an individual. The study has further pointed out that the basic digital literacy and the entrepreneurial orientation of an individual do not lead to his/her digital innovativeness.

2.5 Empirical studies on the impact of digital innovation on organizational performance

Gunday et al. (2011), in their study to determine the effect on firm performance from different types of innovation (organizational, product, process and marketing innovations) covering 184 manufacturing firms in Turkey. In this study, the innovation types stated in the OECD Oslo Manual (2005), theoretical and practical definitions, as well as the particularities of the four innovation categories, have been used to develop innovation metrics. In this study, the innovation variable has been measured separately as organizational innovations, marketing innovations, process innovations and product innovations. The resulting firm performance has been classified and measured in terms of financial performance, innovative performance, production performance and market performance. They have concluded that innovation has a positive impact on firm performance (innovative, market and financial performances) where manufacturing industry is concerned. SEM approach has been used for analyzing relationships between the identified variables.

Kmieciak et al. (2012) have conducted a study for exploring the effects of IT capability and employee empowerment on the innovativeness of SMEs and the effects of innovativeness on the performance of the firm. Data has been collected from 109 SMEs based in Poland and multiple regression analysis has been the method of analysis. Here,

Firm performance has been measured in terms of sales growth, employment growth and profitability growth, and the association between innovativeness and each of these performance dimensions have been tested. IT capability and Employee empowerment have been identified as variables that affect innovativeness and the direct effect of IT capability on firm performance, as well as the moderating effect of IT capability on firm performance have been explored. The findings have suggested that innovativeness has a positive impact on subjective performance measures and subjective performance measures have a significant correlation with objective measures of performance.

Al- Ansari et al. (2013) have investigated the technological orientation of SMEs and its impact on innovation and performance of the business in the emerging market context in Dubai. A sample of 200 has been used and the theoretical background used is the core competence-based view (Heene & Sanchez, 1997). Innovation has been regarded as the independent variable whereas business performance has been regarded the dependent variable in this study. A regression analysis has been conducted and the findings have suggested that technology orientation influenced innovation, however, did not have a significant, direct impact on business performance. It was also found that innovation influenced business performance.

Naidoo and Hoque (2018) have investigated the role played by IT between innovation capability and the performance of a firm. The study has been conducted by involving 292 employees in an aluminum manufacturing company in South Africa. IT capability, innovation capability and firm performance have been the variables considered. Multiple Regression has been the method of analysis in this study and RBV has been used as the theoretical foundation. The results of the study have found that there is a significant, positive relationship between innovation and firm performance.

In a study done by (Iqbal et al., 2018), the direct relationship between knowledge management processes and organizational performance has been studied. This study has proposed to consider the mediating role of intellectual capital and innovation on in the

connection between knowledge management processes and performance of organisations. The variables considered were KM enablers, KM processes, innovation, intellectual capital, and organizational performance. The study has been conducted considering a sample size of 217 academic and administrative persons within Research Universities based in Pakistan. Knowledge Based View (KBV) has provided the theoretical foundation of the study (Grant, 1996) and PLS SEM has been used as the data analysis technique and the findings have supported that Knowledge Management (KM) processes directly and indirectly influence organizational performance through innovation and intellectual capital.

Aboramadan et al. (2019) have contributed to the body of knowledge by investigating the relationship between organizational culture, innovation, and the performance of firms. The study has been conducted considering 186 respondents working in the banking sector of Palestine and has followed the SEM for analyzing data. Organizational culture, marketing innovation, technology innovation and performance have been the variables considered in the conceptual model. The findings of the research have shown that organizational culture and marketing innovation impacts positively on the performance of banks.

Maldonado-Guzmán et al. (2019) who have examined the impact that innovation capabilities have on the performance of an organization, have chosen the context of Mexican SMEs, considering a sample of 308. The independent variables considered were innovation in products, innovations in processes, innovation in marketing and managerial innovation, and business performance has been the dependent variable. This has been a quantitative study that has followed SEM as the analysis method and the theoretical grounds of the study has been based on the DCT. The findings have suggested that product innovations, process innovations and marketing innovations have a significant, positive impact on the performance of SMEs.

2.6 Overall summary of past research

A total of 34 research studies done within the past 10 years (2011 – 2020) were analyzed for the purpose of gaining an understanding on the nature of factors/ themes which were commonly associated with digital innovation and firm performance. According to the above literature review, key variables that seem to affect digital innovation, as identified within previous literature, were identified as antecedents for digital innovation in this study. A summary of those occurrences has been indicated in Table 2.3.

Table 2. 3: Frequency of usage of each variable as a factor affecting digital innovation

Article	Transformational leadership	Top management support	Open communication	Organizational culture	Organizational learning	Digital capability	Financial resources availability	Monitoring the competition from the environment	Employee perceptions of innovative culture	Innovation capabilities of management	Organizational creativity	Entrepreneurial orientation	Digital literacy	entrepreneurial self-efficacy	digital technology self-efficacy
Montreuil et al. (2020)	X	X	X	X	X										
Mancha and Shankaranarayanan (2020)												X	X	X	X
Lita et al. (2020)				X											
Souza-Zomer et al. (2020)				X											
Nguyen et al. (2019)				X											

Article	Transformational leadership	Top management support	Open communication	Organizational culture	Organizational learning	Digital capability	Financial resources availability	Monitoring the competition from the environment	Employee perceptions of innovative culture	Innovation capabilities of management	Organizational creativity	Entrepreneurial orientation	Digital literacy	entrepreneurial self-efficacy	digital technology self-efficacy
Ghasemzadeh et al. (2019)				X	X										
Aboramadan et al. (2019)				X											
Khin and Ho (2018)						X									
Wiesböck and Hess (2018)						X									
Chen et al. (2018)				X											
Rajapathirana and Hui (2017)										X					
(Mokhber et al., 2017)	X														
Sutanto (2017)					X						X				

Article	Transformational leadership	Top management	Open communication	Organizational culture	Organizational learning	Digital capability	Financial resources availability	Monitoring the competition from the	Employee perceptions of innovative culture	Innovation capabilities of management	Organizational creativity	Entrepreneurial orientation	Digital literacy	entrepreneurial self-efficacy	digital technology self-efficacy
Naranjo-Valencia et al. (2016)				X											
Mokhber et al. (2015)	X														
Khalili (2016)	X								X						
Shaar et al. (2015)		X													
Jaiswal and Dhar (2015)	X														
Westerman et al. (2014)	X					X									
Zennouche et al. (2014)	X			X											
Scheler (2013)		X						X							
Uzkurt et al. (2013)				X											

Article	Transformational leadership	Top management support	Open communication	Organizational culture	Organizational learning	Digital capability	Financial resources availability	Monitoring the competition from the	Employee perceptions of innovative culture	Innovation capabilities of management	Organizational creativity	Entrepreneurial orientation	Digital literacy	entrepreneurial self-efficacy	digital technology self-efficacy
Basoglu et al. (2013)			X												
Hsiao et al. (2014)					X										
Hu et al. (2012)	X														
Kim et al. (2012)		X													
García-Morales et al. (2011)	X				X										
Tohidi et al. (2011)					X										
(Linke and Zerfass, (2011)			X												
Klein et al. (2001)							X								
Frequency of usage of each variable	**9**	**4**	**3**	**10**	**6**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Referring to the above table, this study employed the top six variables that have been most frequently used in previous literature as factors affecting digital innovation, in order to develop the conceptual framework. These factors were organizational culture, transformational leadership, organizational learning, top management support, open communication, and digital capability.

In addition to the above, a frequency analysis was conducted to determine how many times the identified variables in the above studies had a significant or non-significant effect on digital innovation and organizational performance. Based on this analysis, the researcher could understand , the nature of the relationship that the above identified factors had on digital innovation and organizational performance. The results of this analysis are summarized in Table 2.4.

Table 2. 4: Frequency of a variable becoming significant or non-significant

Variable identified	**Significant influence on digital innovation**	**Non-significant influence on digital innovation**	**Significant influence on organizational performance**	**Non-significant influence on organizational performance**
Transformational leadership	8 times	0 times	-	-
Top management support	3 times	1 time	-	-
Open communication	3 times	0 times	-	-
Organizational culture	3 times	3 times	-	-
Organizational learning	5 times	0 times	-	-
Digital capability	1 time	0 times	-	-
Digital innovation	-	-	9 times	3 times

2.7 Identification of the existing research gap

It was observed that when examining the past literature above, most of the studies had been conducted in foreign countries which are essentially in contrast to the demographic, economic, social, and cultural context of Sri Lanka. Furthermore, a dearth of studies in the local context with reference to digital innovation and organizational performance could also be observed. In the international context, it was also observed that the studies conducted have indicated inconsistent/ mixed findings. Further, it was observed that most studies were conducted considering a single economic sector/ industry. Hence, to address this gap, this study intended to introduce a new conceptual framework using the independent and dependent variables identified through the literature review, which in turn were tested within the Sri Lankan context, covering multiple industries.

2.8 Chapter Summary

This chapter mainly focused on past studies that have been conducted within the domain considered for this study. Thus, this chapter has identified the main theoretical foundations, Resource Based View (RBV) (Barney,1986) and Dynamic Capabilities Theory (DCT) (Teece et al, 1997) that supported the development of the conceptual framework while paving way for classifying the six key variables affecting digital innovation (transformational leadership, top management support, open communication, organizational culture, organizational learning, and digital capability) under organizational, managerial and technological capabilities, as shown in the next chapter. The literature review further assisted in identifying the relationship between digital innovation and organizational performance. This chapter has further enlightened the reader on the existing gaps in literature and how these will be addressed through the study within the forthcoming chapters.

3. METHODOLOGY

3.1 Introduction

This chapter introduces the overall design and the conceptual framework developed for the study with the aid of the theoretical models identified in the previous chapter. It further presents the hypotheses that were tested in this study. It also elaborates on the target population and the sample, data collection method, data analysis method and the operationalization of the constructs identified through the literature review.

3.2 Overall design of the study

The research philosophy, research approach, research design, research strategy, research choice, and the unit of analysis are discussed under the overall design of this study, by referring to Saunders et al. (2009), who has introduced the concept of "research onion".

3.2.1 Research philosophy

The development of knowledge and its nature are central to research philosophy. A researcher's philosophy is made up of key assumptions that underpin the researcher's point of view on the world. The assumptions serve as the foundation for the research strategy and research methods (Saunders et al., 2009). Positivism, critical realism, interpretivism, postmodernism, and pragmatism are the five major research philosophies according to their study. They have further stated that a positivist researcher develops a hypothesis based on existing theory, and that the developed hypothesis will be investigated, and approved or rejected based on the results, leading to further study development. Similarly, a positivist researcher would aim to stay away from data and remain neutral in order to prevent affecting the results of the study. This research too followed a positivism philosophy where the researcher developed hypotheses based on RBV and DCT and the researcher was independent from the generation of data.

3.2.2 Research approach

Any research could be classified under two contrasting research approaches; deductive approach and inductive approach (Saunders et al., 2009). Bryman and Bell (2011) have further posited that the deductive approach is often attached with quantitative studies, and inductive approach is attached to qualitative studies. Deduction, according to Bryman and Bell represents the most common understanding of the relationship between theory and research. They have stated that under the deductive approach, a theory is developed, and subjected to thorough testing. The deductive approach, entails the following characteristics:

- The causal relationships that exist between variables are examined (Bryman & Bell, 2011).
- Then the hypotheses are developed, and tested using quantitative data (Bryman & Bell, 2011).
- A highly structured methodology is followed to ensure replication, thus ensuring reliability (Gill & Johnson, 2002).
- The researcher is required to be independent from the observations (Saunders et al., 2009).
- To ensure generalization, a sufficient sample size needs to be selected (Saunders et al., 2009).

This research too followed a deductive approach due to several reasons. Firstly, the deductive approach is considered to be linear with a logical sequence in steps, connecting each step with the previous step in the sequence (Bryman & Bell, 2011). Secondly, adhering to Bryman and Bell, since the deductive approach is narrower compared to inductive approach, and as it was related with the investigation of a specified theory, the deductive approach was more applicable under the given time frame. This was as opposed to the inductive approach, where long processes need to be followed to gather and analyse data, and to develop a theory based on that data according to Bryman and Bell. It was also

noticed that several previous studies in the domain have followed a deductive research approach (Sousa-Zomer et al., 2020; Mancha & Shankaranarayan, 2020; Khin & Ho, 2018).

3.2.3 Research design

According to Saunders et al. (2009), how a researcher approaches a research question is explained by the research design, and it determines whether a study is descriptive, explanatory, or exploratory in nature. They have further stated that when the researcher has a clear understanding of the phenomena that is the focus of data collection, the research becomes descriptive. According to Saunders et al., explanatory investigations establish a causal link between the variables. They have also stated that if a study is classified as exploratory, a researcher who is looking for new information or ideas should be present. A significant amount of time should be spent on this. Exploratory research can be carried out by searching the literature, interviewing 'experts' on a specific topic, and conducting focus group interviews, according to Saunders et al. The current research looked at the impact of numerous independent factors on digital innovation, as well as the impact of digital innovation on organizational performance. Therefore, this study can be classified as an explanatory study since it was supposed to investigate the causal relationship between various variables. Several previous authors in the field have also followed a similar research design (Hsu et al., 2018; Lita et al., 2020; Tohidi et al., 2011).

Based on time horizons applicable for studies, studies may be cross-sectional or longitudinal (Saunders et al., 2009). Saunders et al. further stated that in cross sectional studies, the researcher looks at a certain occurrence over a specified period and is usually the method followed by many academic studies due to time constrains. They have also explained that in longitudinal research, the change of the phenomenon being investigated through time is frequently noticed, and usually consumes more time. As per the time horizon, this study is a cross-sectional study since data were collected from respondents at one specific point in time.

3.2.4 Research strategy

There are various research strategies that can be applied to any form of research, according to Yin, (2003). A research strategy is chosen in general depending on the research question, study objectives, underpinning philosophy, current knowledge, time, and resource available (Saunders et al., 2009). Experiment, survey, case study, action research, grounded theory, ethnography, and archival research are a few of the research methods used in management research. Saunders et al. (2019) has stated that in instances where a considerable amount of data has to be collected from a large population, the survey strategy is appropriate. Further, survey strategies are considered to pave way towards descriptive and inferential statistics in analyzing quantitative data. Since the population considered for this study is quite large and undetermined (due to lack of data), the study took a cross-sectional and deductive approach, and since the study was intended to be carried out in the form of a descriptive data analysis, the researcher adapted a survey strategy since it was more suitable for the nature of the study. Hsu et al. (2018), Mokhber et al. (2017), Lita et al., (2020), Rajapathirana & Hui (2017) and Tohidi et al. (2011) have followed a similar research strategy.

3.2.5 Research choice

A researcher must utilize data collection techniques and analysis methods for any research, which are collectively known as the study's research choices (Saunders et al., 2009). When it came to choosing data gathering techniques and analytic methodologies for a study, a researcher has two alternatives called the mono method and the multiple method, according to Saunders et al. They further stated that, mono method researchers can use either a single quantitative data collection approach with quantitative data analysis methods or a single qualitative data collection technique with qualitative data analysis methods. This study has adapted a mono method of data analysis, using only a structured questionnaire for gathering data which was analyzed only using quantitative techniques. A similar research choice has been followed by several previous researchers in the domain

as well (Ghasemzadeh et al., 2019; Hsiao et al., 2014; Mokhber et al., 2017; Uzkurt et al., 2013).

3.3 Conceptualization

A conceptual framework can explain the roadmap of a research study and indicate the theoretical grounds it has been developed upon. It has the ability of making the findings of the research more meaningful and acceptable with reference to the theoretical constructs in the particular domain, while ensuring the generalizability of the study (Adom et al., 2018) . Hence, as postulated by Camp (2001), the conceptual framework has the ability to explain the development of circumstances which will be studied by the researcher. It further describes the relationships between the key concepts identified within the study, arranged in a distinct structure showing how ideas within the study are connected to each other (Grant & Osanloo, 2014). As Grant and Osanloo further elaborate, a conceptual framework enables the researcher to develop his/her own view of the phenomenon to be studied. It simplifies the way in which the researcher intends to present his/her suggested solution/s to the research problem that has been identified (Liehr & Smith, 1999).

Hence, this section presents the conceptual framework developed for this study, linking the critical success factors which impact digital innovation and organizational performance identified within the extensive literature review presented in the previous chapter. As explained previously, several theories and studies conducted in the domain which have explored the factors affecting digital innovation, as well as the impact of digital innovation on organizational performance were presented in Chapter 2. Consequently, the conceptual framework presented in this section was developed after carefully analyzing the underlying theories and the relationships between constructs observed within those considered empirical studies.

Thus, two major underpinning theories, Resource Based View (RBV) and Dynamic Capabilities Theory (DCT) were identified as most applicable to the scope of this study, based upon which the conceptual framework was developed. Further, as per the analysis done in the previous chapter, the factors that were most frequently observed to be significantly affecting digital innovation within organizations, as stated by most researchers, were selected to develop the conceptual framework of this particular study. Accordingly, the identified variables were: Transformational Leadership (TL), Top Management Support (TMS), Open Communication (COM), Organizational Culture (CUL), Organizational Learning (OL) and Digital Capability (DC).

Further, based on the observations made from the above literature, it was understood that for the purpose of this study, these factors could be broadly categorized under organizational, managerial, and technological capabilities. Managerial capabilities (Adner & Helfat, 2003), refer to all the management actions and behaviors that result in the creation and reconfiguration of the organizational resources. Organizational capabilities have been identified as those routines and practices which could renew and reorganize the resource base of the organization and enable the organization to cope with change better (Adner & Helfat, 2003). Technological capability (Teece et al., 1997, p.521) has been defined as "the ability to perform any relevant technical function or volume activity within the organization including the ability to develop new products and processes and to operate facilities effectively".

Since literature suggested that managerial capabilities and organizational capabilities are probable to assist an organization in distinguishing itself from the rest of the competition according to DCT (Teece et al., 1997; Teece & Pisano, 1994), this study too, employed DCT to explain the factors recognized under organizational and managerial levels. Accordingly, as per the review done (refer table 2.3 and 2.4), transformational leadership and top management support were classified under managerial capabilities. Transformational leadership and top management support, in particular, were considered managerial competencies because they both pertain to efforts made by the management

team to encourage employees to adopt innovative behaviors (García-Morales et al., 2011; Montreuil et al., 2020). Under organizational capabilities open communication, organizational culture, and learning were recognized since they represent activities that can affect all employees and serve to create a productive change and innovation environment at an organizational level (Adriansyah & Afiff, 2015; Montreuil et al., 2020). Moreover, digital capabilities is a concept evolved through technological capabilities and IT capabilities (Chan & Ahuja, 2015; Kohli & Grover, 2008; Wiesböck & Hess, 2018). Therefore, Digital capabilities were identified in the conceptual framework under Technological perspective/ Technological capabilities. Technological capabilities and IT capabilities, in literature, have been often supported through the RBV (Acosta-Prado et al., 2014; García-Fernández et al., 2020). However, digital capabilities, which is the evolved version of technological capabilities, have been supported through the DCT (Fernandes et al., 2017; Khin & Ho, 2018), which is considered as an evolution of the RBV. Thus, for the purpose of this study, digital capabilities were supported using both the RBV and DCT, based on past literature.

Based on the above, the conceptual framework developed for this study is given in Figure 3.1.

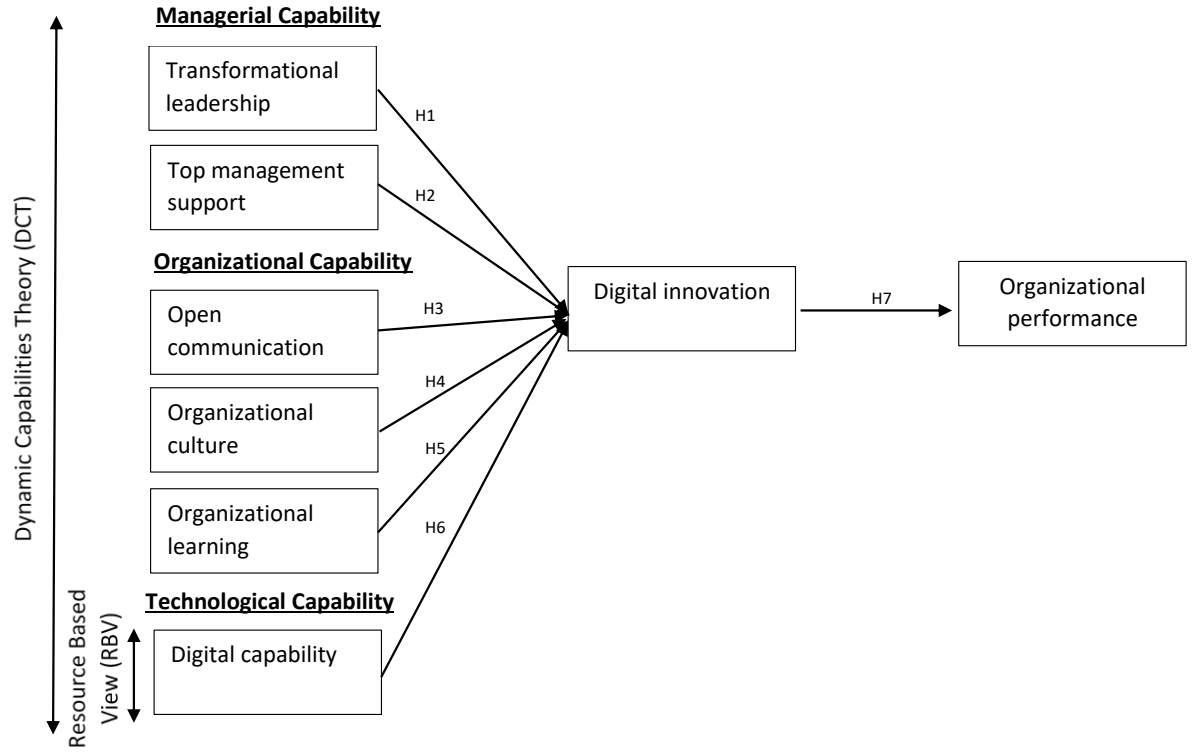

Figure 3. 1: Conceptual Framework

This framework was specifically designed for the purpose of this study and has not been tested earlier, hence, unique in nature and will contribute to fill the prevailing knowledge gap in the domain.

3.4 Development of Hypotheses

Based on the above conceptual framework, the study identified several hypotheses which depicted the relationships existing between the identified variables, explained in the sections that follow.

3.4.1 The effect of transformational leadership on digital innovation

Leadership is explained as the process to enhance the employee abilities and effectiveness shared by the management members (Sarros et al., 2008). Leadership is said to be conducive for improving organizational capabilities when it promotes: the generation of new ideas (Siegel & Kaemmerer, 1978), diffusion of power (Carmeli et al., 2010), development of employees (Gumusluoğlu & Ilsev, 2009), vision sharing, creativity (Jung et al., 2003), questioning the status quo (Hater & Bass, 1988) and innovative behavioral patterns (Shane et al., 1995). Several studies have suggested that an empowering leadership which intellectually stimulates employees, cares about them and leads by example are said to influence innovative behaviors within organizations (Naqshbandi & Tabche, 2018; Sarros et al., 2008)

Transformational leadership, as a form of leadership, has proven to be effective in many countries, as a way which both stimulates the followers to achieve unexpected outcomes and develops their own leadership capacities while committing to the group and the organization in the process (Bass, 1985; Bass, 1998; García-Morales et al., 2011). Thus, transformational leadership is defined as the style of leadership that heightens the consciousness of collective interest among the organization's members and helps them to achieve their collective goals (García-Morales et al.). Bass further describes transformational leadership style to be identified under several feature, namely, idealized influence, attributive charisma, inspirational motivation, intellectual stimulation, and individualized consideration. According to Jung et al. (2003), transformational leadership is considered to be a key driver of innovation at the organizational context. Studying the relationship between transformational leadership and organizational performance has been regarded as an essential and timely premise (Jong & Den Hartog, 2007). There have also been studies which signify that transformational leadership characteristics positively impact innovation (García-Morales et al., 2008; Gumusluoğlu & Ilsev, 2009; Jung et al., 2003; Khalili, 2016; Sattayaraksa & Boon-itt, 2017; Uddin et al., 2017). Transformational leadership is understood to be relating to organizational innovation through several

features such as collaborative vision, active communication and an environment which fosters innovative teams (Aragon-Correa et al., 2007). Based on the above premise, the following hypothesis was proposed:

H1: Transformational leadership is positively related to digital innovation.

3.4.2 The effect of top management support on digital innovation

Top management support refers to the provision of the support needed for operating processes, and also to the role of providing instructions on operating a business (Rodriguez et al., 2008; Rosenbloom, 2000; Swink, 2000). Top management support is said to demonstrate a crucial role in building an organization's innovation-related strategies (Hsu et al., 2018).

Tidd et al. (2001) and Tushman and O'Reilly (1997) have shown the vital impact top management has in providing the necessary resource requirements and deploying reward structures to promote innovative initiatives within the organization. Further, top management commitment has been regarded as a factor which induces innovation within organizations at an individual level. Here, top management commitment has been regarded as the understanding and appreciation of the value of innovation activities by the top management (Scheler, 2013). Several early studies have supported the notion that in order to foster innovation within organizations, it has to be supported by the top management (Deshpandé et al., 1993; Kohli & Jaworski, 1990; Li & Calantone, 1998). The top management usually makes arrangements for the resource requirement and support needed for achieving innovation success (Rodriguez et al., 2008). When elaborated further, management support is crucial for organizational innovation in a scenario where the employees are given the help and encouragement needed for the new initiatives they are trying to implement (Anderson & West, 1998; Sarros et al., 2011).

Thus, top management is said to involve three key activities: awareness of innovative activities, setting controls and targets for innovative initiatives and preparedness to take decisions related to innovation (Deshpandé et al., 1993; Kohli & Jaworski, 1990, 1990). The relationship between top management support and innovation has received substantial attention in previous literature (Kim et al., 2012; Sharma & Rai, 2003; West et al., 2003). Based on the above premise, the following hypothesis was proposed:

H2: Top management support is positively related to digital innovation.

3.4.3 The effect of open communication on digital innovation

Open communication, or communication openness, has been defined as "the ease of talking to each other and the extent of understanding gained when talking to each other" (Ayoko, 2007, p. 109). The term has been regarded synonymous with several other concepts such as listening, honesty, trust, frankness and supportiveness and other similar concepts in a range of previous literature (Rogers, 1987). Open communication has been regarded as one of the crucial ingredients for the success of a business operation (Schiller & Cui, 2010; Syallow et al., 2017). Effective open communication is said to bring more employees to a same page, moving in a single direction to achieve a shared goal (Triveni et al., 2007).

Communication concepts related with innovation have been interchangeably referred as open communication (Rogers, 1987), innovation communication (Zerfass & Huck, 2007), and internal communication (Linke & Zerfass, 2011) in the past literature, with almost similar interpretations. Rogers (1987) has further stated that open communication has been often associated with organizational innovation. Further, information, ideas and feelings, communicated in an open manner has been regarded as the "lifeblood" of innovation (Cronquist et al., 2006). Internal communication has been regarded as vital for an innovative organization (Monge et al. 1992, as cited in Linke and Zerfass, 2011). Previous research has suggested that through its role of facilitating the dissemination of information,

internal communication can greatly induce organizational innovation (Ebadi & Utterback, 1984, Fidler & Johnson, 1984). The cruciality of a proper communication process as a stimulator or a hinderer for innovations is further emphasized by Johnson (2005). This suggestion agrees with the previous study done by (Damanpour, 1991) who found out that frequent internal communication could either promote or deter the distribution, diversity and cross-spreading of ideas within an organization. Based on the above premise, the following hypothesis was proposed:

H3: Open communication is positively related to digital innovation.

3.4.4 The effect of organizational culture on digital innovation

Schein (2010) refers to culture as values and beliefs shared by members of an organization that guide the expected behavior. The swift changes taking place in the digital innovation field necessitates an organization to foster a culture that promotes the innovation performance in order to remain competitive in the industry (Shahzad et al., 2017). Several studies have provided evidence to the substantial relationship that exists between organizational culture and innovation (Clercq et al., 2011; Lounsbury et al., 2019; Lau and Ngo, 2004; Mavondo and Farrell, 2003; Miron et al., 2004) . A study by Hislop (2013) has further established that innovation and learning within organizations are impacted by the values of the organization, its beliefs, working environment, sharing of knowledge and all the cultural aspects within the organization. Further, studies have suggested organizational culture to have a direct impact on the performance of the organization (Gálvez and García, 2011; Hofstede and Bond, 1988) Martins and Terblanche, 2003). Based on the above premise, the following hypothesis was proposed:

H4: Organizational culture is positively related to digital innovation.

3.4.5 The effect of organizational learning on digital innovation

Organizational learning is regarded as a major dynamic capability of organizations, and learning organizations are said to promote the said capability (Aragon-Correa et al., 2007; Senge, 1994) Organizational Learning is regarded as a process which increases the knowledge of individuals and transforms it to organizational knowledge. Further, it is an exemplification of the organizational culture. When considered as an element of culture, it can understand people's thoughts, actions and practices (Jablin & Putnam, 2001). Learning has been identified to enable the organization to identify and remedy its mistakes in order to get acclimatized to the environment better (Asgarnezhad Nouri et al., 2016; Nouri and Ghorbani, 2017). Kiziloglu (2015) States that in the absence of a learning process, there will be a repetition of similar practices, hindering opportunities for innovation. The positive relationship between organizational learning and innovation has been highlighted in several previous studies on innovation (Chen and Chang, 2012; Hussein et al., 2014; Lee and Song, 2015; Wang and Ellinger, 2011; Salehi and Naseri, 2017). Several studies have posited that learning has been known to enhance the performance of an organization in terms of innovation (Lloréns Montes et al., 2005; Liao et al., 2008; Tohidi et al., 2011; Chen & Chang, 2012). Noteboom (2010) has further suggested that a learning organization can be regarded as an innovative organization. Also, on the other hand, it has been found that when the innovation achieved by an organization becomes greater, the level of learning and change required also becomes greater (Sanz-Valle et al., 2011). Based on the above premise, the following hypothesis was proposed:

H5: Organizational learning is positively related to digital innovation.

3.4.6 The effect of digital capability on digital innovation

The capability of an organization for digital innovation is regarded important by several recent studies (Lyytinen et al., 2016; Nambisan et al., 2017; Wiesböck & Hess, 2018). Since digital innovation has been regarded as an important catalyst for organization

success (Nambisan et al., 2017), studies on the capabilities which affect digital innovation have received focus in recent research (Kohli & Melville, 2019; Nambisan et al., 2017). Research on digital capability has been evolved from the concept of IT capability (Chan & Ahuja, 2015; Fichman et al., 2014; Wiesböck & Hess, 2018), which is the ability of an organization to manipulate IT, which is regarded as a crucial ingredient for digital innovations.

However, contemporary studies on digital innovations (Kohli & Melville, 2019; Nambisan et al., 2017) have highlighted the need for theories and concepts which surpass the boundaries of IT capability (Matt et al., 2015; Wiesböck & Hess, 2018), which has shifted the attention towards various concepts related to digital capability with reference to digital innovation (Freitas Junior et al., 2016; Karimi & Walter, 2015; Levallet & Chan, 2018; Tumbas & Brocke, 2017). The fact that digital capability acts as a crucial ingredient of digital innovation has been revealed by several previous studies (Renko et al., 2009; Zawislak et al., 2013; Zhou & Wu, 2009). Recent literature on the field has highlighted the need for the concept of dedicated digital capability (Freitas Junior et al., 2016; Levallet & Chan, 2018; Tumbas & Brocke, 2017). Conforming to this principle, it has been suggested that in order to implement digital innovation, dedicated capabilities which are accountable for the processes dedicated for the management and development of digital innovations are required (Wiesböck & Hess, 2018). These capabilities may refer to the ability of an organization to come up with new digital products, services, processes and structures of organizations or business models through utilizing digital technologies (Nambisan et al., 2017; Wiesböck & Hess, 2018). Based on the above premise, the following hypothesis was proposed:

H6: Digital capability is positively related to digital innovation.

3.4.7 The effect of digital innovation on organizational performance

Digital innovation has been defined as the creation of (and consequent change in) market offerings, business processes, or models that result from the use of digital technologies" (Nambisan et al., 2017, p. 224). When considering both large scale and at SME level, empirical evidence have suggested that there's a positive and significant relationship among innovative capabilities and the performance of organizations (Al-Ansari et al., 2013; Bowen et al., 2010; Gunday et al., 2011; Hilman & Kaliappen, 2015; Hilmi et al., 2010; Jimenez-Jimenez & Sanz Valle, 2011; Kafetzopoulos & Psomas, 2015; Rhee et al., 2010; Tajeddini & Trueman, 2012; Sdiri et al., 2010; Martínez-López & Vargas-Sánchez, 2013).

There have also been several studies which support the notion that there's a positive relationship between innovation and the performance of an organization (Artz et al., 2010; Choi et al., 2013; Naranjo-Valencia et al., 2016; Rosenbusch et al., 2011; Valmohammadi, 2017; Yıldız et al., 2014; Clercq et al., 2011). Damanpour and Gopalakrishnan (2001) support this idea by suggesting that innovation is a crucial factor behind reaching success and achieving sustainable competitive advantage. Previous researches have further suggested that digital transformation impacts positively on the performance of a firm (Dalenogare et al., 2018; Kane et al., 2015). Damanpour and Gopalakrishnan (2001) have further posited that innovation is a vital factor for performance, enabling organizations' expansion capability into new markets. Based on the above premise, the following hypothesis was proposed:

H7: Digital innovation is positively related to organizational performance.

3.5 Population of the study, sample selection and sampling procedure

3.5.1 Population and sample selection

As this study intended to determine the factors that affect digital innovation and the impact digital innovation has on organization performance, it was essential that the organizations selected were already in a digital innovation process or has digital innovation initiatives in place. Further, the population of this study was all the organizations currently undergoing a digitalization process and has implemented or in the process of implementing digital innovation initiatives, within Sri Lanka.

Since there was a practical difficulty in clearly quantifying all the organizations that are following digital innovation initiatives within Sri Lanka, there was no proper indication of the exact population of the study. Hence, in order to select suitable organizations for the study, an initial screening question was included at the beginning of the questionnaire which permitted the respondents to proceed with answers only if their respective organizations were engaged in any digital innovation initiatives.

At the same time, only private sector organizations were selected for the study since there are ambiguities when it comes to measuring performance in terms of perspectives such as return on investment, profit, market share and customer satisfaction etc. within the government sector organizations. Another reason for this exclusion was owing to the fact that the Census and Statistics Department, too, have excluded the government sector information from the 2013/2014 economic census report, classifying the rest of the economic establishments within the country into 3 main sectors. This is the latest publicly available report on census available within Sri Lanka as of now. This will be the classification through which this particular study focused on the cross-industry aspect, as mentioned in the introduction chapter.

Further, for convenience in data collection and for better accessibility to data, it was decided to confine the study to the Western Province of Sri Lanka. Since the study

addresses a cross industry perspective, it was also required that there be a representation from the key economic sectors within Sri Lanka. For this purpose, the classification proposed by the Census and Statistics Department of Sri Lanka was used, which broadly classifies the economic activities into:

- *Industry,*
- *Trade* and
- *Services.*

Hence, when selecting the sample, the researcher tried her best to ensure that there was a representation from all the above three sectors.

The classification of these organizations into small, medium, and large was also done by considering the number of employees as the benchmark, as proposed by the Department of Census and Statistics. Accordingly, the sizes of the organizations have been determined as depicted in Table 3.1.

Table 3. 1: Classification of SME groups based on economic sector

Major economic sector	**SME groups**	**Criteria (Number of persons engaged)**
Industry and construction	Micro	1 to 4
	Small	5 to 24
	Medium	25 to 199
	Large	200 and above
Trade	Micro	1 to 3
	Small	4 to 14
	Medium	15 to 34
	Large	35 and above
	Micro	1 to 4

Services	Small	5 to 15
	Medium	16 to 74
	Large	75 and above

Source: Economic Census, Department of Census and Statistics (2013/2014)

3.5.2 Unit of analysis

In any research, determining the unit of analysis is regarded as an important part of the research design. Sedgwick (2014) has identified that the "who" or "what" for the data analysis is done and conclusions are made, can be identified as the unit of analysis. Sekaran (2003) has mentioned that the unit of analysis may be comprised of individuals, pairs, groups, organizations or even cultures. Since the main objectives of the current study included identifying the critical success factors for digital innovation at organizational level and identifying the effect of digital innovation on organizational performance, the unit of analysis used for the study was a single organization. Several previous studies in this domain have also considered the organization as the unit of analysis (Kim et al., 2012; Mokhber et al., 2017; Lita et al., 2020).

3.5.3 Sampling method

Sampling method used for the study was convenience sampling. Convenience sampling is a non-probabilistic sample method used when the members of a considered target population satisfy certain practical criteria such as, ease of access, geographical closeness, availability during a given time period or the willingness to participate (Dörnyei, as cited in Etikan, 2016). This sampling technique is known to be useful when the population is very large, and randomization is impossible. Further, convenience sampling is also used when the researcher has limited access to resources, time and personnel (Etikan, 2016). Accordingly, due to the practical difficulties associated with randomly reaching out to cover the entire population, the population being very large and unquantifiable, time constraints and restrictions of access due to restrictions in travel imposed with the pandemic situation in the country, it was decided to select convenience sampling as the

sampling technique of the study. Convenience sampling has also been followed in several previous studied conducted within the domain (García-Morales et al., 2008; Iqbal et al., 2018; Nouri & Ghorbani, 2017).

According to Sekaran and Bougie (2009), a satisfactory amount of sampling responses, in the form of a true representation of the total study population should be derived by researchers. The samples required by different types of statistical techniques are different, and the minimum requirement stipulated by the statistical tools utilized within the study should be gratified by the selected sample size. In accordance with this, sample size for this study was determined using the Daniel Soper sample size calculation (Soper, 2021), which is a tool that is used to calculate the sample size required for a study that uses multiple regression modelling (Westland, 2010; Cohen, 1988). This is an A-priori sample calculation method where the sample size is calculated using the number of predictors in the model, the anticipated effect size, and the desired probability level and statistical power levels. Based on this technique, the required minimum sample size was 103. Figure 3.2 represents the sample size calculation done for the study.

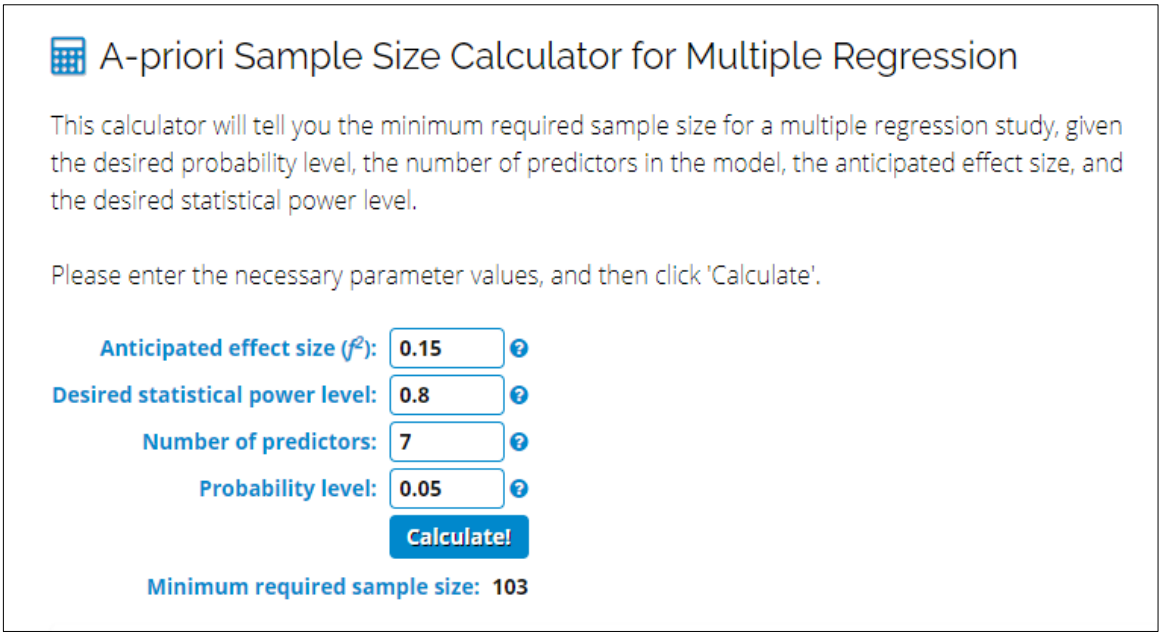

Figure 3. 2: Sample size calculation

3.6 Questionnaire design and development

Saunders et al. (2019) stated that a standardized, administered questionnaire can be used to collect data from a sample of the population considered, as a data collection tool used under survey method. Accordingly, a questionnaire was developed for the purpose of collecting primary data for this study, with the intention of measuring the perceptions of the respondents on the selected variables (digital capability, transformational leadership, top management support, organizational learning, open communication, organizational culture, digital innovation, and organizational performance) as applicable to their respective organizations.

3.6.1 Measurement scales used

Levels of measurement can be used to explain the relationship between different numeric values that researchers usually assign during the research process. These levels are helpful to understand the nature of the data. Especially when comparing values assigned to a particular scale, levels of measurement classifies the numerical differences existing amongst the values (Matthews, 2017). Four basic types of measurement scales can be identified accordingly, in statistical analyses. They are: nominal, ordinal, interval and ratio scales (Stevens, 1946, as cited in (Matthews, 2017). Nominal level measures include categorical variables such as gender, affiliation to a political party, media genres etc. The numerical values assigned to the categories have no rank order in nominal level scales. Ordinal level on the other hand, accounts to variables that indicate a rank order such as the time, attitudes, or opinions etc. The relative differences among the values assigned to an ordinal level scale could be used to order them suitably. Interval measures have consistent distances between the corresponding values, and they use a standard unit of measurement or a metric, such as degrees of Celsius, for example. The differences between values are standardized, permitting the researcher to perform basic mathematical operations on these measurements. Ratio level is where measurements have an absolute zero point such as income, temperature scales and reaction time (Matthews, 2017). When

performing inferential statistics on topics such as perceptions and attitudes, most Likert scale measurements ranging from response categories such as “strongly disagree” – “strongly agree” target interval level measurements. These kind of analyses are based on the assumption that the data collected are spread out in a uniform and linear structure, according to Matthews. Since this particular study was also based on the same statistical assumptions, and the nature of the questionnaire developed was more suitable for a Likert scale measurement which measured the perceptions of the respondents by assigning equidistant numerical values to each response category, the researcher used interval scale measurement in her questionnaire.

The types of scales that can be used in developing a questionnaire have been described by Malhotra (2006). He stated that an itemized rating scale is one which consists of a number, or a brief description related to each response category. These categories should be arranged in a logical order, where the respondents are required to select the appropriate category that best describes their reaction to what is being rated. Likert scale is one such type of scale being widely used as an itemized rating scale (Malhotra, 2006). He stated that it is named after Rensis Likert, the developer of this scale. The data in a Likert scale are usually in interval scale, where several categories are assigned to measure the level of agreement of a respondent by selecting one of the response categories. When this approach is used to determine the total score of the response of each respondent for a particular item measured, a system of consistent scoring needs to be present where a “high” (or “low”) score consistently corresponds to a favorable response, according to Malhotra.

Malhotra (2006) further elaborated that using a Likert scale has several advantages. One is that it makes the process of constructing and administering the scale easy for the researcher and understanding easy for the respondent. Therefore, it has been prescribed as suitable to be used for surveys conducted via email, telephone, in person or electronically. There are several alternatives of the Likert scale when it comes to the number of scale categories. The guideline by Malhotra suggests that the suitable number of categories should be between five and nine, that is, seven plus or minus two.

Considering the ease of developing for the researcher and ease of administering for the respondent, as well as based on the need of the questionnaire to be shared via email, this study adapted an interval-scale based five-point Likert scale to measure the perceptions of the respondents, pertaining to each variable considered in the questionnaire. Selection of a five-point Likert scale was also in line with the measurement scales used in previous studies which were of a similar nature within the domain (Al-Ansari et al., 2013; Gunday et al., 2011; Khin & Ho, 2018; Laforet, 2016; Paladino, 2007). Accordingly, the response scales used for all the variables except for digital capability were: 1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree and 5 = Strongly agree. For digital capability, different response options were employed (1 = Extremely low; 2 = Low; 3 = Neutral; 4 = High; 5 = Extremely High), as observed in the past literature pertaining to the variable. All the sources from which the question items were adapted have been presented in Table 3.2.

3.6.2 Item generation and operationalization of the constructs

When developing the items of the questionnaire, a total of 112 previous articles were referred. Out of the articles referred, the most suitable and reliable questions were selected, focusing on the key authors recognized in each field as well as articles published in high-ranked journals, as applicable to the variables measured in this study. Some of the items adapted were reworded to suit the digital context of the study. Malhotra (2006) has stated that wording of the questionnaire is crucial, and that poorly worded questions may confuse or if they are misinterpreted by respondents, it could lead to non-response or, at times, response bias which is regarded as a response error. In order to avoid this issue, five guidelines were proposed by Malhotra, namely, (1) defining the issue, (2) using ordinary words, (3) avoiding ambiguous words, (4) avoiding leading questions, and (5) using positive and statements. As Podsakoff et al. (2003) further elaborate, common method bias could have a substantial impact on the final output of a study, hence, it is advisable to reduce it. In order to do this, the questionnaire should be designed in such a way that respondents are naturally interested to answer it, the respondents that are most appealing

to the specific subject are, and has sufficient expertise in the area questioned should be selected as the sample of the study, the questions should be articulated using clear language, vague statements should be avoided, all the options available to respond should be clearly labelled and the importance of answering the questions should be stressed to the respondents (Jakobsen & Jensen, 2015). Adding to the same, Podsakoff et al. (2012) have further stated that by reducing items having similar scale properties, common method bias can be avoided. Therefore, due care was given when wording the questionnaire, to ensure the accuracy and understandability of the questions, in order to avoid any possible issues relating to response bias.

In the field of information systems research, applying content validity while a new survey instrument is being developed, is highly recommended. It involves the evaluation of the survey instrument with the view of ensuring that all the essential items of a particular construct have been incorporated and undesirable items of a particular construct are eliminated from the survey instrument (Boudreau et al., 2001; Lewis et al., 1995). Content validity can be established under judgmental approach where literature reviews are carried out initially, followed with an evaluation of experts (Taherdoost, 2016). Hence, after thoroughly examining the previous literature and developing the initial questionnaire, it was then subjected to review by two academic experts, who commented on the validity of each construct and their measures, following which several rounds of revisions were conducted based on the expert feedback received. The question items adapted to represent each variable are presented in Table 3.2.

Following the extensive literature review conducted in the previous chapter, the survey instrument was developed. In doing so, as mentioned previously, certain items were rephrased to fit the digital context. The questionnaire items pertaining to each variable, definitions of variables, measurement scales of each variable and the sources from which each item was adapted, are given in Table 3.2.

Table 3. 2: Operationalization of constructs

Variable	**Definition**	**Measurement scale**	**Items used**	**Item adapted from**
Transformational Leadership	The style of leadership that heightens consciousness of collective interest among the organization's members and helps them to achieve their collective goals (García-Morales et al., 2011, p. 1040)	5-point Likert scale	Our organization's management,	(García-Morales et al., 2011)
			constantly seeks new opportunities for the unit/ department of the organization	
			invests a high percentage of its time and energy in teaching and developing the competences of members of the organization	
			speaks with enthusiasm and optimism of the future it seeks to achieve in the organization, expressing confidence that it will achieve these objectives	
			promotes learning from mistakes, suggesting different ways to perform work and solve problems	
			emphasizes the use of employees' intelligence.	

			transmits the organization's mission, reason for being, and purpose to all the employees.	(García-Morales et al., 2012)
Top Management Support	The explicit and active support of the top management towards the introduction and development of new information technology (Bruque-Camara et al, 2004, p.138)	5-point Likert scale	Our organization's top management,	(Montreuil et al., 2020)
			provides resources for innovation	
			encourages the development of new and innovative ideas	
			commits strongly to the successful implementation of innovation	(Oliveira et al., 2014)
			plans and estimates the expenses required for the implementation of innovation carefully	
			places implementation of innovation as a part of the long-term strategic plan of the organization	
Open Communication	The message sending and message receiving behaviors of superiors, subordinates, and peers with regard to task, personal, and innovative topics (Rogers, 1987, p.39)	5-point Likert scale	In our organization,	(Montreuil et al., 2020)
			communication is frequent	
			communication is made at the right time	
			employees are encouraged to express themselves	

			employees maintain regular contacts with each other	(Kivimäki et al., 2000)
			employees share information with each other	
Organizational Culture	A set of values and basic assumptions that an organization has created and developed through the life of the organization to enable it to adapt to environmental changes to enable the organization to better its performance (Lähteenmäki, et al., 2001)	5-point Likert scale	Our organization	(Montreuil et al., 2020)
			questions the existing norms, behaviors, processes, practices etc. (i.e., status quo)	
			attaches importance to solving problems with flexibility	
			promotes employee driven initiatives	
			values people and processes that can generate changes	(Verdu-Jover et al., 2018)
			changes its values according to the demands of the environment	
Organizational Learning	An organization's enhanced ability to acquire, disseminate and use knowledge in order to adapt to a changing external and internal environment (Hoe & Mc Shane, 2010)	5-point Likert scale	In our organization,	(Montreuil et al., 2020)
			there are processes to share knowledge	
			there are processes to acquire and use much new and relevant knowledge	

			there are processes to improve employee skills and capabilities	(García-Morales et al., 2011)
			organizational improvements have been influenced fundamentally by new knowledge entering the organization through learning processes	
Digital innovation	The creation of (and consequent change in) market offerings, business processes, or models that result from the use of digital technologies" (Nambisan et al., 2017, p. 224)	5-point Likert scale	In our organization,	(Khin & Ho, 2018)
			the quality of digital solutions is superior compared to our competitors	
			the features of digital solutions are superior compared to our competitors	
			the applications of digital solutions are totally different from our competitors	
			some of the digital solutions are new to the market at the time of launching	
			new or significantly improved digital processes have been introduced for manufacturing or producing goods or services	(Cirera & Muzi, 2016)
			new or significantly improved digital processes have been introduced for logistics,	

			delivery or distribution of our inputs, goods, or services	
			new or significantly improved digital processes have been introduced for operations (purchasing, accounting, marketing, IT etc.) or maintenance systems	
Digital capability	The ability of an organization to come up with new digital products, services, processes and structures of organizations or business models through utilizing digital technologies (Nambisan et al. 2017)	5-point Likert scale	Please evaluate the following` capabilities of your organization compared to your competitors.	(Zhou & Wu, 2009)
			Acquiring important digital technologies	
			Identifying new digital opportunities	
			Responding to digital transformation	
			Mastering the state-of-the-art digital technologies	
			Developing innovative products/services/processes using digital technology	
Organizational Performance	Ability of an organization to create employment, improve effectiveness, efficiency, and quality of	5-point Likert scale	In our organization,	(Wang & Wang, 2012)
			customer satisfaction is better as compared to key competitors	

	work life resulting in organizational growth and survival (García-Morales et al. 2006).		market share is higher as compared to key competitors	(Wu et al., 2003)
			responsiveness to customers is better as compared to key competitors	(Wang & Wang, 2012)
			efficiency of customer service is better as compared to key competitors	(Metz et al., 2020)
			average return on investment is better as compared to key competitors	(Wang & Wang, 2012)
			average profit of our organization is better as compared to key competitors	
			profit growth is better as compared to key competitors	
			sales growth is better as compared to key competitors	

The questions in a questionnaire also require to be arranged in a proper order (Malhotra, 2006). He further stated that, when making this arrangement, the researcher should be vigilant on opening questions, the nature of the information requested, difficulty of questions, and the effect on successive questions. Opening questions generally introduce the subject being explored and try to gain the confidence and support of the respondents. These are usually regarded to be non-threatening and simple. Questions probing the opinion of the respondents and prescreening questions are usually regarded as good opening questions, according to Malhotra.

Based on this premise, the developed questionnaire of this study consisted of an introductory section/ covering letter followed by three sections. The first section of the questionnaire included a prescreening/ qualifying question which defined the term "digital innovation", as it was the main subject area the study belonged to and requested the respondent to select whether his/her organization is currently engaged in any digital innovation initiatives, according to the provided definition.

Malhotra further elaborated that the questions gathering different kinds of information in a questionnaire are threefold: (1) questions collecting basic information, (2) questions based on classification information and (3) questions on identification information. Out of these, basic information directly relates to the research question/s. Classification information account to socioeconomic and demographic features of the respondents. Identification information may include questions on respondent's name, address, or phone number etc. Collecting identification information may be for a number of reasons such as for verification that the initially listed respondents were actually a part of the survey or for sending them the promised incentives etc.

Accordingly, the second section was dedicated to collecting demographic data (classification information) from the respondents. These included nine questions, requesting the respondent's gender, age, highest academic educational qualification, professional qualifications, name of his/her organization, the current position held within

the organization, years of experience in the current position, province in which the organization is located, the sector to which the organization belongs, and, finally, the size of the organization. The third section included question items covering the constructs, explained under section 3.2.

According to previous literature, the question items in a questionnaire requires to be arranged according to a logical order, classified under specific topics (Malhotra, 2006; Beatty & Willis, 2007). Further, a group of questions is required to be started with a general introduction to the topic being tested and should be followed by specific questions relating to the topic. Further, when switching in between topics, short phrases or sentences are required to be placed in order to assist respondents shift their focus into a new area (Malhotra, 2006).

These guidelines were followed when preparing the questionnaire for this particular study, where question items describing transformational leadership, top management support, open communication, organizational culture, organizational learning (the independent variables) were placed first in the third section, followed by question items describing digital innovation (the predictor variable for digital innovation), and finally question items describing organizational performance (the dependent variable) were placed in the questionnaire. However, one of the independent variables (digital capability) had to be placed after the dependent variable, because the response scales assigned to this variable were different from the rest of the variables, as mentioned in section 3.5.1. Therefore, in order to avoid any inconvenience to the respondent, and in order to maintain a smooth flow of the questions, this variable was placed at the end.

Further, items pertaining to a single topic were classified together, with an introduction to the topic where necessary, followed by specific questions. For example, the question items which addressed the transformational leadership variable are provided in Table 3.3, extracted from the questionnaire.

Table 3. 3: Organization of question items under each variable

A. Transformational Leadership (Refers to the style of leadership that heightens consciousness of collective interest among the organization's members and helps them to achieve their collective goals)		1 - Strongly disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly agree
Our organization's management,						
1	transmits the organization's mission, reason for being, and purpose to all the employees.					
2	constantly seeks new opportunities for the units/ departments of the organization					
3	invests a high percentage of its time and energy in teaching and developing the competences of members of the organization					
4	speaks with enthusiasm and optimism of the future it seeks to achieve in the organization, expressing confidence that it will achieve these objectives					
5	promotes learning from mistakes, suggesting different ways to perform work and solve problems					
6	emphasizes the use of employees' intelligence					

Source: Survey questionnaire

When the sections changed, transitional phrases were included to guide the respondent through the answering process. For example, when shifting from demographic information (Section 2) to basic information (Section 3), the following transitional phrase

was included: *"The following statements are related to your organization. Please indicate your level of agreement/ disagreement with the following statements, where:*

1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree"

3.6.3 Pilot testing the questionnaire

A pilot study is regarded as a mini version of a full-scale study (Van Teijlingen & Hundley, 2001). Saunders et al. (2019) has suggested that, prior to the commencement of the data collecting process using a questionnaire, conducting a pilot study is vital. He further suggested that, conducting a pilot study is a good technique to ensure the validity and the reliability of the data collected through the questionnaire. The sample size of a pilot study is regarded to be small and could be varied between fifteen (15) to thirty (30). Accordingly, the researcher conducted a pilot study involving 21 respondents, who were several industry practitioners belonging to organizations undergoing a digital transformation process/ or has digital innovation initiatives in place within the organization.

The responses obtained from the pilot study were analyzed using Smart PLS version 3. For the convenience of referring to the variables and items, they were coded as mentioned in Table 3.4.

Table 3. 4: Coding of variable names and measurement items

Variable name	**Variable code**	**Item codes**
Open Communication	COM	COM 1, COM 2, COM 3, COM 4, COM
Organizational Culture	CUL	CUL 1, CUL 2, CUL 3, CUL 4
Digital Capability	DC	DC 1, DC 2, DC 3, DC 4, DC 5
Digital Innovation	DI	DI 1, DI 2, DI 3, DI 4, DI 5, DI 6, DI 7
Organizational Learning	OL	OL 1, OL 2, OL 3, OL 4,

Transformational	TL	TL 1, TL 2, TL 3, TL 4, TL 5, TL 6
Organizational	OP	OP 1, OP 2, OP 3, OP4, OP 5, OP 6, OP
Top Management Support	TMS	TMS 1, TMS 2, TMS 3, TMS 4, TMS 5

In order to assess the reliability of the variables and the respective measurement items, a reliability analysis was conducted. The reliability of the variables was determined based on the Cronbach's Alpha value (Iacobucci & Duhachek, 2003). When observing the results of the pilot study (refer Table 3.5), it was seen that reliability of the variables were ensured since the Cronbach's Alpha value for all the variables was above the threshold value of 0.7 (Hair et al., 2014).

The reliability of the measurement items were determined based on the indicator loadings of individual constructs (Hair et al., 2014). The rule of thumb for evaluating the reliability of measurement items is that the individual indicator loadings should be greater than 0.7 (Hair et al., 2011). When observing the path diagram presented in Figure 3.3 below, it was noticed that items "TL 1" of the variable TL, item "TMS 2" and "TMS 4" of the variable TMS, item "CUL 2" of the variable CUL, items "COM 2", "COM 3" and "COM 4" of the variable COM, items "OL 3" of the variable OL, item "DC 2" of the variable DC, and items "OP 1", "OP 2" and "OP 3" of the variable OP had indicator loadings below 0.7, indicating that there could be an issue with reliability of measurement items.

Convergent validity of the measures was tested using the Average Variance Extracted (Hair et al., 2014). The rule of thumb is that AVE should be greater than 0.5 (Hair et al., 2011) for convergent validity to be ensured. When observing the values, it was seen that the AVE values of COM and OL were both below 0.5, indicating a possible issue with convergent validity (refer Table 3.5).

The Discriminant validity was measured using the Fornell-Larcker criterion (Hair et al., 2014). Here the square root of the AVE of each construct should be higher than its highest

correlation with any remaining construct (Hair et al., 2011). The results below indicate that the variables CUL, OL, OP, TL, TMS indicate possible issues pertaining to discriminant validity (refer Table 3.6). A detailed description on each of these analyses have been provided under section 3.7.

Table 3. 5: Reliability and validity of constructs – pilot study

Variable code	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
COM	0.734	**0.586**	**0.311**
CUL	0.753	0.832	0.558
DC	0.881	0.909	0.670
DI	0.956	0.964	0.794
OL	0.853	0.733	**0.454**
OP	0.880	0.902	0.553
TL	0.889	0.904	0.617
TMS	0.813	0.868	0.596

Table 3. 6: Discriminant validity – pilot study

Variable code	COM	CUL	DC	DI	OL	OP	TL	TMS
COM	**0.558**							
CUL	-0.098	**0.747**						
DC	-0.513	0.625	**0.819**					
DI	-0.727	0.640	0.812	**0.891**				
OL	-0.109	0.898	0.645	0.561	**0.674**			
OP	-0.334	0.891	0.683	0.703	0.756	**0.744**		
TL	-0.096	0.858	0.640	0.645	0.756	0.800	**0.786**	
TMS	-0.220	0.789	0.744	0.738	0.625	0.755	0.846	**0.772**

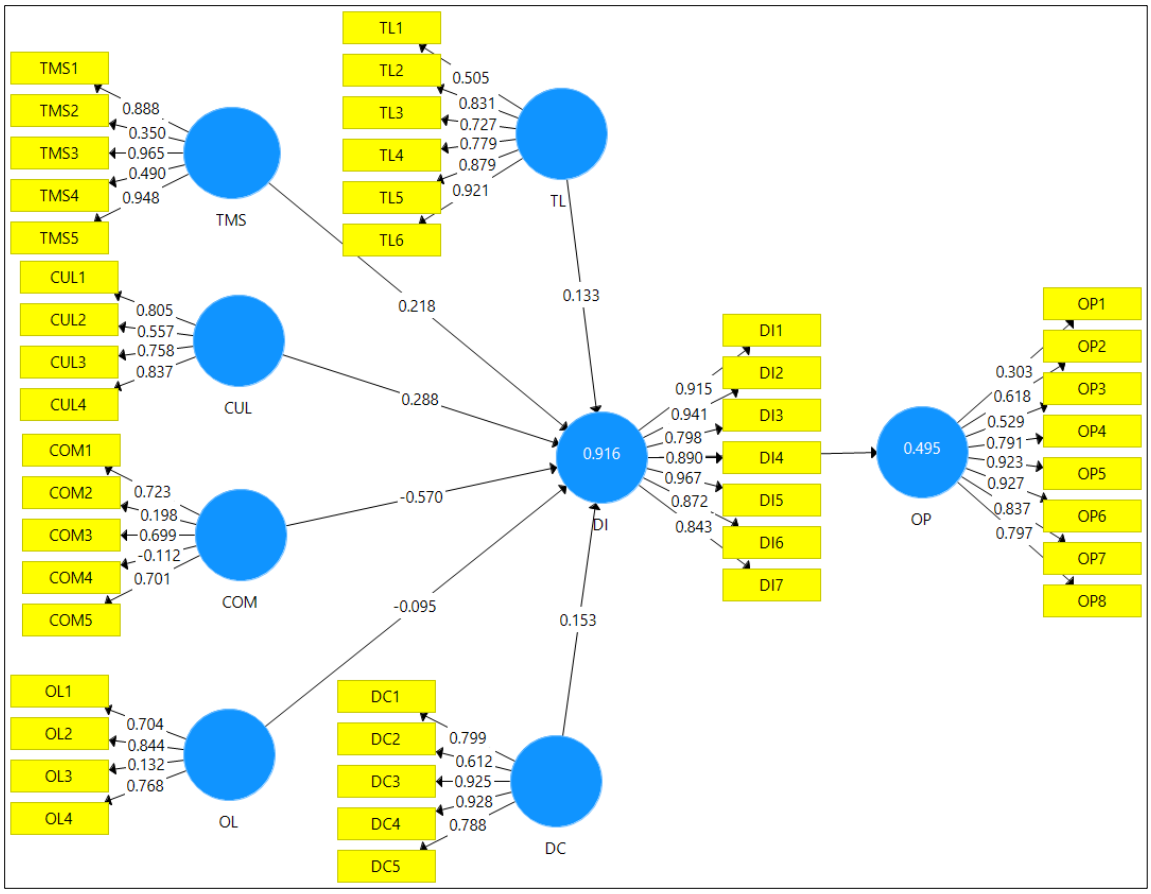

Figure 3. 3: Path diagram of the pilot study

Based on the comments received during the pilot study and the results of the data analysed from the pilot study, several revisions were made to the questionnaire. Since some respondents had mentioned that digital innovation could be perceived in different ways when filling the questionnaire, a definition on digital innovation was included at the top of the questionnaire when revising. Further, since there were low item loadings on several measurement items of variables, these were reworded in order to ensure that they were easily comprehended by the respondent, so that they will not misinterpret them while filling the questionnaire. For example, items TMS 2 and TMS 4 both had factor loadings below 0.7. Therefore, these questions were reworded as shown in Table 3.7:

Table 3. 7: Rewording of the measurement items

Item code	Item as appeared in the pilot study questionnaire	Revised item as appeared in the final questionnaire
TMS 2	Our organization's top management values employees' attempts to implement new ways of doing things or new initiatives	Our organization's top management encourages the development of new and innovative ideas
TMS 4	Our organization's top management carefully plans and budgets the implementation of innovation	Our organization's top management plans and estimates the expenses required for the implementation of innovation carefully

Revisions of this nature were carried out for items COM 2, COM 4, CUL 1, CUL 2, OP 3, OP 4, DI 5, DI 6, and DI 7.

The revised questionnaire was subsequently distributed among the target respondents (refer Appendix I).

3.7 Methods of data collection

In order to achieve the research objectives mentioned in chapter 1, this study followed a quantitative research method. Self-administered online survey questionnaires (Google forms) consisting items of a Likert scale were distributed among the selected organizations via email. The questionnaires were sent out based on the contact information obtained pertaining to the current and past MBA candidates of University of Moratuwa, University of Sri Jayewardenepura, University of Colombo, and the Postgraduate Institute of Management. Another set of questionnaires were also distributed among the managerial level employees of leading organizations within the Western Province, based on personal contacts.

In order to ensure the reliability of the study, it was necessary that whoever responded on behalf of the selected organization during the data collection process, had an overall understanding on the organization's digital innovation processes, digital capability, performance and culture etc. To guarantee this, the covering letter of the questionnaire requested only those who belonged to managerial level positions of the organization (Eg: Assistant Manager and above up to Director/Proprietor) to respond to the survey. Selection of the managerial level employees as the respondents was also in line with the previous studies of Mokhber et al. (2017), Rajapathirana and Hui (2017) and Shaar et al. (2015), who have selected managerial level respondents for their studies. Further, in the questionnaire, the section on respondents' demographic information included an item which requested for the most appropriate category out of a given list that best matched with the respondents' current positions. Through this, respondents belonging to positions lower than Assistant Manager were identified and hence the researcher was able to omit their responses from the data analysis process.

3.8 Methods of data analysis

After collecting a sufficient amount of data, they were analysed with the aid of Smart PLS 3 and SPSS version 21. Different analytical procedures used for analyzing data of this research are described in detail in the next section of the study.

3.8.1 Descriptive statistics

Descriptive statistics are usually used in order to summarize data in an organized way by describing the connection between the variables in a study (Yellapu, 2018). He further stated that descriptive statistics should be calculated as the first step before conducting any further analyses and making inferential statistical comparisons. Descriptive statistics may include measures pertaining to frequency, variation, and position, according to Yellapu.

In this particular study, Mean value and the Standard Deviation of the selected variables and the items were calculated to obtain an understanding on the nature of the data set.

3.8.2 Common method bias

Common method bias is referred to as the biasedness of the variance of the systematic error shared among the measured variables or the common method variance on the estimated relationship among the measures. If there is a presence of common method variance, a third variable could impact the independent behavior between two given variables, which might lead to an increase or decrease of the relationship (Jakobsen & Jensen, 2015). Common method bias could be caused due to various reasons such as: respondents' tendency to answer based on their social acceptability instead of the true feeling they carry, the respondents' proneness to personally agree or disagree with the questionnaire items, respondents' independence from the content, same anchor points being repeatedly used in the questionnaire and usage of similar amount of response items using similar scales (Podsakoff et al., 2003).

As proposed by Jakobsen & Jensen (2015), there are several statistical techniques to check the common method bias, such as the Harman's single-factor test and the test suggested by Bagozzi et al., as cited in Rodríguez-Ardura et al. (2020). In this particular study, Harman's single-factor test was adapted to test for common method bias.

3.8.3 Testing Multivariate assumptions

According to Hair et al. (2014)**,** multivariate data analysis techniques could detect complex relationships that are not easy to simply represent. Resultingly, these types of analyses call for thorough examination of data due to the impact that may arise from outliers, assumption violations and missing data that could be multiplied across several variables, creating a significant effect. There are a range of techniques which pave way to identifying these relationships. The researcher should employ these techniques to

diagnose the data used for the study in order to obtain a deeper understanding of the data and the basic relationships that could exist in the data set according to Hair et al. Testing for multivariate assumptions include testing the Normality, Homoscedasticity, Linearity and Multicollinearity of the data set, which help to ensure that the researcher could proceed with the PLS – SEM analysis. This particular study too, tested the data set for the multivariate assumptions. These multivariate assumptions have been explained in the sections that follow.

- **Normality**

Normality refers to the extent to which the shape of the distribution of the data set resembles to a normal distribution. If a large variation from a normal distribution is observed in the data set, all the statistical tests consequently arrived at would be invalid, since normality is mandatory for using the F statistic and the t statistic (Hair et al., 2014). They further suggested that, when analyzing the shape of any normal distribution, it can be done with reference to kurtosis and skewness. Where kurtosis focuses on the height or "peakedness" / "flatness" of a distribution, skewness relates to the balance of a distribution. Distributions that are taller and shorter than a normal distribution are regarded as "leptokurtic" and "platykurtic" respectively, according to Hair et al. On the other hand, when considering skewness measures, a positive skewness indicates that the distribution considered is more shifted towards the left, whereas negative skewness represents a distribution more lenient towards the right.

Tests of normality were conducted in this particular study to get an understanding on the nature of the distribution of data.

- **Homoscedasticity and linearity**

In order to properly apply multivariate techniques, the assumption that there's an equal variance in the population error (E) should be satisfied. Homoscedasticity means that the

dependent variable(s) demonstrate equal variance levels across a range of predictors (Hair et al., 2014). When the variance of the error terms (e) is evenly distributed, the data said is identified to be homoscedastic according to Hair et al. They further suggested that, if this relationship is unequally dispersed, it is called "heteroscedastic", and that, in order to statistically test the homoscedasticity, one of the most commonly used methods to detect homoscedasticity is through scatter plots and box plots.

Whereas with regards to the linearity assumption, Saunders et al. (2009) have posited that the residual plot can be used to identify linearity. Further, normal probability plots can also be used to detect normality (Filliben, 1975). Pallant (2007) states that the linearity between two variables can be roughly identified using scatter plots. When the normal probability plots are being used to conclude on linearity, it has been stated that the slight deviations observable from an array should be disregarded (Abraham & Keve, 1971).

Based on the above, tests of homoscedasticity and linearity were performed on the data set of this study to ensure that there is an equal variance in the population error and that there is a linear distribution in the data.

- **Multicollinearity**

When there is a situation where there exists a high amount of correlation between two or more independent variables in a multiple regression model, it is referred to as multicollinearity (Sekaran & Bougie, 2016). Hair et al. (2010) further explained this as when one independent variable is highly correlated with the other independent variables. The Variance influence Factor (VIF) is identified as the regular method of assessing multicollinearity, and the measure indicates the degree to which one independent variable is explained by another independent variable (Sekaran & Bougie, 2016). This study adapted the cutoff value suggested by Hair et al. (2010) in testing for multicollinearity.

3.8.4 Analysis of the Structural Equation Model

The researcher has used PLS - SEM technique for data analysis. There are basically two techniques for structural equation model analyses, the CB- SEM (Covariance Based Structural Equation Modelling) and PLS – SEM (Partial Least Square based Structural Equation Modelling). PLS-SEM is regarded as a more feasible option over CB-SEM due to several reasons, such as in instances where the sample size is small, data is not distributed normally or when the model consists of many indicators with complex relationships, for example, when six constructs or more are used in the model (Hair et al., 2011, 2019). According to them, PLS-SEM refers to the structural model as the inner model, which explains the relationships among the latent constructs of the study. The outer model, on the other hand, describes the single directional, predictive relationships among each latent construct as well as their indicators. Hair et al. further talks about "reflective measurement models" and "formative measurement models". Reflective models are those which contain indicators which change based on the changes that happen in the latent constructs. Reflective indicators are depicted in the form of arrow heads pointing towards the particular construct, starting from the latent constructs. The connections among the indicators are depicted with reference to coefficient values, called "outer loadings". Reflective models have been observed in many studies which contain scale based measurements. (Hair et al., 2011). They further suggested that formative models, opposingly, consist of latent constructs which change with the change in indicators. Formative constructs are indicated with a single headed arrow which points towards the latent construct from the indicators. The connection among indicators in these models are depicted using coefficients, commonly referred to as "outer weights" according to Hair et al. Considering the qualities mentioned above, since this particular study employs a Likert scale, a reflective model has been considered as the measurement model of this study. Further, in this particular study, the resulting consequence upon transformational leadership, top management support, open communication, organizational culture, organizational learning and digital capability are being described through their respective,

individual indicators. Further, the consequence upon organizational performance is described through its separate indicators. Hence, affirming with Hair et al (2014), who have stated that in a reflective study, the indicators have the ability of explaining the resulting effect on the respective construct, this particular study adapted a reflective model as its measurement model.

According to Hair et al. (2011), analyzing a PLS-SEM model consists of two steps. Firstly, the score values corresponding to the latent constructs will be estimated (measurement model assessment) and then the estimates corresponding to the outer loadings will be determined alongside their path coefficients in the structural model (structural model assessment). The next section of this chapter is dedicated towards explaining the stages of analysis that were followed in each of these assessments within the study.

3.8.5 Testing the reliability of the constructs and indicators

Reliability is a measure dedicated to ensuring consistent results attached to identical values (Blumberg et al., 2005). The term has been used to mean concepts such as consistency, precision, repeatability, and trustworthiness of a research (Chakrabartty, 2013). In other words, it is the degree to which an assessment tool in a research study could produce error-free and consistent results (Feldt & Brennan, 1989). Reliability has been regarded as a necessary condition for validity (Hair et al., 2014). The following section explains several analyses that were performed in order to ensure the reliability of the constructs of the conceptual model and their respective indicators.

- **Internal consistency**

This assesses the internal consistency of constructs. The traditional method of assessing the internal consistency is through Cronbach's Alpha. Cronbach's Alpha is considered as a technique which assumes that every indicator is equally reliable. However, in PLS-SEM, the indicators are prioritized according to their individual reliability. Due to the

conservativeness of Cronbach's Alpha, therefore, composite reliability is considered as a more appropriate measure to assess internal consistency (Hair et al., 2014). In this study, both Cronbach's Alpha and composite reliability values were used to determine internal consistency.

- **Indicator reliability**

Indicator reliability refers to the portion of the variance of an indicator that could be explained using the relevant latent variable. A common threshold is that more than 50% of an indicator's variance should be explained by the relevant latent variable. This study used the indicator loading values of each item to ascertain the indicator reliability (Hair et al., 2011).

The next section of the study explains the assessments of validity performed during the study.

3.8.6 Testing the validity of the constructs and indicators

Validity accounts to the degree to which a particular research instrument measures what it intends to measure (Blumberg et al., 2005; Robson, 2011). Validity assures that the research instrument measures the concepts in the study correctly (Pallant, 2011). The assessment of validity of a reflective model is done based on the convergent validity and the discriminant validity (Hair et al., 2011). The following section explains several assessments of validity done within the study.

- **Convergent validity**

Convergent validity refers to the degree to which a particular measure positively correlates with alternate measures of the same construct (Hair et al., 2014). Convergent validity ensures that the items of a specific variable should "converge", or, in other words, share a high amount of variance of the variable. In order to ensure convergent validity, the outer

loadings of the indicators, as well as the AVE value were considered in this study, as prescribed by Hair et al.

- **Discriminant validity**

Discriminant validity refers to the degree to which a construct is distinct from other constructs with reference to pragmatic standards (Hair et al., 2011). Several measures have been proposed to ascertain the discriminant validity so far. One is to assess by examining the indicator cross loadings. The first rule of thumb prescribes that outer loadings of an indicator on a particular associated construct should be greater than the rest of the loadings on the remaining constructs (cross loadings) according to Hair et al. According to them, the second method is to look at the Fornell – Larcker criterion. This compares the square root of the AVE values with the correlations of the latent variable. Here the square root of the AVE of each construct should be higher than its highest correlation with any remaining construct. However, a recent argument by Hair et al. (2019) suggests that the Fornell-Larcker criterion is unsuitable to assess the discriminant validity. Therefore, the Heterotrait-Monotrait (HTMT) ratio has been introduced by Henseler et al (2015), which has overcome the weaknesses of the Fornell-Larcker criterion. HTMT ratio is calculated as the mean value of the correlations of items across constructs against the mean value of the average correlations of the items that measure the same construct (Hair et al., 2019). This study employed all the above three criteria in order to test for discriminant validity.

The following section explains the analyses that were performed in evaluating the structural model.

3.8.7 Evaluation of the structural model

As recommended by Hair et al. (2019), the results of the structural model were tested after testing for the reliability and the validity of the constructs and the measures. Accordingly,

the structural model was evaluated with reference to multicollinearity, the coefficient of determination (R^2), assessing the path coefficients (testing of hypotheses), the effect size (f^2) and the predictive relevance (Q^2), which have been explained below:

- **Multicollinearity**

Multicollinearity refers to a high amount of correlation between two or more independent variables in a multiple regression model (Sekaran & Bougie, 2009). As the first stage in analysing the structural model, it should be examined for collinearity. To measure collinearity, the Variance Inflation Factor (VIF) has to be used (Hair et al., 2019). If collinearity issues persist, it is recommended to either remove the constructs, to combine the predictors into a single construct or to create higher order constructs as remedies (Hair et al., 2014). Accordingly, this study employed the VIF values of the predictor variables to determine whether issues of multicollinearity are associated with the structural model.

- **Coefficients of determination (R^2)**

As the next step, coefficient of determination was assessed. Here, the variance explained by the dependent variables are explained through the coefficient of determination (R^2), which is regarded as a measure explaining the explanatory power of the model (Shmueli & Koppius, 2011) was tested. The adjusted R^2 value is computed in order to remove the biasness in complex models with multiple regression (Hair et al., 2014). It has also been stated that there are no specific criteria to decide on the threshold value for R^2, and that it depends on the context and the fields of study (Hair et al., 2011; Falk & Miller, 1992). This study used the adjusted R^2 value in determining the explanatory power of the structural model.

- **Assessing path coefficients (Testing hypotheses)**

The path coefficient determines the relationship between the latent constructs within the structural model. In regression analyses, the path coefficient corresponds to the standardized beta values (Hair et al., 2014). According to them, assessing the path coefficients involve two things: The significance of the coefficients and relevance of the coefficients. Whether this coefficient is significant, largely depends on the standard error derived through the bootstrapping process. The empirical t value is computed based on this bootstrapping standard error. If the t value is greater than the prescribed critical value, the coefficient is said to be significant within a designated level of error probability. The *p* value obtained through the bootstrapping procedure could also be used to determine whether the path coefficient is significant, according to Hair et al. In structural model assessments, *p* value accounts to the probability of error to assume that a certain path coefficient is different significantly from zero. They further elaborate that, researchers compare this *p* value of a coefficient with reference to a previously selected significance level, to decide whether the path coefficient is statistically significant.

Thus, the significance of the hypotheses of this particular study were tested using empirical t values and *p* values.

- **The effect size f^2**

The effect size has a further ability of measuring the impact each independent variable has on the dependent variable. Specifically, this value explains how much an independent variable contributes to the R^2 value of a designated variable in the structural model (Hair et al., 2014). The effect size can be calculated as follows, according to Hair et al.:

$$f^2 = \frac{R^2_{\text{included}} - R^2_{\text{excluded}}}{1 - R^2_{\text{included}}},$$

The effect size was calculated to determine how much each independent variable considered in the study contributed to the R^2 value of digital innovation.

- **Predictive relevance (Q^2)**

Another important aspect of analysing the structural model is examining the Stone-Geisser's Q^2 value (Geisser, 1974; Stone, 1974). This indicates the predictive relevance of the model. To further elaborate, when there is predictive relevance of a model, it is said to have the ability of accurately predicting the data points of the items of dependent variables and single-item dependent variables of reflective measurement models (Hair et al., 2014). This value is obtained by utilizing a procedure called blindfolding for a specified omission distance (*d*). Here, every *d*th data point of the data set of the dependent variable items are removed, treated as missing values when running the algorithm for PLS and the resultant estimates, in turn, are then used for predicting the data points that were omitted (Henseler et al., 2009; Tenenhaus et al., 2005). The difference between the removed data points and the predicted data points are used subsequently as an input for calculating the Q^2 value. This process is repeated until each data point of the dependent variable is omitted and the data model is re-estimated (Hair et al., 2014). According to them, the Q^2 value can be computed based on two methods, (1) the cross validated redundancy method and (2) cross validated communality approach. Hair et al. further state that the former is more suitable since that calculation consists of the key elements of the path model and structural model used to predict the removed data points.

This study has used the predictive relevance (Q^2), in order to assess the predictive relevance of the structural model.

3.9 Summary

Through this chapter, the methodology utilized to achieve the research objectives mentioned in the first chapter was discussed. It involved development of the conceptual model of the study, which identified the organizational performance as the dependent variable, digital innovation as a predictor variable of organizational performance, and six independent variables which affected digital innovation as identified through the literature review, namely, transformational leadership, top management support, organizational learning, organizational culture, open communication, and digital capability. Subsequently, the process of designing the questionnaire to measure the variables identified was discussed, where a total of 41 indicators were used to represent the model. The minimum sample size calculated for the study was 103. Finally, this section elaborated on the target population and sample selection, questionnaire development, methods of data collection, and methods of data analysis.

4. DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter presents the analysis of data performed in order to test the hypotheses and the research objectives. As mentioned in the methodology chapter, this study has adapted a quantitative research design. In this chapter, the data analysis will be explained in detail, emphasizing on data cleaning, the sample profile, descriptive statistics, statistics of common method bias, multivariate assumptions, measurement model validation, structural model validation and testing of hypotheses. The final section of the chapter discusses the results obtained through the analysis, with reference to the research objectives set at the beginning of the study.

4.2 Preparation of data

4.2.1 Data cleaning

Data cleaning is a process used to detect, diagnose and edit data containing faults (Broeck et al., 2005). As stated previously in section 3.4, the minimum required sample size recommended as per Daniel Soper sample size calculator, which is used for PLS SEM based analyses, was 103. Initially the researcher planned to collect at least 200 responses with the intention of sufficiently covering the minimum required sample as well as to ensure better validity in responses. However, although 907 questionnaires were distributed, only 197 were received. A total of 709 questionnaires were not received by the researcher.

This study has considered organizations that are already engaged in digital innovation initiatives for data collection purposes. Since it is difficult to ascertain from a general outlook whether the responding organizations are engaged in any such initiatives, the following probing question was entered to filter out only the organizations that are currently engaged in innovative initiatives.

"Digital innovation refers to the usage of digital technology [websites, mobile applications, e-mail, social media, SMS, e-commerce, digital marketing, self-service kiosks etc.] to improve existing business processes, workforce efficiency, customer experience and launch new products or business models. According to the above definition, is your organization currently engaged in any digital innovation initiatives?"

- **Relevance of responses**

Out of the received responses, the researcher had to eliminate 59 questionnaires, since 16 respondents had responded that there were no digital innovation initiatives in place within those organizations and 43 had responded that they are belonging to positions below Assistant Manager level. Accordingly, only 138 responses, out of the 197 received, were usable for the purpose of data analysis. Hence, the total response rate when compared with the total 907 questionnaires sent, as defined by Saunders et al. (2019) was 21.72% and the active response rate out of the total questionnaires sent, was 15.23%.

- **Missing values**

After collecting a satisfactory amount of data, they were allocated a unique code and uploaded to the SPSS version 21 software prior to the analysing process, in order to perform the data cleaning.
During the data cleaning process, missing values should be treated (Malhotra et al., 2017). However, in this case, since all that was distributed were online questionnaires where the responses to all questions were set to mandatory by default, no missing values were observed in the responses received (Appendix II).

- **Outliers**

However, the data still had to be tested for outliers. Outliers can be identified as observations that substantially differ from the rest of the observations (Sekaran & Bougie, 2009). Sekaran and Bougie further elaborate that since outliers can have an impact on the

final results of the study, it is essential that outliers are treated with attention and corrected. Standard deviation can be used to identify substantial outliers in a Likert scale data set (Aguinis et al., 2013). The same was employed in this study, where three items had the standard deviation value zero (0), meaning that all the responses of the respondent had the same value, which could have been due to an extreme situation, respondent intentionally trying to avoid responding the truth or responding carelessly. Hence, these cases were removed from the data set by the researcher (case no. 08, case no. 33 and case no. 90) before feeding them to the software for further analysis. After the data cleaning process, 135 responses were suitable for further analysis, making it the sample size of the study. Further, when observing previous literature, it was noticed that sample sizes such as 109 (Kmieciak et al., 2012) and 66 (Mokhber et al., 2017) have been used in studies within the digital innovation domain where the unit of analysis has been a single organization. Moreover, since the minimum required sample size was 103, it was decided that 135 responses was adequate to continue with the rest of the analysis.

To summarize, after the data collection, the data were subjected to an initial screening where responses mismatching with the expected respondent profiles and useless for the analysis were eliminated, following which, the data cleaning process was carried out. During data cleaning, missing values and outliers were inspected. It was observed that data had no missing values, however, had three outliers. These outliers were removed, prior to subjecting the data set for further analyses. Accordingly, the final data set had 135 usable responses.

4.3 Demographic Data

The demographic data for this study was based on the name of the organization, position of the respondent, years of experience in the current position, sector to which the organization belongs and the size of the organization in terms of the number of employees in the organization. The profile of the sample of respondents in terms of their demographic characteristics is shown below.

4.3.1 Sector analysis of organizations

Among the 135 responses used for the analysis, 33 represented the industry sector, 19 represented the trade sector and 83 represented the services sector. This composition is depicted in Figure 4.1.

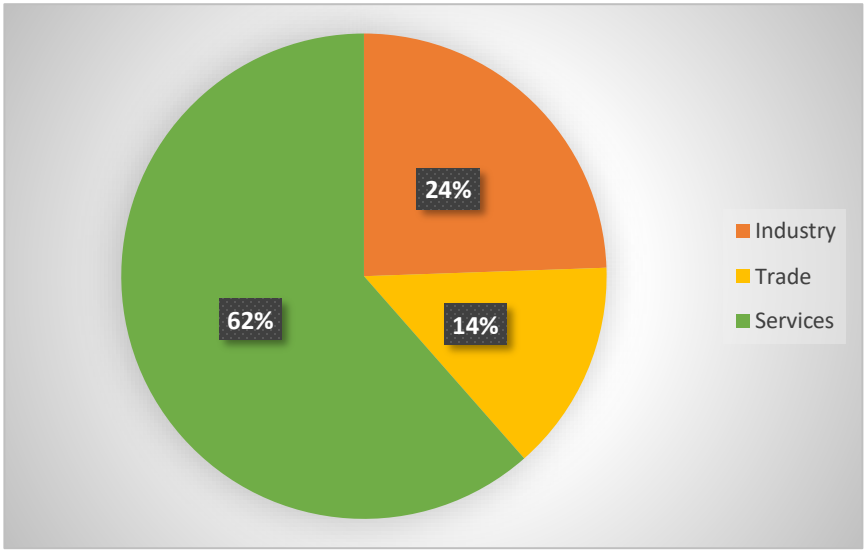

Figure 4.1: Sector-wise composition of the responses

As explained in section 3.4, the above sector wise categorization was based on the classification proposed by the latest publicly available report by the Department of Census and Statistics.

4.3.2 Size of the organizations

In this study, the respondent organizations were categorized into four groups: Micro, Small, Medium, and Large (Refer Section 3.4). Analysis on demographic data revealed that, out of the total number of responses in the Industry sector, 5 belonged to the "Small" category, 9 belonged to the "Medium" category and 19 belonged to the "Large" category. Out of the Trade sector, 3 belonged to the "Medium" category and 16 belonged to the "Large" category. In the Services sector, 1 response was from the "Micro" category, 4

from “Small” category, 14 from “Medium” category and 64 from “Large” category. This classification is depicted in the Figure 4.2 below:

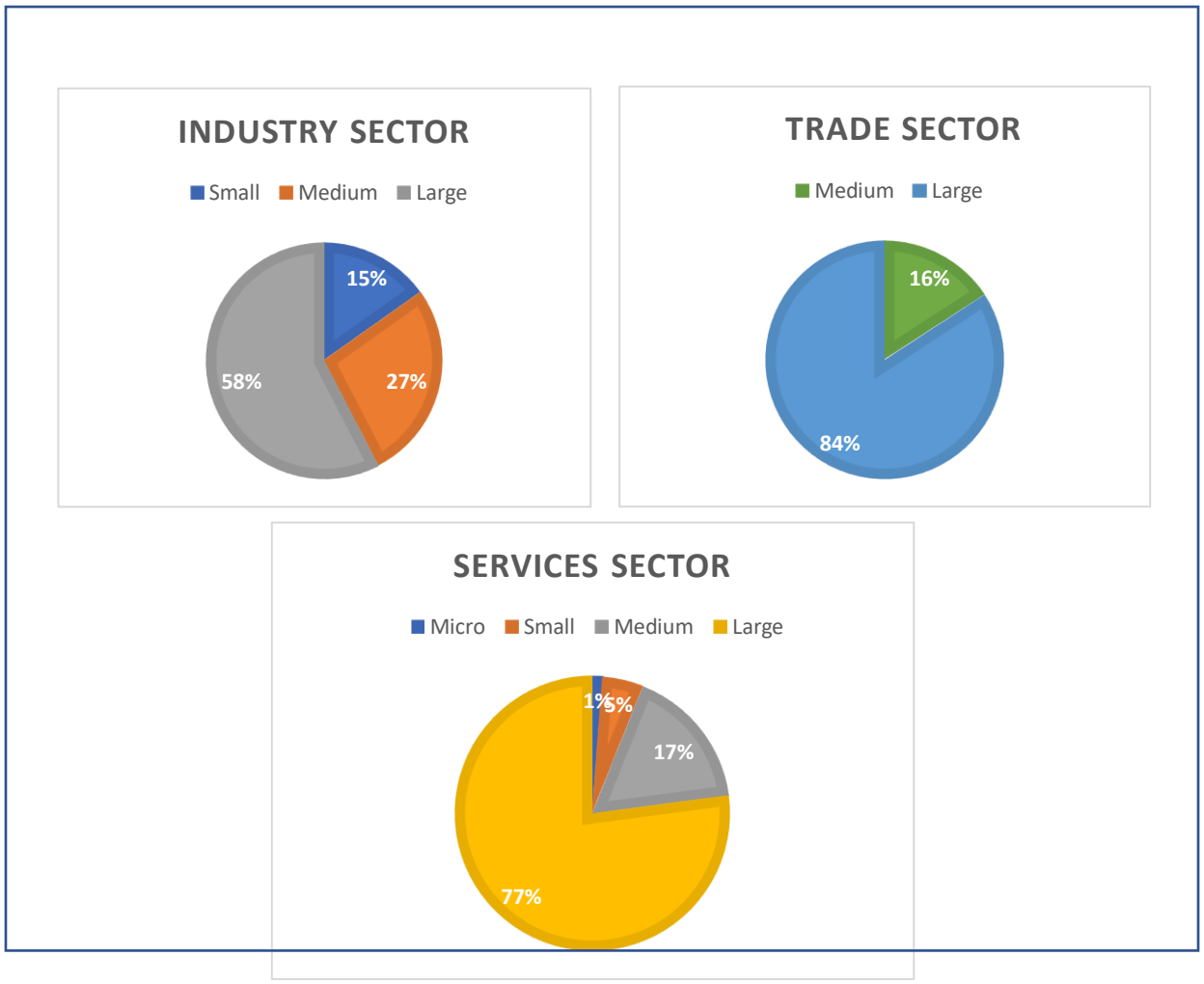

Figure 4.2: Size of the organizations – sector wise classification

4.3.3 Profiles of the respondents

The analysis of respondent profiles revealed that, 46 belonged to Assistant Managerial (AM) positions, 38 belonged to Managerial positions, 24 belonged to Senior Managerial positions, 3 belonged to CFO/ CIO level, 3 belonged to CEO/ MD level, 3 belonged to Director level, 1 belonged to Board Chairman / Proprietor / Partner level and 17 belonged

to positions other than what was mentioned in the given list of positions. This composition is depicted in the Figure 4.3:

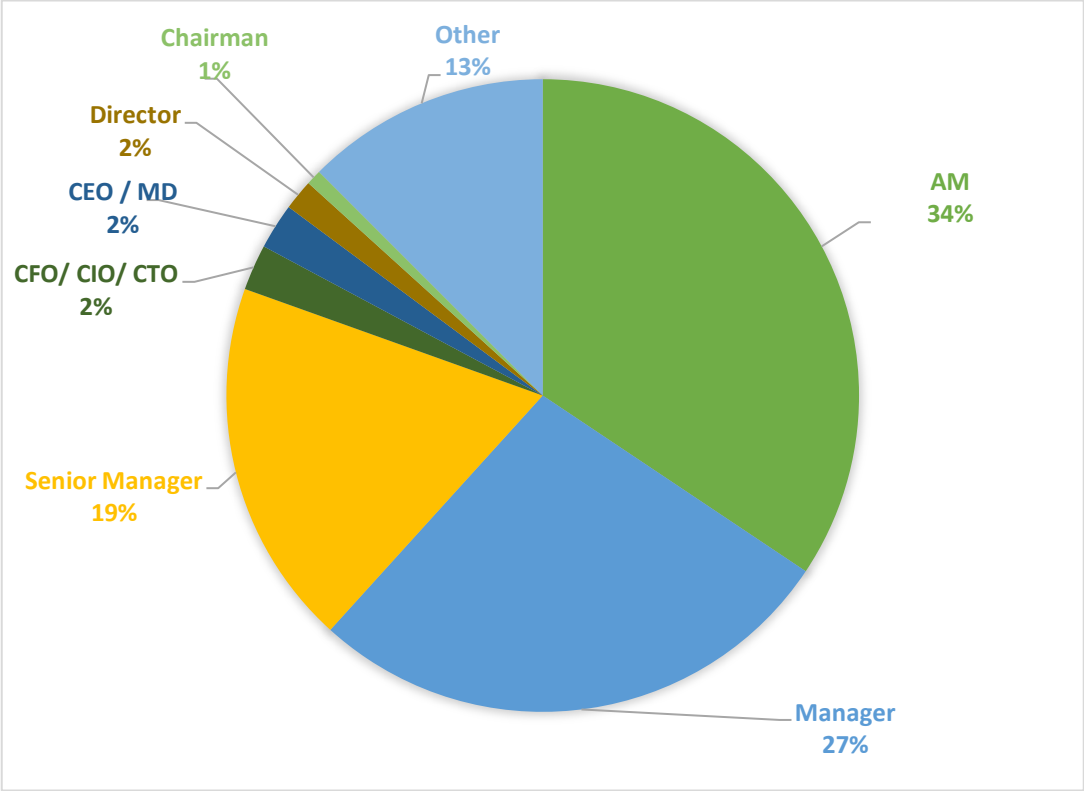

Figure 4.3: Profiles of the respondents

4.4 Descriptive statistics

In this study, descriptive statistics were calculated with the intention of summarizing data in an organized way and to describe the connection between the variables. Accordingly, the Mean value and the Standard Deviation of the variables are depicted in Table 4.1 and the Mean values and the Standard Deviations of the measurement items are depicted in the and Appendix II.

Table 4. 1: Descriptive statistics for variables

Variable code	Minimum	Maximum	Mean	Std. Deviation
TL	1.00	5.00	3.9877	0.80721
TMS	1.00	5.00	3.9274	0.89062
COM	1.40	5.00	3.9156	0.70540
CUL	1.00	5.00	3.7052	0.80737
OL	1.00	5.00	3.7963	0.87096
DI	1.00	5.00	3.6910	0.82402
PER	1.00	5.00	3.7037	0.81221
DC	1.20	5.00	3.7363	0.95656

Source: survey data (N=135)

When observing Table 4.1 and Appendix II, it was seen that the size of the sample was 135 respondents. The mean values of the responses for variables have ranged between 3.68 – 3.98. Thus, at the outset, it was observed that majority of the responses of the respondents were concentrated towards a positive response trend (i.e., "Agree") in terms of questions which tried to inspect the availability of certain factors, practices, and processes etc. which were conducive for digital innovation within their organizations. Standard deviation could be used to interpret how concentrated or spread out the data are, around its mean value. A small standard deviation value implies that the values of the data set are concentrated around the mean, and vice versa (Hassani et al., 2010). When observing the standard deviation of the variables, the observation made on the mean value was further confirmed since all the standard deviation values were less than 1 standard deviation, thus, were concentrated around the means of the variables.

4.4.1 Common method bias

Test for common method bias in this study was done was done using Harman's one factor test in order to find out the biasedness of the variance of the systematic error that is shared

among the variables measured. Podsakoff and Organ, (As cited in Fuller et al., 2015), mentioned that common method bias could exist owing to either having only one factor as a result of the factor analysis, or when the first factor explains a variance above 50%. (Eichhorn, 2014) has further stated that the generally accepted norm for the common method bias to exist is if the total variance is below 50%.

In this particular study, the Harman's one factor test results are shown in Appendix III. The results proved that through the exploratory factor analysis done, the variance demonstrated for the first factor was only 47.98% (which is less than the prescribed maximum value of 50%) and the factor analysis resulted in eight factors, which means that the variance is shared by several factors, and not one factor. The total variance of this data set is 77.56%, which is larger than the threshold of 50%. Hence, based on these observations, it was concluded that there is no issue of common method bias, and the data is ready for further analysis.

The multivariate assumptions were tested in the study to diagnose relationships among data, to understand the nature of the data and to determine whether the researcher could proceed with the PLS-SEM analysis based on the observations made on the data. The multivariate assumptions tested in this manner included testing the Normality, Homoscedasticity, Linearity and Multicollinearity of the data set. The results of each of these tests are explained below:

4.4.2 Normality

Normality of the data set in this study was assessed with the intention of determining to which degree it resembled to the shape of a normally distributed data set. Measures of kurtosis and skewness were used to assess this. For multivariate normality, the threshold values for testing kurtosis considered are +10 and -10 respectively. Pallant (2007) stated that in a perfectly normal distribution, the kurtosis values are zero.

Kline (1998) stated that, positive skewness represents that most of the scores are below the mean level and negative skewness represents that most of the scores are above the mean level. He further elaborates that for multivariate normality, the threshold values for skewness are +3 and -3. The results of the tests on Kurtosis and skewness done for this study are depicted in Appendix IV.

The researcher found that the kurtosis values range between +2.991 and -0.172. Since this is acceptable with the threshold values of +10 and -10 prescribed for kurtosis, it could be stated that the data set is normally distributed. Further, the skewness is distributed between -1.559 and -0.421 Therefore, it could be concluded that the values for skewness were satisfied since they are within the prescribed range of +3 and -3, and the distribution is normally distributed.

4.4.3 Homoscedasticity and linearity

The term "homoscedasticity" refers to the dependent relationships between variables. Homoscedasticity is attributed to the idea that the dependent variable(s) have the same degree of variation over a variety of predictors (Hair et al., 2014). In order to statistically test the homoscedasticity, one of the most commonly used methods is through scatter plots and box plots (Hair et al., 2014). The scatter plots drawn to detect homoscedasticity of the data set of the study are depicted in Figures 4.4 and 4.5.

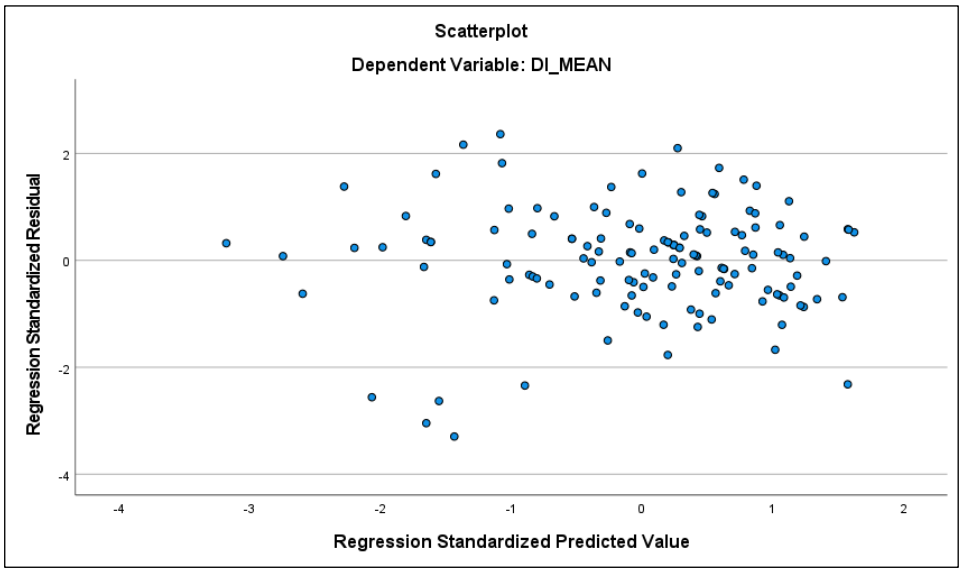

Figure 4.4: Relationship between the independent variables and Digital Innovation

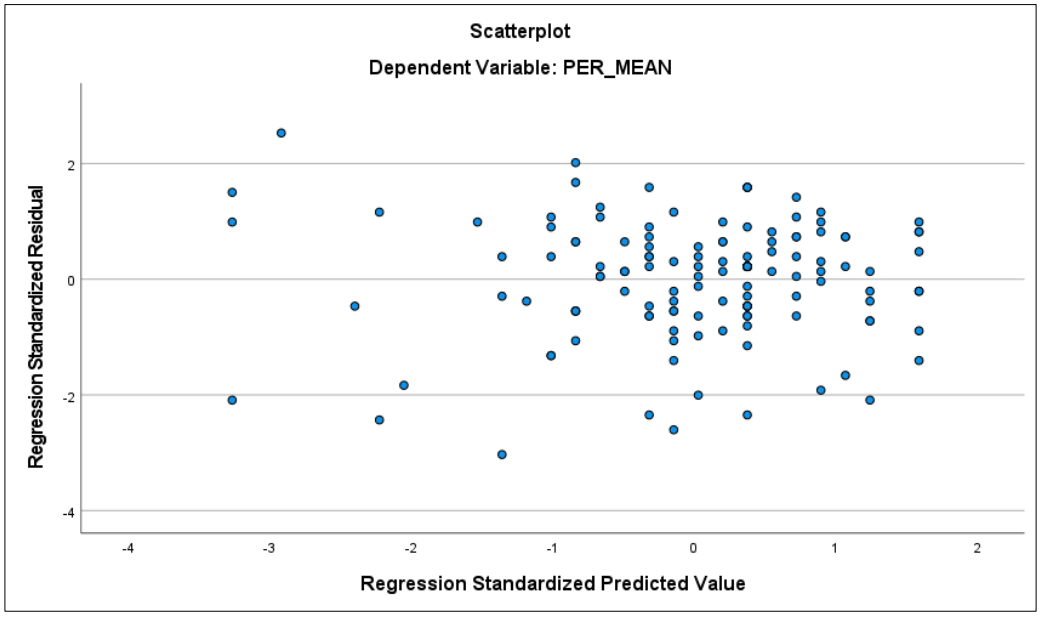

Figure 4.5: Relationship between Digital Innovation and Organizational Performance

When observing the scatter plots drawn to identify the homoscedasticity of the distribution, it is evident that, when looking at scatter plot 4.4, where the relationship between the predictor variables and digital innovation was drawn, the data points are not tightly concentrated towards a single axis/area of the graph. Scatterplot 4.5 accounts to a similar nature, where data points are distributed freely across the graph and not concentrated at a single area. Therefore, upon visual observation, it was inferred that the data distribution was homoscedastic.

The concept of "linearity" is used to describe the model's additivity and homogeneity. In a summary, linear models assume that the dependent variable has a constant unit change (slope) for a constant unit change of the independent variable to forecast values that fall in a straight line (Hair et al., 2014). The linearity can be visually detected through residual plots (Saunders et al., 2009) and normal probability plots (Filliben, 1975). When

determining linearity using the normal probability plot, minor deviations from the array should be ignored since they have no significant impact (Abrahams & Keve, 1971). The normal P-P Plots drawn for the relationships observed in this study are depicted in Figure 4.6 and Figure 4.7.

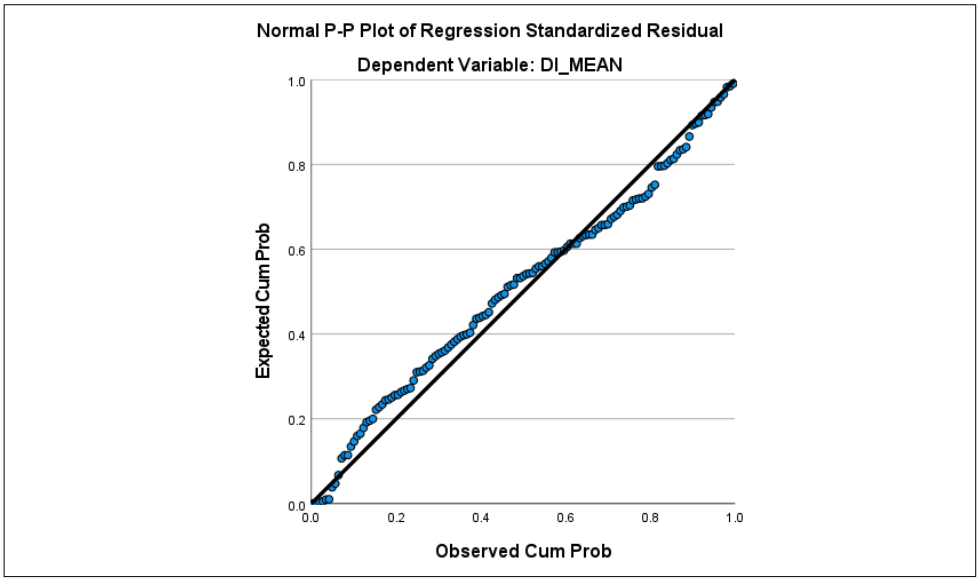

Figure 4.6: Normal PP – Plot for residual of independent variables and Digital Innovation

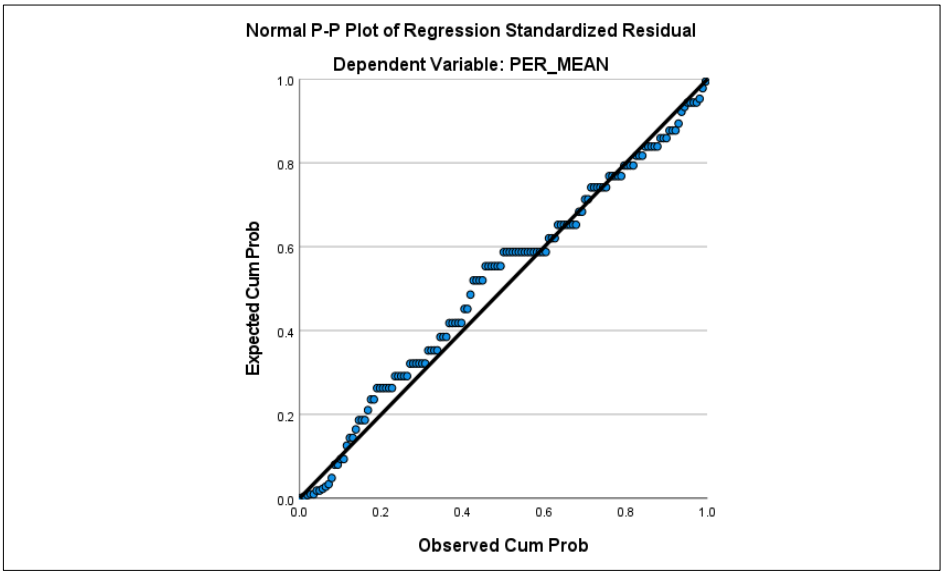

Figure 4.7: Normal PP – Plot for residual of Digital Innovation and Organizational Performance

Therefore, upon visual observation of these, it was concluded that the data set was linear, since there were only minor deviations from the axis. Therefore, it was inferred that there were linear relationships among the variables that were considered for this study.

4.4.4 Multicollinearity

Multicollinearity refers to a situation where a high correlation exists between two or more independent variables in a multiple regression model (Sekaran & Bougie, 2009). In this study, The Variance influence Factor (VIF) as prescribed by Sekaran and Bougie was used to assess whether any issues of multicollinearity persisted. To avoid issues of multicollinearity, each predicting variable's VIF value should be less than 5. If the values are outside of this limit, they should be discarded since they could suggest a multicollinearity problem (Hair et al., 2014).

For the purpose of this study, the researcher used the cutoff points recommended by Hair et al. (2010) where VIF values less than 5 needs to be present in order to evade issues with multicollinearity. When referring to Table 4.2, it was observed that the VIF of all the variables were less than 5, thus indicating that there was no issue with regards to multicollinearity.

Table 4. 2: Multicollinearity

Coefficients[a]					
Variables	**Standardized Coefficients**	**T**	**Sig.**	**Collinearity Statistics**	
	Beta			**Tolerance**	**VIF**
		1.731	0.086		
TL	-0.039	-0.374	0.709	0.298	**3.358**
TMS	0.229	2.128	0.035	0.279	**3.585**
COM	0.109	1.226	0.222	0.404	**2.472**
CUL	-0.038	-0.393	0.695	0.340	**2.938**

OL	0.240	2.597	0.010	0.378	**2.646**
DC	0.409	5.694	0.000	0.626	**1.598**

a. Dependent Variable: DI

4.5 Analysis of the Structural Equation Model

As explained in section 3.7.4, this study used a PLS-SEM technique for data analysis. Accordingly, as Hair et al. (2011) have stated, the researcher has analysed the structural equation model in two steps – first, through measurement model assessment and subsequently through structural model assessment. In the present study, there were six independent variables (transformational leadership, top management support, open communication, organizational culture, organizational learning, and digital capability) that were identified to have an effect on digital innovation, which, in turn, affects the dependent variable – organizational performance.

The next section of the study elaborates on the assessments that were performed during the analysis of the measurement model pertaining to the above variables and their measurement items. These assessments included: evaluation of the reliability of the constructs and indicators, and evaluation of the validity of constructs and indicators.

4.5.1 Reliability of the constructs and indicators

Reliability is a measure used to describe the degree to which an assessment tool used in a research study is able to produce error-free, consistent results when re-examined. (Feldt & Brennan, 1989). In order to assess the reliability of this study, assessments of internal consistency and indicator reliability were performed. The following section describes those analyses in detail.

- **Internal consistency (construct reliability)**

Construct reliability is used to specify how well the measurement items of a construct collectively measure the construct sufficiently (Straub et al., 2004). In order to assess the reliability of the constructs, this study has used the Cronbach's Alpha and composite

reliability values, as recommended by Hair et al. (2014). Cronbach's Alpha provides an estimate of the reliability based on the observed intercorrelations between indicator variables. Composite reliability is a measure that is used to examine how well a variable can be measured by the measurement items assigned to it (Vinzi et al., 2010). The rule of thumb in assessing internal consistency is that the composite reliability value should be greater than 0.70 (Hair et al., 2011), and the values for Cronbach's Alpha should be between 0.6 - 0.7 for exploratory research (Hair et al., 2014b) – but should not exceed 0.95 (Hair et al., 2019; Nunnally, 1978). The findings of those analyses are provided in Table 4.3, followed with a detailed explanation of the results with reference to each variable.

Table 4. 3: Cronbach's Alpha and composite reliability

Variable code	Cronbach's Alpha	Composite Reliability
COM	0.876	0.910
CUL	0.903	0.928
DC	0.958	0.967
DI	0.919	0.935
OL	0.937	0.955
PER	0.945	0.953
TL	0.921	0.938
TMS	0.948	0.960

When considering open communication (COM), The composite reliability of the variable was 0.910, which was above the threshold value of 0.7 and the Cronbach's alpha value for COM was 0.876, which was within the recommended thresholds of 0.7 and 0.95. Therefore, the construct reliability of COM was established.

The next considered independent variable, organizational culture (CUL), had a composite reliability value of 0.928. This was above the threshold value of 0.7. Cronbach's Alpha

value was 0.903. This was above the minimum threshold of 0.7 and below the maximum threshold of 0.95. Therefore, it was concluded that the construct reliability of CUL was established.

In the variable Digital Capability (DC), composite reliability and Cronbach's alpha values were 0.958 and 0.967, respectively. Here, although the composite reliability value was acceptable since it was above the prescribed threshold of 0.7, the Cronbach's alpha value was beyond the maximum accepted threshold of 0.95. According to literature mentioned previously, if the Cronbach's alpha value exceeds 0.95, the variable is considered to be redundant, indicating that all the indicators of the variable are measuring the same phenomenon, therefore, cannot be considered as valid measures of the variable. Such redundant items could have an adverse impact on the content validity of the measurement model (Rossiter, 2002). In order to detect redundancy, one can examine the outer VIF values associated with the measurement items. The researcher should then remove those corresponding items which indicate a VIF value of 5 or higher (accounting for a multicollinearity issue), provided that the remaining indicators sufficiently capture the theoretical grounds of the construct (Hair, 2014a). Further, it has been stated that in PLS-SEM models, the researcher may critically consider whether a particular indicator should be included in the construct or not, based on two factors: (1) whether it shows high correlations with other indicators of the same construct, which can be done by examining its collinearity with the others. (2) When an indicator does not significantly contribute to a construct relatively/absolutely, which can be done by assessing the statistical significance of the respective indicators (Hair, 2014a). Based on this premise, the VIF values for the construct Digital Capability was inspected.

Table 4. 4: VIF values for Digital Capability

Item code	VIF
DC 1	5.040
DC 2	5.457
DC 3	5.295
DC 4	5.313

Source: survey data

As it was be observed, all the items were above 5, indicating a possible issue with multicollinearity, which could lead DC to becoming a redundant variable. To identify the impact on Cronbach's alpha if each of these items are removed, therefore, a reliability analysis was performed in SPSS (refer Table 4.5).

Table 4. 5: Reliability analysis for DC

Item-Total Statistics				
Variable code	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
DC1	14.990	14.575	0.878	0.948
DC2	14.930	14.660	0.886	0.947
DC3	14.820	15.102	0.896	**0.946**
DC4	15.060	14.788	0.889	**0.946**
DC5	14.920	14.852	0.860	0.951

Source: survey data

When inspecting this result, it was seen that the least Cronbach's Alpha value below 0.95 can be obtained when either DC 3 or DC 4 is removed. In order to decide which item to remove, therefore, the second criteria prescribed above by Hair et al. (2014a), to inspect the contribution each item had on the construct was examined (refer Table 4.6). This can be done by looking at the outer loadings/ factor loadings of the items, which describe each item's absolute contribution to an associated construct (Hair et al., 2014a).

Table 4. 6: Outer loadings of DC

Component Matrix[a]	
DC1	0.922
DC2	0.926
DC3	0.934
DC4	**0.929**
DC5	0.913
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	

Source: survey data

According to the above table, it was evident that when comparing between DC 3 and DC 4, the least contribution to the construct is done by DC4. Further, as prescribed by literature, in this instance, the researcher has also observed that the questions explaining DC 3 and DC4 both account for a similar meaning.

- DC 3 - Responding to digital transformation
- DC 4 - Mastering the state-of-the-art digital technologies

Here, since mastering the state-of-the-art digital technologies is considered to be a part of responding to digital transformation (Khin & Ho, 2018), both items could be considered to be very much related to each other and therefore, removal of DC4 was not going to affect the content validity of the construct considerably. Therefore, based on the above assessments, it was decided by the researcher to delete the item DC 4, in order to improve the reliability of the model.

When considering Organizational Learning (OL), the Cronbach's alpha and composite reliability were 0.937 and 0.955, respectively. It was observed that both values were above the minimum threshold of 0.7 and, Cronbach alpha was below the maximum threshold of 0.95 as well. Since both values were well within the accepted threshold range, the construct reliability of OL was established.

The next considered independent variable was Transformational Leadership (TL). The Cronbach's alpha value was 0.921 and composite reliability value was 0.938. Since both these values were above the minimum threshold value of 0.7 and Cronbach alpha was below the maximum threshold of 0.95, the construct reliability of TL was established.

The final independent variable considered was Top Management Support (TMS). In this variable, the Cronbach's alpha value was 0.948 and composite reliability value was 0.960. Since both these values were above the minimum threshold value of 0.7 and Cronbach alpha was below the maximum threshold of 0.95, the construct reliability of TMS was established.

When considering the variable Digital Innovation (DI), the Cronbach's alpha and composite reliability values were 0.923 and 0.924. Since both these values were above the minimum threshold value of 0.7 and Cronbach alpha was below the maximum threshold of 0.95, the construct reliability of DI was established.
Where the dependent variable Organizational Performance (PER) was concerned, The Cronbach's alpha and composite reliability values were 0.945 and 0.953, respectively. Since both these values were above the minimum threshold value of 0.7 and Cronbach alpha was below the maximum threshold of 0.95, the construct reliability of PER was established.

- **Indicator reliability**

Indicator reliability measures to what extent the variance of a measurement item could be explained by its related variable (Hair et al., 2011). Each indicator's loading value should be greater than 0.7 for composite reliability to be ensured (Hair et al., 2011). Further, when the loadings of an indicator are between 0.4 and 0.7, two other factors to consider before deleting it are, whether deleting those indicators would improve the composite reliability or the Average Variance extracted (AVE) above the threshold value, and the impact of

deletion on the content validity (Hair et al., 2011). Therefore, it is not always recommended to delete indicators with lower loadings if they impact the content validity negatively (Hair, 2014a). However, indicators with outer loadings below 0.4 should always be deleted (Hair et al., 2011). The indicator loadings for each measurement item of this study are provided in Appendix V, and a detailed explanation of the indicator reliability is provided in the next section.

When considering the variables COM, CUL, DC, OL, PER, TL and TMS, it was observed that the indicator loadings of all the items that were used to measure the variable were above the threshold value of 0.7. However, when considering Digital Innovation (DI), all the item loadings, except for DI3, were above the threshold. DI3 corresponded to a value of 0.668, which was below the threshold of 0.7. According to Hair et al. (2019), deletion of items based on the indicator loadings is permitted based on the impact of the deletion on the content validity or the reliability of the model. Hence, the impact of deletion was considered at this point. It was observed that, the AVE value, which was 0.675 before deleting the variable, improved up to 0.722 after deleting DI3. Further, the Cronbach's alpha and composite reliability values which were at 0.919 and 0.925 initially, were transformed to 0.923 and 0.924, which were still within the accepted limit, which meant that the internal consistency will not be adversely affected due to deleting the item. Therefore, it was decided to delete the item DI3. This further assured that the model's convergent validity was established.

4.5.2 Validity of the constructs and indicators

The degree to which a research instrument measures what it claims to measure is referre d to as validity (Blumberg et al., 2005; Robson & McCartan, 2011). Validity assures that the research instrument measures the concepts in the study correctly (Pallant, 2010). This study employed convergent validity and discriminant validity tests to determine the validity of constructs, as recommended by Hair et al (2011).

- **Convergent validity**

This measures the extent to which the measurement items of a particular construct positively correlate with the remaining measurement items of the same construct (Hair et al., 2014). In order to ensure convergent validity, the Average Variance Extracted (AVE) should be greater than 0.5 (Hair et al., 2011). If the AVE values are greater than 0.5, it means that above half of the variance of the indicator is explained by the latent variable (Hair et al., 2011). The results of AVE for the measurement model of this study are tabulated in Table 4.7 below, followed with a detailed explanation.

Table 4. 7: AVE values of the constructs

Variable code	Average Variance Extracted (AVE)
COM	0.669
CUL	0.722
DC	0.856
DI	0.675
OL	0.840
PER	0.720
TL	0.716
TMS	0.827

Source: survey data

When considering the variables COM, CUL, DC, DI, OL, PER, TL and TMS, it was observed that The AVE values of all the variables were above the threshold value of 0.5. Therefore, it was concluded that the indicators of all the constructs had a satisfactory level of correlation with the other indicators/measures of the relevant construct.

- **Discriminant validity**

Discriminant validity explains the extent to which a certain construct is distinct from the rest of the constructs of the model, as prescribed by practical standards. As explained in section 3.7.6., the discriminant validity of this study was examined with reference to three methods. First method was with reference to the cross loadings of the indicators. Hair et al. (2011) prescribed that, outer loadings of an indicator on a particular associated construct should be greater than the rest of the loadings on the remaining constructs (cross loadings), in order to ensure discriminant validity. The second method, Fornell-Larcker criterion, compares the square root of the AVE values with the correlations of the latent variable. Here the square root of the AVE of each construct should be higher than its highest correlation with any remaining construct, for discriminant validity to be ensured according to Hair et al. The third method was the HTMT ratio proposed by Henseler et al., (2015). The heterotrait-monotrait ratio is defined as the mean of item correlations across constructs (heterotrait-heteromethod correlations) compared to the (geometric) mean of average correlations for items measuring the same construct (monotrait-heteromethod correlations) (Hair et al., 2019). The threshold value for HTMT ratio in order to ensure discriminant validity, is 0.90. (Gold et al., 2001). That means, the HTMT ratio should be under the prescribed value of 0.90 for ensuring discriminant validity (Hensler et al, 2015). The results of the Fornell Larcker criterion and the HTMT ratio are tabulated in Table 4.8 and Table 4.9 below, and the cross loadings are tabulated in Appendix VI. The description that follows provides a detailed explanation on the discriminant validity of the model.

Table 4. 8: Fornell Larcker criterion

	COM	CUL	DC	DI	OL	PER	TL	TMS
COM	**0.818**							
CUL	0.677	**0.850**						
DC	0.512	0.534	**0.925**					
DI	0.589	0.585	0.684	**0.850**				
OL	0.691	0.724	0.477	0.621	**0.917**			
PER	0.617	0.556	0.396	0.457	0.606	**0.848**		
TL	0.667	0.719	0.459	0.557	0.671	0.566	**0.846**	
TMS	0.683	0.710	0.561	0.646	0.673	0.503	0.807	**0.909**

Table 4. 9: HTMT ratio

	COM	CUL	DC	DI	OL	PER	TL	TMS
COM								
CUL	0.754							
DC	0.556	0.575						
DI	0.649	0.633	0.725					
OL	0.762	0.786	0.503	0.664				
PER	0.663	0.59	0.399	0.462	0.633			
TL	0.74	0.784	0.482	0.592	0.716	0.594		
TMS	0.741	0.764	0.586	0.687	0.715	0.516	0.859	

When considering open communication (COM), the cross loadings of all the remaining constructs were less than the outer loadings for COM, ensuring the discriminant validity of the construct. Further, the square root of the AVE was less than the variable's highest squared correlation with the rest of the variables, ensuring the fulfillment of the Fornell-Larcker criterion. The HTMT ratio for COM is satisfied since all the values were below 0.9 – which meant that the indicators of this construct showed an acceptable level of

correlation with remaining indicators which are used to measure the other constructs within the model.

When considering the next independent variable, organizational culture (CUL), The cross loadings examination ensured the discriminant validity of the construct, since the cross loadings of all the other constructs were less than that of the outer loadings of CUL. The Fornell Larcker criterion was satisfied since the square root of the AVE was less than CUL's highest squared correlation with the rest of the variables. HTMT ratio was satisfied since all the corresponding values were less than 0.9. Therefore, it was concluded that the discriminant validity of the variable was ensured.

Digital Capability (DC) was the next variable. The cross loadings examination ensured the discriminant validity of the construct since the cross loadings of all the other constructs were less than that of the outer loadings of DC. Where the Fornell Larcker criterion was concerned, the square root of the AVE was less than DC's highest squared correlation with the rest of the variables. The HTMT ratio values were all under 0.9, proving the discriminant validity. This implied that the variable DC had distinct items which captured a significant amount of variation in the DC variable, ensuring the discriminant validity.

When considering Organizational Learning (OL), the cross loadings of all the other constructs are less than that of the outer loadings of OL. The Fornell Larcker criterion values were all within the accepted range since the square root of the AVE was less than OL's highest squared correlation with the rest of the variables. The HTMT ratio values were satisfied since all the values were under 0.9. Therefore, the discriminant validity for OL was ensured.

The next considered independent variable was Transformational Leadership (TL). When analysing the discriminant validity under cross loadings, it was evident that all the remaining cross loadings were less than the item loadings of TL. The square root of the AVE was less than TL's highest squared correlation with the rest of the variables.

Therefore, the Fornell Larcker criterion values were satisfactory. The values corresponding to the HTMT ratio were also satisfactory since all the corresponding values were below the threshold of 0.9. This meant that when considering the TL variable, discriminant validity was ensured.

The final independent variable considered was Top Management Support (TMS). When cross loadings were concerned, all the item loadings were greater than the rest of the cross loadings. The Fornell Larcker Criterion was satisfied since the square root of the AVE was less than TMS's highest squared correlation with the rest of the variables, and HTMT ratio was also fulfilled since all the corresponding values were less than 0.9. Hence, it was justifiable to state that the discriminant validity for TMS was established under all three methods of assessment.

When considering Digital Innovation (DI), the cross loadings of the rest of the items are all lower than the item loadings of DI. The Fornell Larcker criterion confirmed that the square root of AVE of DI was higher than the highest squared correlation of the rest of the latent constructs in the model. The HTMT ratio for DI was also within the accepted range, since all corresponding values were less than 0.9. This ensured the discriminant validity for DI under all the three criteria.

Where the dependent variable Organizational Performance (PER) was concerned, the Fornell Larcker criterion was satisfactorily fulfilled since the square root of AVE of PER was higher than the highest squared correlation of the rest of the latent constructs in the model. The item loadings of PER were all greater than the cross loadings of the rest of the items. Further, HTMT ratio for PER was satisfied, since all the corresponding values were less than 0.90. Therefore, the criteria pertaining to ensuring discriminant validity of PER were ensured.

4.6 Evaluation of the structural model

As explained earlier (section 4.4), the structural model needs to be evaluated after the evaluation of the measurement model. The structural/inner model of a study represents the constructs and the relationships between constructs. Once it is confirmed that there is a satisfactory level of reliability and validity in the constructs and measures, the next stage is to assess the results of the structural model (Hair et al., 2019). Here, the predictive capability of the model and the relationships between the constructs is assessed (Hair, 2014a). This assessment is done with reference to testing for multicollinearity, the coefficient of determination (R^2), size and the significance of the path coefficients (testing of hypotheses), the effect size (f^2) and the predictive relevance (Q^2). The next section of the study presents the results obtained under each of these criteria, along with an interpretation of the results.

4.6.1 Multicollinearity

Multicollinearity refers to a high amount of correlation between two or more independent variables in a multiple regression model (Sekaran & Bougie, 2009). The first stage of evaluating the structural model involves examining it for collinearity, which could be done using the Variance Inflation Factor (VIF) (Hair et al., 2019). It has been prescribed that, to evade issues of multicollinearity, tolerance value of each predicting variable should be above 0.2 or its VIF value has to be less than 5. If the values fall outside these limits, they should be eliminated, since these could indicate a possible multicollinearity issue - which means that the independent predictor variables could be highly correlated with each other (Hair et al., 2014).

The VIF values related to the structural model were obtained through SPSS in order to make this assessment (refer Table 4.10).

Table 4. 10: Collinearity statistics

Coefficients[a]							
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**Collinearity Statistics**	
	B	**Std. Error**	**Beta**			**Tolerance**	**VIF**
	0.485	0.280		1.731	0.086		
TL	-0.040	0.106	-0.039	-0.374	0.709	**0.298**	**3.358**
TMS	0.212	0.099	0.229	2.128	0.035	**0.279**	**3.585**
COM	0.128	0.104	0.109	1.226	0.222	**0.404**	**2.472**
CUL	-0.039	0.099	-0.038	-0.393	0.695	**0.340**	**2.938**
OL	0.227	0.087	0.240	2.597	0.010	**0.378**	**2.646**
DC	0.352	0.062	0.409	5.694	0.000	**0.626**	**1.598**

a. Dependent Variable: DI

When observing the Table, all the VIF values were less than 5, and had tolerance values above 0.2, indicating no issues in multicollinearity.

4.6.2 Coefficient of determination (R^2)

The coefficient of determination (R^2), which is known as a measure of the model's explanatory power, is used to describe the variance explained by the dependent variables (Shmueli & Koppius, 2011). There are different threshold values regarded as the significance level of R^2 in different studies according to different disciplines. For example, in consumer behavior disciplines, 0.20 is regarded as a high value, where as in marketing related researches, values of 0.75, 0.50 or 0.25 are regarded as substantial, moderate or weak as a rule of thumb (Hair et al., 2011). Additionally, values 0.67, 0.33 or 0.19 accounts for substantial, moderate, and weak correlations respectively in certain studies (Vinzi et al., 2010; Haenlein & Kaplan, 2004).

For the purpose of this study, as prescribed by Hair et al. (2014), an R^2 value of 0.20 was considered as the threshold for the key dependent variables. The adjusted R^2 value is computed in order to remove the biasness in complex models with multiple regression (Hair et al., 2014). Accordingly, two key dependent variables could be identified in the current study: Digital Innovation (DI) and Organizational Performance (PER). The adjusted R^2 value for DI was 0.592, and for PER it was 0.203. This indicates that the R^2 is satisfactory and 59.2% of the variation in innovation has been explained and is moderately influenced by the independent variables and that 20.3% of the variation in organizational performance is explained and is weakly influenced (Vinzi et al., 2010) by digital innovation (refer Table 4.11).

Table 4. 11: Coefficient of determination (R^2)

Dependent variable	R Square	R Square Adjusted
DI	0.611	0.592
PER	0.209	0.203

Source: Survey data

4.6.3 Testing of hypotheses

Usually, path coefficients range between a range of standardized values between -1 and +1. If the value is close to +1, it is said to represent a strong and positive relationship and vice versa if negative (Hair et al., 2014). In order to assess the path coefficients, bootstrapping should be conducted using 5000 bootstrap samples in PLS SEM (Hair et al., 2011). The critical threshold t values for two tailed tests are prescribed as 1.65, 1.96 and 2.58 when the significance levels considered are 10%, 5% and 1% respectively (Hair et al., 2011). For two tailed tests, commonly used t value at 5% significance level is 1.96 (t value > 1.96, p <0.05). (Hair et al., 2014). Figure 4.8 represents the path diagram, indicating the t values between the relationships shown in the model.

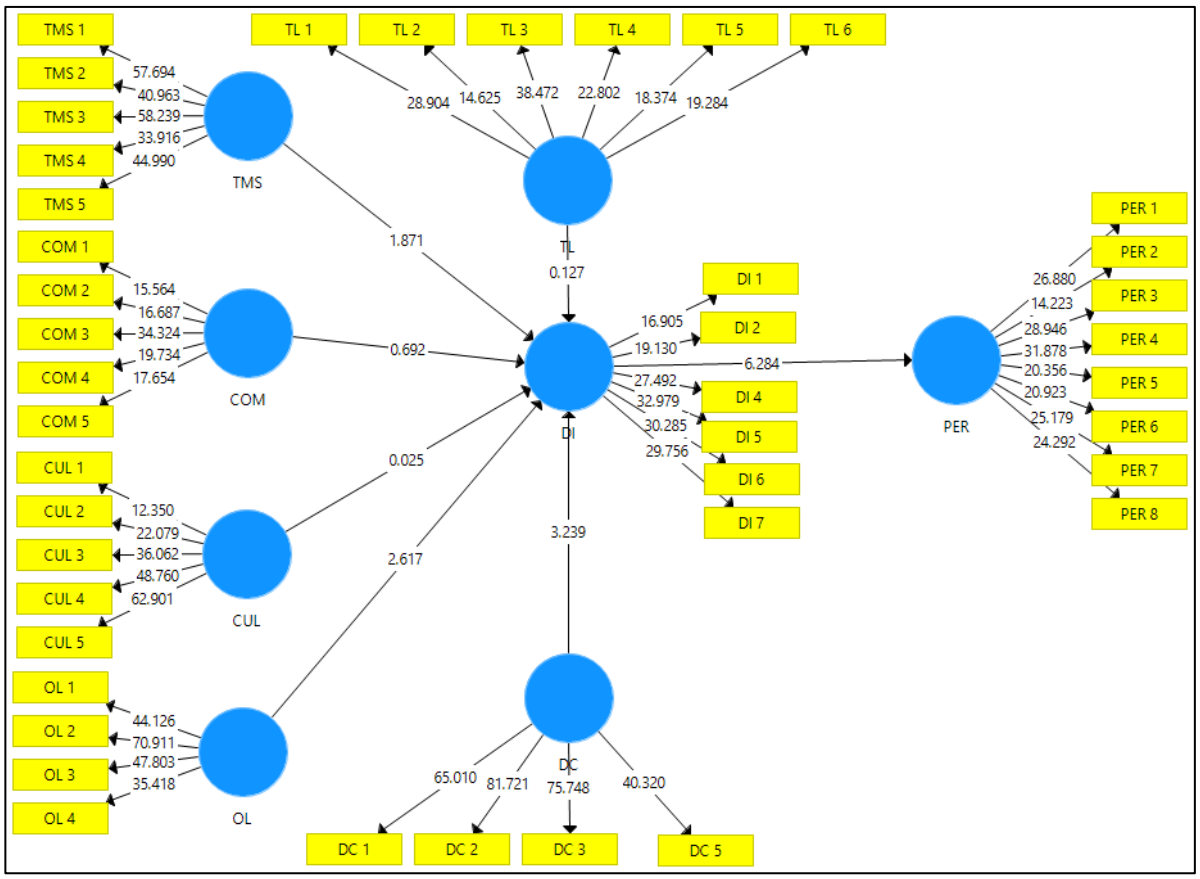

Figure 4.8: Bootstrapping output of the final model

The p value obtained through bootstrapping procedure may also be used to decide if the path coefficient is significant (Hair et al., 2014). In structural model evaluations, the p value represents the likelihood of error in assuming that a given path coefficient is significantly different from zero. If the path coefficients of the model are significant, it is considered that the previously established hypotheses are accepted, and vice versa (Hair et al., 2011).

Thus, the significance of the hypotheses of this particular study were tested using empirical t values at 5% significance level (threshold value 1.96) (Hair et al., 2014) and *p* values at 95% confidence level (threshold value 0.05) (Hair et al., 2014) (refer Table 4.12).

Table 4. 12: Path coefficients and hypotheses testing

Hypotheses	Path	T statistic	P values	Decision
H1	TL → DI	0.127	0.899	Not Supported
H2	TMS → DI	1.871	0.061	Not Supported
H3	COM → DI	0.692	0.489	Not Supported
H4	CUL → DI	0.025	0.980	Not Supported
H5	**OL → DI**	**2.617**	**0.009**	**Supported**
H6	**DC → DI**	**3.239**	**0.001**	**Supported**
H7	**DI → PER**	**6.284**	**0.000**	**Supported**

Source: survey data

Accordingly, when the first hypothesis was concerned, where it was stated that transformational leadership is positively related to digital innovation, the t value was 0.127, which was below the stipulated threshold of 1.96. Moreover, when the p value was considered at 95% confidence level, it was recorded as 0.899, which was above the cutoff value of 0.05. Therefore, even though there was a positive relationship between transformational leadership and digital innovation, it was not significant. Hence, H1 was not supported.

When the second hypothesis was concerned, which was stated as top management support is positively related to digital innovation, the associated t value between top management support and digital innovation was 1.871, which was also below the threshold of 1.96. Further, the p value recorded 0.061, which dissatisfied the 0.05 threshold for significance at 95% confidence level. Hence, it could be concluded that, even though there was a positive relationship between top management support and digital innovation, it was not significant. Hence, H2 was not supported.

The third hypothesis stated that open communication is positively related to digital innovation. The t value relevant to the variable was 0.692, which was below the stipulated threshold of 1.96, indicating an insignificant, positive association between the two

variables. When probed further, the corresponding p value was 0.489, which was above 0.05 at the 95% confidence level. Therefore, it could be concluded that even though there was a positive relationship between open communication and digital innovation, it was not significant. Hence, H3 was not supported.

H4 stated that organizational culture is positively related to digital innovation. When inspecting the t value, it could be observed that it is 0.025 which was less than the threshold (1.96), indicating an insignificant relationship with digital innovation. When the p value was further considered, it corresponded to 0.980, which was also above the critical value 0.05 at 95% confidence level. Therefore, it could be concluded that, even though there was a positive relationship between organizational culture and digital innovation, it was not significant. Hence, H4 was not supported.

H5 stated that organizational learning is positively related to digital innovation. The t value between OL and DI was 2.617, indicating a significant, positive relationship between the two variables since it was above the threshold of 1.96. The p value further complimented this with a value of 0.009, which was satisfactorily below the critical value of 0.05. Therefore, it could be concluded that, organizational learning was positively and significantly related to digital innovation. Hence, H5 was supported at 95% confidence level.

The next hypothesis was that digital capability is positively related to digital innovation. When inspecting the t value, it could be observed that it was at a level of 3.239, which was above the threshold 1.96. This indicated a significant, positive relationship between digital capability and digital innovation, and when the significance was further inspected, the p value is at 0.001, which, also was below the critical value of 0.05 as required. Hence, it could be justified that digital capability was significantly and positively related to digital innovation. Hence, H6 was supported at 95% confidence level.

The last hypothesis has stated that digital innovation is positively related to organizational performance. The path coefficient between digital innovation and organizational performance was 6.284, which was well above the threshold of 1.96. Where the significance of the relationship was concerned, it could be stated that the p value was at 0.000, which was well below the accepted critical value. Hence, it was concluded that digital innovation was significantly and positively related to organizational performance, therefore, H7 was accepted at 95% confidence interval.

This analysis means that, in summary, out of the seven hypotheses that were tested, only three (H5, H6, and H7) were supported and four hypotheses (H1, H2, H3 and H4) were not supported.

4.6.4 The effect size f^2

The effect size has a further ability of measuring the impact each independent variable has on the dependent variable. Specifically, this value explains how much an independent variable contributes to the R^2 value of a designated variable in the structural model (Hair et al., 2014). According to Cohen (1988), small, medium, and large effect sizes are respectively represented through f^2 values, 0.02, 0.15 and 0.35, respectively. According to Kenny (2016), 0.005, 0.01, and 0.025 are more realistic standards for small, medium, and large effect sizes, respectively. For the purpose of this study, the threshold values prescribed by Kenny (2016) were employed in order to determine the effect size. The f^2 values for the model, calculated for this purpose, are depicted in Table 4.13.

Table 4. 13: The effect size f^2

Scenario	Dependent variable: DI		
	R^2 included	**R^2 excluded**	**f^2**
TL	0.611	0.61	0.003
TMS	0.611	0.599	**0.031**
DC	0.611	0.497	**0.293**
OL	0.611	0.59	**0.054**
CUL	0.611	0.611	0.000
COM	0.611	0.608	0.008

Source: survey data

According to the Table 4.13 and based on the threshold values prescribed by Kenny (2016), it was evident that there was a small effect from TL, CUL and COM on digital innovation. Further, according to f^2 statistic, TMS, DC and OL were observed to have a large effect on DI. This observation made on DC and OL was also consistent with the path coefficient analysis which proved that DC and OL both had a significant, positive influence on DI.

4.6.5 Predictive relevance (Q^2)

The Q^2 value of Stone-Geisser (Geisser, 1974; Stone, 1974) indicates a model's predictive relevance. To elaborate, a model's predictive relevance is described as its ability to accurately predict the data points of the dependent variables' items as well as single-item dependent variables in reflective measurement models (Hair et al., 2014). This value is obtained by utilizing a procedure called blindfolding for a specified omission distance (*d*). Here, every *d*th data point of the data set of the dependent variable items are removed, treated as missing values when running the algorithm for PLS and the resultant estimates, in turn, are then used for predicting the data points that were omitted (Henseler et al.,

2009). The difference between the removed data points and the predicted data points are used subsequently as an input for calculating the Q^2 value. This process is repeated until each data point of the dependent variable is omitted and the data model is re-estimated (Hair et al., 2014). In the structural model, if a Q^2 value is observed to be greater than zero (Hair et al., 2011) for a specified dependent variable, that shows the predictive relevance of the path model for the particular variable considered. The predictive relevance of the structural model of this particular study is depicted in Table 4.14.

Table 4. 14: The predictive relevance (Q^2)

	Total Q^2 value	**Case 1**	**Case 2**	**Case 3**	**Case 4**	**Case 5**	**Case 6**	**Case 7**
DI	0.421	0.457	0.433	0.405	0.324	0.393	0.447	0.474
PER	0.129	0.133	0.189	0.106	0.174	0.071	0.132	0.089

Source: survey data

According to the Table above, it was evident that, in all the cases throughout case 1 – case 7, the predicted values were above zero. Hair et al. (2014a) stated that Q^2 values greater than zero indicate a high predictive relevance. In all of the above cases, it was observed that there was a high predictive relevance in the model, therefore.

The next section of the report is dedicated to a comprehensive discussion based on the results of the data analysis presented thus far.

4.7 Discussion of findings

As mentioned in chapter 1, the present study was conducted with the intention of fulfilling the following key research objectives:

1. To identify the critical success factors for digital innovation
2. To assess the impact of identified critical success factors on digital innovation
3. To assess the impact of digital innovation on organizational performance

The research and analytical methods of this study were geared with the intention of achieving each of these objectives. Accordingly, a comprehensive literature analysis of research published in the last ten years was conducted to determine the factors that influenced digital innovation, which was the first objective listed above. Based on the literature review, six factors which had a positive relationship with digital innovation were identified, as well as it was determined that digital innovation had a significant, positive effect on organizational performance. Based on these observations made through literature, research hypotheses and the conceptual framework were developed.

The second and third objectives were fulfilled by means of the data analysis performed. The data analysis consisted of a descriptive statistics analysis to understand the demographic data, assessments to test the reliability of the constructs and indicators, and assessments to test the validity of constructs and indicator. This was followed by an evaluation of the structural model, which included tests to inspect multicollinearity, explanatory power of the model, significance of the path coefficients, effect size of independent variables on dependent variables and the predictive relevance of the model. Based on the assessment of path coefficients, it was observed that three out of the initially hypothesized relationships were supported and four were not supported. As a result, the factors that had a positive and significant effect on digital innovation were identified, fulfilling the second research objective. The third research objective was also fulfilled, as it was observed that digital innovation had a significant, positive effect on organizational performance. The following sections discuss the findings pertaining to each of the objectives mentioned above, with proper justifications in relation to previous literature where necessary.

4.7.1 Objective 1: To identify the critical success factors for digital innovation

One of the key objectives of the study was to identify what are the critical success factors which influence digital innovation at organizational level. In order to fulfill this objective, an extensive literature review was carried out, as explained in chapter 02, where the factors

which had mostly considered to be impactful for digital innovation based on past research were selected to develop the conceptual framework.

Through the previous studies, various factors influencing digital innovation have been suggested, such as digital capability (Khin & Ho, 2018; Westerman et al., 2014; Wiesböck & Hess, 2018), organizational learning (Hsiao et al., 2014; Montreuil et al., 2020; Sanz-Valle et al., 2011; Sutanto, 2017), adaptive culture (Montreuil et al., 2020; Prima Lita et al., 2020; Sousa-Zomer et al., 2020), open communication (Basoglu et al., 2013; Linke & Zerfass, 2011; Montreuil et al., 2020), top management support (Kim et al., 2012; Montreuil et al., 2020; Shaar et al., 2015) and transformational leadership (Jaiswal & Dhar, 2015; Mokhber et al., 2017; Westerman et al., 2014). Based on the literature, the conceptual framework was then developed by using these identified factors and hypothesized relationships, to find out whether the identified factors have a positive impact on digital innovation of an organization. Hypotheses were then proposed to depict the relationships observed among the factors identified.

4.7.2 Objective 2: To assess the impact of identified critical success factors on digital innovation

Findings of this study contradict those of Montreuil et al. (2020) and (Mokhber et al., 2017), who have suggested that there is a significant positive effect of transformational leadership on digital innovation. Contrary to the hypothesized association, the results indicated that transformational leadership does not significantly influence digital innovation. It showed a p value of 0.899 ($p>0.05$) at 5% significance level.

However, there have also been inconsistent findings on the impact of transformational leadership on innovation. For example, there have been findings which suggested that among the sub-dimensions considered under transformational leadership suggested by Bass & Riggio (2006) – intellectual stimulation, individualized consideration, idealized influence and inspirational motivation, idealized influence has a non-significant

relationship with innovation (Al Ahmad et al.,2019 ; Jaussi and Dionne, 2003; Li et al., 2016). Jaussi and Dionne (2003) further suggested that even if a person is not a transformational leader, any unconventional behaviours shown by a person may be more incidental for innovative outcomes, and these unconventional behaviours explain more variation in innovative outcomes than transformational leadership. Based on these facts, it can be stated that transformational leadership may not always be a guaranteeing factor for organizational innovation, since people with unconventional behaviors within organizations, could also be highly influential for the innovative outcomes of those organizations, even though they are not labelled as transformational leaders. Further, all the traits of a transformational leader, as defined by Bass and Riggio, may not always have a significant effect on digital innovation.

Further, top Management support was also found to have no significant effect on digital innovation, with a p value of 0.061 ($p>0.05$) at 5% significance level. This finding is contrary to several previous studies such as Shaar et al. (2015) who found that the top management support significantly affects innovation. Further, Elenkov and Manev (2005) have suggested that there is a significant influence of top management on innovation. Montreuil et al. (2020) have further concluded that management support has a positive influence on an organization's capability to innovate.

However, a study conducted to determine the influence of leadership commitment on technological innovation, has concluded that management support has a non-significant effect on implementing innovation and innovation implementation policies within an organization (Klein et al., 2001). They further suggested that organizational differences in implementation of innovation have a major effect on management support, and that in certain contexts, innovation implementation specialists such as technicians could occupy a more central role in the development and implementation of innovative practices such as technology training, support for users and software / hardware quality and accessibility. Therefore, Klein et al. suggested that they may be more incidental in deciding the quality

of the innovation implementation process. Hence, it can be concluded that, due to contextual differences in innovative climates and implementation of innovation that could persist within organizations, the top management support could have a non-significant relationship with digital innovation.

The findings of the study further suggested that there was no significant effect of open communication on digital innovation. The p value relevant for the relationship between open communication and digital innovation was 0.489 ($p>0.05$) at 5% significance level. This finding is inconsistent with the several previous studies which have suggested a positive relationship between communication and innovation (Basoglu et al., 2013; Linke & Zerfass, 2011; Montreuil et al., 2020).

However, a recent study has also posited that communication among team members may have a positive yet not significant impact on innovative idea generation (Grözinger et al., 2020). They have suggested that this could be due to frequent communication efforts blocking productivity, and constant evaluative communication apprehending innovative ideas (Diehl & Strpebe, 1987; Grözinger et al., 2020). Thus, it could be seen that collaboration and communication may not always be necessary for unique, innovative idea generation.

The results of the study further indicated that there is no significant effect of organizational culture on digital innovation. The corresponding p value was 0.98 ($p>0.05$) at 5% significance level. This finding was inconsistent with several previous researches that had posited that the organizational culture affected positively and significantly on innovation (Aboramadan et al., 2019; Montreuil et al., 2020; Nguyen et al., 2019; Lita et al., 2020; Sousa-Zomer et al., 2020).

However, studies have posited that the connection between organization's culture and its innovative strategy are not significantly related to the speed and the quality of innovation

of an organization (Chen et al., 2018). They have further elaborated that it is the extent to which how well an organization's innovation strategy is implemented based on its culture, which decides the differences in innovation performances between organizations. Further, they have highlighted that the organizations need to have an understanding on different configurations of organizational culture applicable to innovation strategic groups, which could be incidental in driving the organization towards higher speed of innovation and quality of innovation. These findings were further supported by another study which suggested that there is no significant relationship between clan culture and organizational innovation, neither a significant relationship between market culture and organizational innovation (Naranjo-Valencia et al., 2016). They further suggest that although traits such as teamwork are inherent in clan cultures are influential for innovation, they may be effective only when remaining values pertaining to external orientation are present. It has also been posited that market cultures which are more oriented towards the external environment are supportive of innovation, they may hinder innovation where there is a mechanistic structure, excessive hierarchies, focus on too much details and excessive pressure on employees (Naranjo-Valencia et al., 2016). They conclude that although organization culture may foster innovation, it can also act as an obstacle against innovation. According to these facts, it could be implied that organizational culture may not always be a positive influence on innovation, and that it may depend on different cultural contexts observed within different organizations.

Another finding of the study was that there is a significant, positive association between organizational learning digital innovation. The relationship between organizational learning and digital innovation showed a p value of 0.009 ($p<0.05$) at 5% significance level. This finding is consistent with the findings of previous studies which have also posited a significant, positive relationship between organizational learning and innovation (García-Morales et al., 2011; Hsiao et al., 2014; Montreuil et al., 2020; Sutanto, 2017; Tohidi et al., 2011). This positive association is in accordance with the argument that learning acts as an enabler in organizational capacity to innovate, where there is an

advancement in existing knowledge (March, 1991). Learning is also regarded as an important factor for organizational innovation since it permits organizations to realize the mistakes by themselves and their competitors and correct them with the view of adapting to their environment (Nouri et al., 2016). This finding was further consistent with the suggestion that individual expertise of employees and new knowledge entering the organization is incidental in nurturing innovation (Lin, 2007).

According to the results derived through the analysis, it was identified that digital capability has a significant positive impact on digital innovation, with a p value of 0.001 ($p<0.05$) at 5% significance level. This finding was consistent with the previous studies done by Khin and Ho (2018), who have found a significant positive relationship between digital capability and innovation, proving that it is an important factor which drives digital innovation within organizations. This finding is also consistent with the suggestions by Wiesböck and Hess (2018) and Westerman et al. (2014), who have stated that digital capability has a positive influence on innovation. Further, this finding further solidifies that organizations ought to strengthen their abilities, skills, and expertise they have in technological applications and digital infrastructure in order to improve decision making, work processes and new product and processes development, so that they could result in digital innovation within the organization (OECD, 2020).

4.8.3 Objective 3: To assess the impact of digital innovation on organizational performance

The third key objective of the study was to assess the impact of digital innovation on organizational performance. To ascertain this, the final results of the data analysis can be considered. According to the data analysis, it was evident that 20.3% of the variation in organizational performance is explained by digital innovation according to the conceptual model (adjusted $R^2 = 0.203$) and that the organizational performance was weakly influenced (Vinzi et al., 2010) by digital innovation. When comparing this measure with past literature, Al-Ansari et al. (2013) have stated that, in their study to determine whether

there was a significant relationship between innovation and performance of the business within the context of Dubai, 27.6% of the variation in performance was explained with innovation (adjusted $R^2 = 0.276$). Adjusted R^2 on the effect of innovation on performance has been recorded as 0.269 in a study done by Hao et al. (2012), within the context of China. These results from previous studies, however, cannot be directly compared to the results of this study, due to differences in techniques and research settings that may have been followed in other studies. They do, however, imply that the model developed for this study explains the variance in a way that is closely related with previous research within the domain. (Renko et al., 2009). The low adjusted R-square value between digital innovation and organizational performance in this study, on the other hand, suggests that there are other, more relevant factors that influence organizational performance, that were not considered in this study (Wei et al., 2009).

Further, in this study, a significant influence of digital innovation on organizational performance was established with a p value of 0.000 ($p<0.05$) at 5% significance level.

When comparing this finding with previous literature, Camisón & Villar-López (2014) have shown that the effect of organizational innovation on organizational performance was significant where $p < 0.05$. Kafetzopoulos and Psomas (2015) have concluded according to their study that innovation capability significantly influenced performance with a p value of 0.000 ($p < 0.001$). Innovativeness has further been proposed to have a significant positive impact on performance of an organization by Rhee et al. (2010), whose study has indicated that $p < 0.01$. Valmohammadi (2017) has indicated a positive and significant influence of innovation capability on organizational performance at $p < 0.05$.

Thus, the findings of this study and the previous literature that have been examined, confirmed to the argument that characteristics of organizational innovation provide the organization the capability to create competitive advantage in the long run and the goal of

introducing organizational innovation is to improve the performance of a firm (Hamel, 2006).

4.8 Summary

This chapter presented a description on how the data were prepared for analysis and a presentation of the demographic profile of the respondents. The chapter has next elaborated on the descriptive statistics, which explained about the common method bias associated with the study, along with basic multivariate assumptions. Consequently, the structural equation model data were tested and explained, with reference to the measurement model and the structural model, where the validity and reliability of the indicators were tested, followed by a hypothesis testing. Based on the analysis, three out of seven hypotheses were supported. The next section of the study was dedicated to an extensive discussion on the findings of the research study, with reference to the research objectives, supported by previous literature as applicable.

5. CONCLUSION

5.1 Summary of the study

This study attempted to determine the factors which affect digital innovation and the impact of digital innovation on the performance of an organization. Digital innovation has been defined in different ways by various authors and has emerged from the concept of "innovation". As Drucker (2002) stated, innovation is regarded as the conversion of an idea into a product or service which creates value through new efficiencies in operations or new value propositions for customers. Digital innovation, for the purpose of this study, was regarded as "the creation of (and consequent change in) market offerings, business processes, or models that result from the use of digital technologies" (Nambisan et al., 2017, p. 224). The relationship between digital innovation and organizational performance has been studied by many researchers over the past (Al-Ansari et al., 2013; Canh et al., 2019; Hilman & Kaliappen, 2015; Khin & Ho, 2018; Montreuil et al., 2020; Naidoo & Hoque, 2018; Paladino, 2007; Rajapathirana & Hui, 2017; Valmohammadi, 2017). Many of these studies have tried to establish the impact digital innovation has on organizational performance, where innovation acts as a mediator between several independent variables and organizational performance (Khin & Ho, 2018; Paladino, 2007; Valmohammadi, 2017).

However, these studies have been carried out in different contextual backgrounds, covering different countries, economic sectors, organizations, respondent groups using different methodologies and analytical procedures. It was also noticed that the findings of the studies were inconsistent (Kohli & Jaworski, 1990; Mokhber et al., 2017). Further, even though digital innovation has gained attention as an emerging and popular field of study, literature pertaining to the same is still regarded to be at an infancy stage (Khin & Ho, 2018). Another important fact to notice was that most of the studies that have studied digital innovation, have looked at it from a technical perspective (Lyytinen et al., 2016) rather than from an organizational or managerial perspective (Khin & Ho, 2018).

With the view of filling the above research gaps identified, the current study was conducted with the intention of achieving the following research objectives:

1. To identify the critical success factors for digital innovation
2. To assess the impact of identified critical success factors on digital innovation
3. To assess the impact of digital innovation on organizational performance

In order to achieve the first objective mentioned above, an extensive literature review concerning studies done within the past ten years was conducted, thereby identifying the factors which affected digital innovation. Factors affecting digital innovation have been examined by researchers using two prominent theories, Resource Based View (RBV) and the Dynamic Capabilities Theory (DCT). Therefore, to explain the relationship between identified antecedent factors and digital innovation, this study used RBV and DCT. RBV has been often utilized to explain how organizations are enabled to achieve competitive advantage and better performance. DCT was used as one of the theories supporting the framework of this study since it is used to explain how organizations realize sustained competitive advantage and superior performance within a dynamic environment (Teece & Pisano, 1994). Further analysis of literature revealed the existence of six factors that affected digital innovation. Out of these, five factors were related to DCT, and they were transformational leadership, top management support, organizational culture, open communication, and organizational learning. One factor was related to both RBV and DCT - and it was digital capability. These six factors were then regrouped under managerial, organizational, and technological capabilities, based on theoretical justifications. Apart from this, the literature review revealed the existence of a positive and significant effect of digital innovation on organizational performance.

The development of the conceptual framework of this study took place consequently, based on these relationships and findings that were proposed through previous literature.

Seven hypotheses were then developed based on the relationships denoted in the conceptual framework.

This study followed a quantitative research method. Accordingly, distribution of a self-administered survey questionnaire was used as the primary method of collecting data from the respondents. An online questionnaire (google form) was distributed among selected groups, which returned a total of 135 usable responses for the study. The responses received were then analysed using a partial least square – structural equation modelling (PLS SEM) method, using the software Smart PLS 3. Further, SPSS software (version 21) was used for analysing descriptive statistics and the data cleaning process.

With reference to the second objective, the impact of the identified critical success factors (identified through the literature review) on digital innovation was analysed, where two factors were found to have a significant positive influence on digital innovation while four factors did not have a significant effect on digital innovation. Accordingly, digital capability and organizational learning were identified as the two factors which had a significant positive influence on digital innovation while transformational leadership, top management support, open communication and organizational culture did not have a significant influence on digital innovation.

The third objective tried to determine the impact of digital innovation on organizational performance, and the findings of the study proved that there was a significant, positive impact of digital innovation on organizational performance.

5.2 Theoretical implications

As mentioned in several studies within the domain, comprehensive models and literature are deemed to be lacking when it comes to identifying the antecedents for digital innovation and organizational performance (Khin & Ho, 2018; Loon et al., 2020; Vial, 2020). By realizing the objectives established at the outset, this study contributed to fill the above research gaps existing in the domain in several ways. Firstly, the researcher

conducted a comprehensive literature review, covering literature pertaining to ten years, from 2011 to 2020. The literature review revealed that different researchers have tested different factors affecting the digital innovation. The present study could identify the six most used factors affecting the digital innovation, which were repeatedly highlighted in the past literature. They were transformational leadership, top management support, open communication, organizational culture, organizational learning, and digital capability. This is one of the major contributions to the existing literature as this finding would benefit other researchers pursuing research in this field. Therefore, this study has contributed to filling the existing knowledge gaps with reference to empirical evidence.

Secondly, the conceptual framework developed for this study was unique in nature and had not been tested earlier. Therefore, this new framework has contributed to filling the knowledge gap existing within the subject area, and it would provide some insight to the researchers interested on this domain on the relationships existing between different factors and digital innovation. The value in this framework is increased as it included the extended relationship between digital innovation on organizational performance, which was very rarely tested so far in a single model together with antecedents of digital innovation by other researchers.

Thirdly, the findings of the study have further contributed to understanding the nature of the effect of several factors on digital innovation and how it is translated to organizational performance. The findings suggested that different types of factors may affect digital innovation at differing levels, depending on their contextual differences. Digital capability and organizational learning both had a positive and significant influence on digital innovation. However, transformational leadership, open communication, organizational culture, and top management support did not have a significant influence on digital innovation according to the analysis. Further, previous researchers had rarely examined the relationship between digital innovation and organizational performance, which was examined in this study. The findings posited that there is a significant, positive influence

of digital innovation on organizational performance. Therefore, this finding adds some new knowledge to an area where there is dearth of research.

Further, upon the examination of existing literature related to digital innovation and organizational performance, a dearth of studies in the local context was observed. Hence, this study addressed this local research gap existing within the domain as well.

5.3 Practical implications

Although the previous sections of the study have addressed the context of digital innovation mainly at a theoretical level, there are several important contributions from those sections for managerial practices as well.

Firstly, the conceptual framework used within the study could be used to understand and leverage the necessary determinants of digital innovation within different organizational contexts. Accordingly, this study identified six factors which impacted digital innovation within organizations, namely, transformational leadership, top management support, open communication, organizational culture, organizational learning, and digital capability. These factors were reclassified under organizational, managerial, and technological capabilities. These factors can provide an inference to organizations on specific factors which could have an impact on the digital innovation processes within their organizations, as well as at which level (organizational, managerial, or technological) these factors should be leveraged within the organization.

Secondly, the findings of the study could be operationalized by managers within their organizations. For instance, within sectors which are rapidly undergoing a digital transformation, in order to succeed in their digital innovation processes, the organizations should focus more on enhancing their digital capabilities and fostering organizational learning efforts, according to the findings of the study. This may mean investing more on technologies and digital infrastructure to develop new products, services, and work processes (OECD, 2020) and allowing new knowledge to enter and flow freely within the

organization (García-Morales et al., 2011) with the view of initiating new improvements within the organization and improving employee skills and capabilities (Milbratz et al., 2020), which can result in enhancing the digital innovation process in the organizations.

The findings also revealed that there is a significant effect of digital innovation on organizational performance. Thus, organizations are assured that the success in the digital innovation process results in better organizational performance. This finding can be used to focus on what needs to be promoted at an organizational level in order to foster digital innovation, which would in turn lead to better performance in the organization. The findings could further encourage managers to take necessary actions and decisions at individual, team, and organizational levels to build, lead and leverage a digitally innovative organization, and drive it towards better performance outcomes. In order to achieve this, it is imperative that the organization possesses the appropriate structure, culture, and work processes conducive for digital innovation (Hilmi et al., 2010).

Thirdly, the findings could also be helpful for government policy makers to promote digital innovation at a regional and national level as well, especially aiming organizations that are still rooted in traditional modes of business, and to communicate the importance of fostering a culture that supports digital innovation in order to achieve better organizational performance.

5.4 Limitations of the study

It is acknowledged that the current study consisted of several limitations. These limitations could lead way for additional investigations in future studies in the domain.

Data collection of the study mainly focused on organizations within the Western Province, that are already engaged in innovative practices, concerning the three main economic sectors (industry, trade, services), as prescribed by the Department of Census and Statistics.

Further, even though the minimum required sample size was 103, the researcher had planned to collect more than 200 responses since the greater the sample size, higher the reliability and validity of the findings. Further, the researcher had planned to collect responses covering a sample representing the entire Sri Lanka. The researcher had also planned to reach respondent organizations both via online and in person. However, visiting the organizations in person and travelling outside the province was difficult due to the travel restrictions and other strict health guidelines imposed due to the Covid-19 pandemic within the country. Due to these restrictions, the researcher had to restrict the study to the Western Province in Sri Lanka and had to rely only on online modes for collecting data. Further, even after three to four online reminders, the final usable responses only amounted to 135. Therefore, the generalization of the findings of this study needs to be done carefully, especially for other regions, organizations, and entirety of Sri Lanka.

Due to the restrictions mentioned above, the researcher also had to adapt a convenience sampling method and generalizing the results of convenience sampling method to the entire population could be questionable. Additionally, although this is a cross industrial study, since convenience sampling was followed, responses were not uniformly distributed across all three economic sectors considered for the study. Therefore, it is questionable whether the findings of the study could be equally generalized to all the three sectors considered.

5.5 Future research directions

A point to note is that, as argued by many researchers, the nature of what encompasses innovation is different in context, in diverse economic sectors (Drejer, 2004). For instance, in the service sector, innovation has been regarded as the introduction of a new product or service, or the reconfiguration/optimization of current services in a radical or incremental style (Miles, 2008). However, in the manufacturing sector, this notion may change as products or goods that an organization offers change, depending on the way in which they

have been developed or delivered – and this has been referred as product-process innovation (Veugelers, 2008). The same could be true to the digital innovation landscape, when compared within different sectors. Therefore, the conceptual framework introduced in this study could be extended to compare the differences in the antecedents of digital innovation in different sectors, and what factors determine the digital innovativeness of organizations, provided the different economic sectors/industries they belong to. Studies could be extended to determine whether there are differences in resulting performance outcomes based on the impact of digital innovation when different economic sectors are concerned.

There is also further room to explore the direct and indirect effects of each of the independent variables considered on the performance of an organization when digital innovation acts as a mediating variable.

This study was conducted only for private sector organizations. Therefore, further studies in the domain could be extended to explore what determines digital innovation within the government sector organizations and how digital innovation relates to the performance outcomes of those organizations.

Furthermore, this study has considered six antecedents of digital innovation, as appeared in previous literature. However, there are other variables which have also been considered as factors which affect digital innovation, such as digital orientation (Khin & Ho, 2018), entrepreneurial self-efficacy, digital technology self-efficacy (Mancha & Shankaranarayanan, 2020), and CRM practices (Valmohammadi, 2017). These factors and some new factors could also be incorporated in future studies.

This study was mainly conducted considering the antecedents of digital innovation and its effect on performance at an organizational level. However, further studies could be extended to explore factors affecting digital innovation and its performance effect at individual and groups levels as well.

As suggested previously, since digital innovation may translate to organizational performance at differing levels based on context, it is also worthwhile to study what factors moderate the relationship between digital innovation and organizational performance.

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APPENDIX I : Questionnaire

QUESTIONNAIRE
Critical Success Factors for Digital Innovation and Organizational Performance: A Cross-Industry Analysis in Sri Lanka

Dear participant,

This questionnaire has been developed to collect data for the research I am pursuing as a part of the Master's Degree Programme followed by me in the Faculty of Engineering, University of Moratuwa. The main objective of this study is to determine the critical success factors affecting digital innovation and their impact on organizational performance. This questionnaire will take approximately 10 – 15 minutes to complete. Please read all the statements given below carefully and provide your true opinion as it is vital for the success of my research study. All the information collected through this survey will be used only for the purpose of this research. Therefore, I assure you that the information provided by you will be treated with utmost confidentiality.

Kindly note that in order to be eligible for this survey, the respondent should belong to a Managerial Level position of the organization (Eg: Assistant Manager and above up to Director/Proprietor), having an overall idea on the organization's digital innovation processes, digital capability, performance and culture etc.

Note: If you are using your mobile phone to respond to the questionnaire, for each statement, kindly swipe left to view all the options available to choose.

I take this opportunity to thank you for your time and co-operation.

Yours' faithfully,
Sanduni Senaratne

Digital innovation is the use of digital technology (websites, mobile applications, e-mail, social media, SMS, e-commerce, digital marketing, self-service kiosks etc.) to improve existing business processes, workforce efficiency, customer experience and launch new products or business models.

According to the above definition, is your organization currently engaged in any digital innovation initiatives?

Yes ☐ No ☐

If your answer for the above was “Yes”, please proceed to Section 1.

If your answer was “No”, please note that this survey is only applicable for organizations which are currently in a process of digital innovation. Hence, you are kindly requested to finish and submit your response. Thank you very much for your cooperation.

SECTION 1 – Demographic Information

The following section contains questions designed to collect certain demographic information regarding the respondents. Please select the most appropriate option or mention your answer/s in the dotted lines provided, as applicable.

1. **Please mention the name of your organization** (kindly note that the name of your organization is requested with the sole intention of screening multiple responses from the same organization. I assure you that your organization's name will not be shared with anyone else, and it will not be used for any type of analysis in this research.)

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2. Gender

Male ☐ Female ☐

3. Age

Below 25 years ☐ Between 25 – 35 years ☐ Between 36 – 45 years ☐

Between 46 – 55 years ☐ Between 56 – 65 years ☐ Above 65 years ☐

4. Highest academic educational qualification

PhD ☐ Master’s / M.Phil. Degree ☐ Postgraduate Diploma ☐

Bachelor’s Degree ☐ Certificate Course ☐ G.C.E. A/L ☐

G.C.E. O/L ☐

5. Professional qualification/s

Qualification	Partly completed	Member	Associate Member	Fellow member
CIMA				
ACCA				
CA				
CIM				
SLIM				
CMA				
Others (pleases specify below)				
……				
……				
……				

6. Please select the most appropriate category from the list below that match best with your current position.

1. Below Assistant Manager ☐
2. Assistant Manager ☐
3. Manager ☐
4. Senior Manager ☐
5. CFO / CIO / CTO ☐
6. Chief Executive Officer / Managing Director ☐
7. Director ☐
8. Board Chairman / Proprietor / Partner ☐
9. Other (Please Specify) ……..

7. Experience in the current position

Less than 1 Year ☐ Between 1- 5 years ☐ Between 5 – 10 years ☐
Above 10 years ☐

8. The province in which your organization is located

Central Province ☐ Eastern Province ☐ Northern Province ☐

North Central Province ☐ North Western Province ☐ Sabaragamuwa Province ☐

☐

Southern Province ☐ Uva Province ☐ Western Province

9. Based on the majority of your business operations, your organization can be broadly classified under:

Industry and construction sector (Eg: Manufacturing, Electricity and water supply, Waste management etc.) ☐

Trade sector (Wholesale and retail trade, Repair of motor vehicles etc.) ☐

Service sector (Eg: Transportation, Information and communication, Financial, Professional, Scientific etc.) ☐

9.1 If your organization belongs to the industry and construction sector,

The size of your organization (number of employees):

1 to 4 ☐ 5 to 24 ☐ 25 to 199 ☐

200 and above ☐

9.2 If your organization belongs to the trade sector,

The size of your organization (number of employees):

1 to 3 ☐ 5 to 24 ☐ 25 to 199 ☐

200 and above ☐

9.3 If your organization belongs to the services sector,

The size of your organization (number of employees):

1 to 4 ☐ 5 to 15 ☐ 16 to 74 ☐

75 and above ☐

SECTION - 2

The following statements are related to your organization. Please indicate your level of agreement/ disagreement with the following statements, where:
1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree

	A. Transformational Leadership (Refers to the style of leadership that heightens consciousness of collective interest among the organization's members and helps them to achieve their collective goals)	1 - Strongly disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly agree
Our organization's management,						
1	transmits the organization's mission, reason for being, and purpose to all of the employees					
2	constantly seeks new opportunities for the unit/ department of the organization					
3	invests a high percentage of its time and energy in teaching and developing the competences of members of the organization					
4	speaks with enthusiasm and optimism of the future it seeks to achieve in the organization, expressing confidence that it will achieve these objectives					
5	promotes learning from mistakes, suggesting different ways to perform work and solve problems					
6	emphasizes the use of employees' intelligence					

	B. **Top Management Support**	1 - Strongly disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly agree
Our organization's top management,						
1	provides resources for innovation					
2	encourages the development of new and innovative ideas					
3	commits strongly to the successful implementation of innovation					
4	plans and estimates the expenses required for the implementation of innovation carefully					
5	places implementation of innovation as a part of the long-term strategic plan of the organization					

	C. Open Communication	1 - Strongly disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly agree
In our organization,						
1	communication is frequent					
2	communication is made at the right time					
3	employees are encouraged to express themselves					
4	employees maintain regular contacts with each other					
5	employees share information with each other					

	D. Organizational Learning (Refers to an organization's enhanced ability to acquire, disseminate and use knowledge in order to adapt to a changing external and internal environment)	1 - Strongly disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly agree
In our organization,						
1	there are processes to share knowledge					
2	there are processes to acquire and use much new and relevant knowledge					
3	there are processes to improve employee skills and capabilities					
4	organizational improvements have been influenced fundamentally by new knowledge entering the organization through learning processes					

	E. Organizational Culture	1 - Strongly disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly agree
Our organization's culture,						
1	can be changed when we know that we are not aligned with the demands of the environment					
2	questions the existing norms, behaviours, processes, practices etc. (i.e., status quo)					
3	attaches importance to solving problems with flexibility					
4	promotes employee driven initiatives					

	F. Digital Innovation (Refers to the use of digital technology (websites, mobile applications, e-mail, social media, SMS, e-commerce, digital marketing, self-service kiosks etc.) to improve existing business processes, workforce efficiency, customer experience and launch new products or business models).	1 - Strongly disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly agree
In our organization,						
1	the quality of digital solutions is superior compared to our competitors					
2	the features of digital solutions are superior compared to our competitors					
3	the applications of digital solutions are totally different from our competitors					
4	some of the digital solutions are new to the market at the time of launching					
5	new or significantly improved digital processes for manufacturing or producing goods or services have been produced					
6	new or significantly improved digital processes on logistics, delivery or distribution of our inputs, goods or services have been produced					
7	new or significantly improved digital processes on supporting activities such as maintenance systems or operations for purchasing, accounting, or computing have been produced					

	G. Organizational Performance	1 - Strongly disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly agree
In our organization,						
1	customer satisfaction is better as compared to key competitors					
2	market share is higher as compared to key competitors					
3	efficiency of customer service is better as compared to key competitors					
4	employee productivity is better as compared to key competitors					
5	average return on investment is better as compared to key competitors					
6	average profit of our organization is better as compared to key competitors					
7	profit growth is better as compared to key competitors					
8	sales growth is better as compared to key competitors					

Please indicate your personal evaluation on the following statements which rate your organization's digital capability in comparison to your major competitors, where:
1 = Extremely low; 2 = Low; 3 = Neutral; 4 = High; 5 = Extremely High

	H. Digital capability (Refers to the abilities, strengths, and expertise acquired through investments in advanced application technologies and digital infrastructure to optimize decisions and work processes and develop new products or services)	1 – Extremely Low	2 – Low	3 – Neutral	4 – High	5 – Extremely High
	Compared to the organization's major competitors, how would you evaluate your organization's capabilities in the following areas?					
1	Acquiring important digital technologies					
2	Identifying new digital opportunities					
3	Responding to digital transformation					
4	Mastering the state-of-the-art digital technologies					
5	Developing innovative products/services/processes using digital technology					

~ Thank you very much for your cooperation ~

APPENDIX II : Descriptive statistics for measurement items

Item code	Minimum	Maximum	Mean	Std. Deviation
TL1	1	5	4.10	0.953
TL2	1	5	4.10	0.979
TL3	1	5	3.77	0.992
TL4	1	5	4.01	0.954
TL5	1	5	3.99	0.926
TL6	1	5	3.95	0.917
TMS1	1	5	3.90	0.969
TMS2	1	5	4.03	0.938
TMS3	1	5	3.96	0.945
TMS4	1	5	3.78	0.990
TMS5	1	5	3.97	1.058
COM1	1	5	4.13	0.790
COM2	1	5	3.79	0.939
COM3	1	5	3.83	0.919
COM4	1	5	3.96	0.836
COM5	1	5	3.87	0.827
CUL1	1	5	3.57	1.004
CUL2	1	5	3.64	0.893
CUL3	1	5	3.81	0.902
CUL4	1	5	3.72	1.005
CUL5	1	5	3.79	0.957
OL1	1	5	3.81	0.940
OL2	1	5	3.79	0.963
OL3	1	5	3.85	0.996
OL4	1	5	3.73	0.901
DI1	1	5	3.81	0.956
DI2	1	5	3.77	1.022

DI3	1	5	3.47	1.006
DI4	1	5	3.66	1.114
DI5	1	5	3.79	0.925
DI6	1	5	3.64	1.003
DI7	1	5	3.70	1.009
PER1	1	5	3.93	0.857
PER2	1	5	3.59	1.024
PER3	1	5	3.79	0.909
PER4	1	5	3.61	0.985
PER5	1	5	3.67	0.961
PER6	1	5	3.70	0.947
PER7	1	5	3.64	1.011
PER8	1	5	3.68	0.959
DC1	1	5	3.69	1.068
DC2	1	5	3.75	1.049
DC3	1	5	3.86	0.979
DC4	1	5	3.62	1.028
DC5	1	5	3.76	1.045

Source: survey data (N=135)

APPENDIX III : Exploratory factor analysis

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	21.594	47.987	47.987	21.594	47.987	47.987	7.804	17.343	17.343
2	3.890	8.644	56.631	3.890	8.644	56.631	6.701	14.890	32.233
3	2.914	6.476	63.107	2.914	6.476	63.107	5.355	11.900	44.133
4	1.678	3.729	66.836	1.678	3.729	66.836	5.252	11.671	55.804
5	1.540	3.423	70.259	1.540	3.423	70.259	3.646	8.103	63.907
6	1.255	2.788	73.048	1.255	2.788	73.048	2.972	6.604	70.511
7	1.057	2.350	75.398	1.057	2.350	75.398	2.029	4.509	75.020
8	0.975	2.166	77.563	0.975	2.166	77.563	1.144	2.543	77.563
9	0.904	2.010	79.573						
10	0.857	1.905	81.478						
11	0.720	1.599	83.077						
12	0.650	1.444	84.521						
13	0.587	1.304	85.825						
14	0.488	1.083	86.909						
15	0.469	1.042	87.951						
16	0.438	0.974	88.925						
17	0.398	0.885	89.810						
18	0.349	0.777	90.586						
19	0.333	0.740	91.326						
20	0.317	0.704	92.030						
21	0.309	0.687	92.717						
22	0.290	0.645	93.361						
23	0.262	0.581	93.943						

24	0.250	0.556	94.499
25	0.221	0.491	94.990
26	0.213	0.474	95.464
27	0.202	0.448	95.913
28	0.195	0.433	96.346
29	0.191	0.424	96.770
30	0.171	0.380	97.150
31	0.154	0.343	97.492
32	0.137	0.304	97.797
33	0.128	0.284	98.081
34	0.117	0.260	98.341
35	0.111	0.247	98.587
36	0.092	0.206	98.793
37	0.088	0.195	98.988
38	0.079	0.177	99.164
39	0.075	0.167	99.331
40	0.066	0.147	99.478
41	0.062	0.138	99.616
42	0.059	0.131	99.747
43	0.042	0.094	99.841
44	0.038	0.085	99.926
45	0.033	0.074	100.000

Extraction Method: Principal Component Analysis.

Source: survey data

APPENDIX IV: Missing values, Kurtosis and Skewness

Item code	Missing values	Mean	Standard Deviation	Kurtosis	Skewness
TL 1	0	4.096	0.95	2.991	-1.559
TL 2	0	4.104	0.976	2.145	-1.42
TL 3	0	3.77	0.988	0.65	-0.873
TL 4	0	4.015	0.951	2.58	-1.443
TL 5	0	3.993	0.923	2.429	-1.357
TL 6	0	3.948	0.913	2.982	-1.489
TMS 1	0	3.904	0.965	0.815	-0.905
TMS 2	0	4.03	0.934	1.911	-1.271
TMS 3	0	3.956	0.942	1.398	-1.094
TMS 4	0	3.778	0.986	0.652	-0.851
TMS 5	0	3.97	1.054	0.88	-1.093
COM 1	0	4.133	0.787	1.564	-0.98
COM 2	0	3.793	0.936	0.458	-0.725
COM 3	0	3.83	0.915	0.611	-0.709
COM 4	0	3.956	0.833	1.639	-1.003
COM 5	0	3.867	0.824	1.219	-0.791
CUL 1	0	3.57	1	-0.172	-0.578
CUL 2	0	3.644	0.89	0.211	-0.636
CUL 3	0	3.807	0.899	0.466	-0.723
CUL 4	0	3.719	1.001	0.213	-0.797
CUL 5	0	3.785	0.954	1.185	-1.058
OL 1	0	3.815	0.936	1.314	-0.989
OL 2	0	3.793	0.959	1.486	-1.151
OL 3	0	3.852	0.993	0.363	-0.892
OL 4	0	3.726	0.898	1.489	-0.98
DI 1	0	3.815	0.952	0.782	-0.869
DI 2	0	3.77	1.018	0.624	-0.888
DI 3	0	3.467	1.002	-0.027	-0.421
DI 4	0	3.659	1.11	-0.006	-0.77

DI 5	0	3.785	0.922	1.471	-1.048
DI 6	0	3.644	1	0.667	-0.855
DI 7	0	3.696	1.006	1.095	-1.081
PER 1	0	3.933	0.854	2.316	-1.099
PER 2	0	3.593	1.021	-0.09	-0.55
PER 3	0	3.785	0.906	1.16	-0.89
PER 4	0	3.615	0.981	0.494	-0.73
PER 5	0	3.674	0.957	0.568	-0.687
PER 6	0	3.704	0.943	0.516	-0.711
PER 7	0	3.644	1.007	0.354	-0.732
PER 8	0	3.681	0.956	0.69	-0.814
DC 1	0	3.689	1.064	-0.504	-0.579
DC 2	0	3.748	1.045	-0.064	-0.738
DC 3	0	3.859	0.975	-0.168	-0.731
DC 4	0	3.622	1.025	-0.254	-0.523
DC 5	0	3.763	1.041	0.176	-0.783

Source: survey data (N=135)

APPENDIX V: Indicator loadings

Variable code	Item code	Indicator loading
COM	COM 1	0.790
	COM 2	0.779
	COM 3	0.869
	COM 4	0.838
	COM 5	0.811
CUL	CUL 1	0.735
	CUL 2	0.833
	CUL 3	0.865
	CUL 4	0.889
	CUL 5	0.915
DC	DC 1	0.925
	DC 2	0.932
	DC 3	0.934
	DC 4	0.927
	DC 5	0.909
DI	DI 1	0.797
	DI 2	0.821
	DI 3	**0.668**
	DI 4	0.860
	DI 5	0.887
	DI 6	0.872
	DI 7	0.857
OL	OL 1	0.912
	OL 2	0.939
	OL 3	0.908
	OL 4	0.907
PER	PER 1	0.827
	PER 2	0.748

	PER 3	0.853
	PER 4	0.854
	PER 5	0.850
	PER 6	0.857
	PER 7	0.897
	PER 8	0.889
TL	TL 1	0.882
	TL 2	0.828
	TL 3	0.868
	TL 4	0.857
	TL 5	0.815
	TL 6	0.824
TMS	TMS 1	0.920
	TMS 2	0.909
	TMS 3	0.933
	TMS 4	0.884
	TMS 5	0.899

APPENDIX VI: Cross loadings

Item Code	COM	CUL	DC	DI	OL	PER	TL	TMS
COM 1	**0.790**	0.543	0.395	0.516	0.545	0.442	0.583	0.584
COM 2	**0.779**	0.55	0.464	0.468	0.572	0.56	0.568	0.542
COM 3	**0.869**	0.607	0.447	0.518	0.626	0.52	0.588	0.65
COM 4	**0.838**	0.542	0.363	0.416	0.53	0.526	0.537	0.457
COM 5	**0.811**	0.518	0.415	0.473	0.546	0.481	0.442	0.535
CUL 1	0.495	**0.735**	0.44	0.404	0.553	0.367	0.551	0.542
CUL 2	0.497	**0.833**	0.441	0.435	0.541	0.46	0.538	0.538
CUL 3	0.629	**0.865**	0.424	0.552	0.659	0.544	0.623	0.659
CUL 4	0.605	**0.889**	0.504	0.525	0.64	0.487	0.627	0.614
CUL 5	0.625	**0.915**	0.467	0.546	0.666	0.487	0.698	0.648
DC 1	0.463	0.491	**0.925**	0.642	0.421	0.323	0.413	0.525
DC 2	0.493	0.577	**0.932**	0.688	0.483	0.395	0.453	0.567
DC 3	0.464	0.48	**0.934**	0.625	0.441	0.377	0.416	0.495
DC 4	0.46	0.476	**0.927**	0.599	0.415	0.358	0.405	0.485
DC 5	0.486	0.438	**0.909**	0.604	0.441	0.378	0.435	0.517
DI 1	0.475	0.496	0.522	**0.797**	0.523	0.403	0.432	0.518
DI 2	0.522	0.56	0.581	**0.821**	0.59	0.46	0.501	0.565
DI 4	0.547	0.492	0.618	**0.86**	0.502	0.361	0.516	0.57
DI 5	0.469	0.462	0.574	**0.887**	0.483	0.299	0.467	0.513
DI 6	0.483	0.432	0.585	**0.872**	0.501	0.349	0.421	0.533
DI 7	0.493	0.526	0.6	**0.857**	0.55	0.438	0.493	0.582
OL 1	0.602	0.623	0.414	0.582	**0.912**	0.514	0.609	0.579
OL 2	0.645	0.643	0.444	0.587	**0.939**	0.575	0.616	0.644
OL 3	0.661	0.714	0.454	0.53	**0.908**	0.548	0.604	0.656
OL 4	0.63	0.68	0.438	0.574	**0.907**	0.582	0.629	0.594
PER 1	0.625	0.505	0.397	0.486	0.561	**0.827**	0.526	0.489
PER 2	0.395	0.379	0.305	0.373	0.412	**0.748**	0.419	0.333
PER 3	0.567	0.445	0.378	0.398	0.518	**0.853**	0.451	0.447
PER 4	0.578	0.524	0.401	0.484	0.555	**0.854**	0.56	0.499
PER 5	0.461	0.455	0.257	0.296	0.478	**0.85**	0.431	0.414
PER 6	0.492	0.445	0.234	0.261	0.471	**0.857**	0.452	0.353

PER 7	0.501	0.497	0.331	0.348	0.542	**0.897**	0.47	0.429
PER 8	0.466	0.476	0.271	0.308	0.508	**0.889**	0.451	0.353
TL 1	0.607	0.643	0.413	0.477	0.612	0.517	**0.882**	0.693
TL 2	0.48	0.554	0.32	0.411	0.417	0.425	**0.828**	0.613
TL 3	0.565	0.631	0.462	0.598	0.634	0.473	**0.868**	0.753
TL 4	0.538	0.587	0.343	0.442	0.539	0.489	**0.857**	0.674
TL 5	0.574	0.609	0.367	0.406	0.576	0.458	**0.815**	0.666
TL 6	0.62	0.618	0.396	0.447	0.597	0.509	**0.824**	0.676
TMS 1	0.643	0.677	0.521	0.605	0.624	0.398	0.769	**0.920**
TMS 2	0.641	0.625	0.496	0.595	0.6	0.419	0.733	**0.909**
TMS 3	0.628	0.662	0.487	0.545	0.633	0.487	0.753	**0.933**
TMS 4	0.533	0.587	0.493	0.559	0.567	0.447	0.678	**0.884**
TMS 5	0.651	0.671	0.547	0.625	0.634	0.532	0.733	**0.899**