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Exploring the relationship between the factors of Digital Maturity

Joice Nkomazana

A research proposal submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business

Johannesburg, 2023

ABSTRACT

This study examines the factors that influence digital transformation in South African organizations and explain their hypothesized relationships. Armstrong and Lee (2021), building on and synthesizing existing models of digital maturity, proposed a unified digital maturity model and further proposed a systems digital maturity model to understand these relationships. However, their model has not been directly empirically validated, including in the specific context of South African businesses. Therefore, the extent to which the same questions or factors apply in a South African business context remains assumed.

Secondly, while the proposed systems model is intuitively compelling, the relationship between the factors is postulated rather than demonstrated. These factors are not independent, as one might – and in many cases will – impact the other. As a result, there is a lack of studies that disentangles business results from the other factors of digital maturity to see whether these factors can explain the business results. Accordingly, there is a need to examine the relationship between these other factors and business results.

The research was quantitative and cross-sectional. An online survey using a self-administered questionnaire was issued to collect data from the sample from the 763 respondents drawn from the student database studying digital business management courses at the Wits Business School during the period 2019 to 2022.

The study found out that the majority of the factors of digital maturity have a positive and significant relationship with each other. Moreover, these findings suggest that these factors are crucial to the success of a business, and they contribute to successful digital transformation and business results. However, the study also found a negative and statistically insignificant relationship between organization and governance and workforce enablement and performance, skills and workforce enablement and performance, Information Technology/ Information systems excellence (IT/IS) and workforce enablement and performance and Workforce enablement and performance and business results, whereas Investment and

innovation architecture and workforce enablement showed a negative and significant relationship.

The implications of this research for managers are to inform practitioners of the significance of digital transformation and the factors that drive it. The study will also assist managers in developing risk management strategies that address the unique challenges digital transformation poses. The study will assist managers in differentiating their organizations from competitors by investing in digital abilities that improve agility, customer service, and innovation.

KEYWORDS

Business results, Digital maturity, Digital transformation, Managers, Proposed Systems Model, Unified Digital Maturity model

DECLARATION

I, Joice Machirovi Nkomazana, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Name: Joice Nkomazana Signature: Joice Nkomazana

Signed at ……Sandton……

On the ……26th …….. day of ……June …… 2023…..

DEDICATION

I want to dedicate this to my late parents and my two boys, Jayden Misodzi and Keith Misodzi. To my late parents, thank you for showing me the ropes of life and the importance of being responsible and never giving up. My mother used to say, “this one will make me proud one day,” and my father said, “I want you to work hard and never depend on a man, and you must always remember that one day I might not be there.” Without their love and support, I would have never achieved my dreams, and you continue to inspire me even though you are no longer with us. To my kids, thank you for your endless love and support during this journey.

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First and foremost, I would like to thank the almighty who has been holding my hand since I started this research journey. I would not have done it without him by my side.

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Table 1 List of Acronyms

Abbreviation	Meaning
BR	Business results
CFA	Confirmatory Factor Analysis
CPD	Core Processes and Digitalization
COVID	Coronavirus Disease
COE	Customer Orientation and Engagement
DC	Digital Ethics
DM	Digital maturity
DPI	Digital Product Innovation
DT	Digital transformation
DIGI	Digitalization
Hypo	Hypothesis
IT/IS Excellence	Information Technology/ Information systems excellence
IAI	Innovation Architecture and Investment
KMO	Kaiser-Meyer Olkin
NVSBM	New value streams and business Models
OS	Organizational and Culture
PSM	Proposed systems Model
SK	Skills
SEM	Structural equation modelling
STATA	Statistical software for data scientists
UDMM	Unified digital Maturity Model
VS	Vision and Strategy
WEP	Workforce enablement and performance

CHAPTER 1: INTRODUCTION

1.1 Statement of purpose

There is a growing body of research on digital maturity and the factors which comprise it. For example, several digital maturity frameworks have been proposed (Berghaus & Back, 2016; Bumann & Peter, 2020; Teichert, 2019; Thordsen et al., 2020; Westerman et al., 2014). Westerman et al (2014) model pioneered in understanding digital transformation. Their book 'Leading Digital' proposed a model comprising two dimensions: Digital Capabilities and Leadership Capabilities. The digital capabilities include the digital transformation of customer experience, core processes, and launching new business models. The leadership capabilities include the breadth and transformative nature of digital vision. They argue that “digital masters,” meaning organizations successful at digital transformation, must be ambidextrous at both digital capabilities and leadership capabilities. Subsequently, Berghaus et al (2016) emphasized the dimensions of digital transformation: Customer Experience, Product Innovation, Strategy, Organization, Process Digitalization, Collaboration, Information and Technology, Culture and Expertise and Transformation management.

Other models for digital maturity and transformation have been explored in a number of systematic literature reviews, for example, (Bumann & Peter, 2019; Teichert, 2019; Thordsen et al., 2020). Bumann and Peter (2019) reviewed 18 digital maturity and transformation models and emphasized six factors: Strategy, Organization, Culture, Technology, Customer and People. In a separate study, Teichert (2019) assessed 22 different models, and he found out that while they capture most of the aspects, some of them tend to overlook culture as an integral part of digital transformation. Differently, Thordsen et al. (2020) evaluated 17 different maturity models and digital transformation and showed that Berghaus et al. (2016a) is the best model, followed by Westerman et al (2014).

All of these models exhibit significant overlap but also some divergence. Accordingly, Armstrong and Lee (2020) integrated these models to build a unified model and further

refined it (Armstrong & Lee, 2021) to suggest a proposed systems model with two main dimensions of digital maturity, with 12 factors in total, and “business results” as an outcome of digital maturity. They argue that digital maturity is a compound notion comprised of several factors such as Leadership, Strategy, Culture, Organization and governance, Digital Ethics, Skills, New Value Streams and Business Models, Innovation and Investment, Core process digitalization, Workforce enablement and enforcement, Digital product innovation and IT/IS Excellence. This assumes that the factors of digital maturity are independent variables. However, there is no evidence to support this assumption of independence, and it is intuitively compelling that the factors are very much dependent. For example, Leadership would influence Culture and Governance, technological prowess would influence customer engagement and process optimization; and so on.

Although authors such as Vial (2019) and Armstrong and Lee (2021) postulate more systems-like models for digital maturity and the interconnections between its factors, they do not propose the relative strengths of the relationships or demonstrate such connections based on empirical data. Therefore, this thesis aims to investigate and understand if there is a statistically significant relationship between the various factors of digital maturity and business results in different organizations in South Africa, based on pre-existing survey data gathered according to the Armstrong and Lee model for digital maturity.

This is important to see the extent to which the various factors of digital maturity contribute to the overall business performance. For organizations, this is because the business environment is ever-changing as they are subjected to unprecedented technological disruptions, including digital transformations that affect most businesses (Armstrong & Lee, 2021; Teichert, 2019; Thordsen et al., 2020). Consequently, this places more demands on organizations to have a clear vision for the digital future and to foster a digital culture responding to these changes and demands in the business environment (Armstrong & Lee, 2021; MIT, 2011; Westerman et al., 2011). Therefore, organizations must identify critical factors for digital maturity and invest in building

these capabilities to achieve superior business results (Armstrong & Lee, 2021; Westerman et al., 2011; Westerman et al., 2014).

Accordingly, the proposed research was built on Armstrong and Lee's (2021) proposed systems model for digital maturity to examine the relationship between various factors of digital transformation and the overall business result. A quantitative research approach was used to conduct the study involving a cross-sectional survey design using an online survey captured from university students in South Africa. The data analysis involved a confirmatory factors analysis and a structural equation modelling (SEM).

This study first used a confirmatory factor analysis using formative scales to identify which factors emerge to explain digital maturity and empirically validate and/or adapt the unified model for digital maturity and the associated proposed systems model for digital maturity. Secondly, correlation analysis was performed to see the relationship between these so-established factors of digital maturity. Lastly, SEM analysis was performed to examine the hypothesized relationships between the factors of the proposed system's model and business results. The managerial implication is that the study's findings will inform practitioners of the significance of digital transformation and the factors that drive it.

1.2 Background of the study

Digitalization, digital maturity, and transformation have become the buzzwords and “must-dos” for any business, especially in the age of technological disruption, pandemics such as coronavirus disease (COVID) and the drive towards corporate sustainability (Armstrong & Lee, 2021; Marsh et al., 2022). The COVID pandemic has changed our world drastically in many ways. Hence, the need for digital transformation is faster than we imagined.

Armstrong and Lee (2021) indicated that digital transformation is a complex and multi-faceted organization-wide process, which is continuously developing, and the end state is forever evolving.

Accordingly, Kane (2019) suggested that different organizations respond differently to digital transformation as their starting points, industry norms, and competitive pressures are different. Further, Westerman et al (2014) indicated that organizations that embrace digital transformation would undoubtedly outperform those that do not exist in different ways. Albukhitan (2020) and Salviotti et al. (2019) further suggested that organizations that do not adapt fast to the digital landscape will not survive in the transforming market and will be left behind. Accordingly, Armstrong and Lee (2021) and Teichert (2019) recommended that firms have a clear understanding of what the process of digital transformation entails and how do describe in some detail the to-be target state of digital maturity. This includes, inter alia, a vision for the digital future and a strategy to get there, fostering a digital and adaptive innovative culture, being agile, being more customer-centric and engaged, collaborating within ecosystems on emerging technologies, and driving innovation strategically.

Numerous industries are faced with the transformative impact of disruptive technologies and increasingly digital market environments on their external environment, forcing them to embark on complex digital transformation journeys to redefine their business processes to improve their operations (Chanias & Hess, 2016; Deloitte, 2018; Kane et al., 2017).

1.3 Research problem

Digital transformation has become the driving force of every private or public organization, forcing businesses to respond quickly to current market changes. Nadeem et al. (2018) have indicated that digital transformation has disrupted various industries in the banking, healthcare, automobile, and manufacturing sectors. Digital transformation helps organizations thrive in the digital age to deliver better business results, achieve operational goals, improve performance, and attain strategic objectives (Armstrong & Lee, 2021; Teichert, 2019).

Multiple studies on digital transformation in businesses or firms (e.g., Arreola et al., 2016; Berghaus & Back, 2016; Bumann & Peter, 2019; Catlin et al., 2015; Friedrich et

al., 2011; Kane et al., 2018; Teichert 2019; Thordsen et al. 2020; Westerman et al., 2014) allude to its importance and provide models for understanding it, and the challenge is that in practice the research in this phenomenon is complex. The models do not necessarily capture all its dimensions.

In response to this complexity and the need to understand digital transformation, based on the literature, Armstrong and Lee (2021) proposed a unified digital maturity model and further proposed a systems digital maturity model to understand the relationship between factors of digital maturity. This model systematically consolidated the factors of digital maturity from a wide range of leading academic works (e.g., Bumann and Peter's (2019), dimensions and factors of digital maturity, five leading popular business books on the topic (e.g., Leading Digital: Turning Technology into Business Transformation (Westerman et al., 2014), and more than ten global advisory firm models (e.g., Deloitte, 2019), for digital transformation and digital maturity. However, whilst this consolidation could be argued to represent the "best available current view" of what digital maturity is and its factors, two main gaps remain in its application.

First, the model for the dimensions and factors of digital maturity has been derived from other models for digital maturity and has not been directly empirically validated, including in the specific context of South African businesses. Therefore, the extent to which the same questions or factors apply in a South African business context remains assumed.

Second, while the proposed systems model for digital maturity is intuitively compelling, the relationship between the factors is postulated rather than demonstrated. These factors are not independent, as each factor might – and in many cases will – impact one or more other factors. For example, Culture impacts Digital ethics and Organization and governance, affecting Investment and innovation architecture (Armstrong & Lee, 2021). Consequently, there is a lack of research that disentangles the relationships between all of these factors of digital maturity, and which further may explain the relationship to business results. These relationships are not well-defined and need further examination. Accordingly, there is a need to examine the relationship

between factors of digital maturity in digital transformation implementation to understand and explain the hypothesized relationships between the two main dimensions and sub-dimensions of the proposed systems digital maturity model. The proposed research fulfilled three research objectives.

1.4 Research objectives

1. To validate the factors of Armstrong and Lee's unified model for digital maturity.
2. To quantitatively examine the relationships between each of the factors of digital maturity to validate and refine the proposed systems model for digital maturity.
3. To establish the relationships between the factors of digital maturity and the business results.

1.5 Rationale

The interest of the research is to examine the collective set of relationships of factors of digital maturity, establish the significance of each of the relationships, and contribution to the overall business results in South Africa. The research contributes to theory in three ways. First, it identifies and validates the 12 factors of digital maturity. Secondly, it establishes the relationships between the factors of digital maturity. Third, it establishes relationships between the factors of digital maturity and business result. Overall, the research validates the proposed model systems model for digital maturity. The findings provided valuable insights to inform managerial practices and help to improve organizations' digital transformation journey.

1.6 Delimitations of the study

The study will specifically look at the digital maturity of South African organizations as perceived by their employees who are post-experience Masters-level students at the Wits Business School. The majority of these students are junior- to mid-level

managers in their organizations, and all of whom have had instruction in digital maturity and have knowledge of digital maturity and digital transformation.

This study uses the Armstrong and Lee proposed systems model for digital maturity. It does not attempt to explore the relationships between the factors of digital maturity for other digital maturity frameworks.

1.7 Definition of terms

Six key terms used in this study are Digital transformation (DT), Digital maturity (DM), Unified digital maturity model (UDMM), proposed systems model (PSM), Digitalization (DIGI), and Business results (BR). These six key terms and 12 factors of the digital maturity model are defined accordingly based on Armstrong and Lee (2021) and as used in this study:

- **Digital transformation (DT)** is the sum total of an organization's change efforts in response to technological disruption resulting in a marked change in its form, nature, and improvement.
- **Digital maturity (DM)** is a measure of an organization's ability to achieve desired strategic and operational organizational outcomes in embracing technological change as it progresses on its digital transformation journey.
- The **unified digital maturity model (UDMM**) refers to a single framework of all consolidated and condensed factors and indicators of all the maturity models to address all the necessary questions about an organization's digital maturity and is measured using 56 indicators explained by 12 factors.
- **Proposed systems model (PSM)** refers to the nuanced representation of the assumed relationships between various dimensions and factors of digital maturity designed to assist organizations in breaking down quantifiable modelling of the relationship into more manageable, researchable parts as well as providing practical guidance on how to structure a digital transformation program.
- **Digitalization** refers to the reconceptualizing and reconfiguring of processes and systems from analogue and physical-centric forms into maximally digital-centric forms.

- **Business results** are not a factor of digital maturity but an outcome that includes financial, customer, and operations measures. It is critical to assist us in measuring results factors alongside the digital measurement instrument to validate the model.

- **Leadership: Vision and strategy** is the first factor of digital maturity and refers to the extent of the leaders' commitment, a shared vision from the board of the firm to the shop floor and its integration to the business strategy and translation to a digital strategy.
- **Culture** is the second factor of DM and refers to the extent to which the organization has a culture that supports digital transformation, thereby allowing the organization to thrive in the digital era.
- **Organization and Governance** is the third factor of DM and describes the extent to which organizations have well established structures, processes, and practices, and governance for driving digital transformation.
- **New value streams and business models** is the fourth factor for DM is the extent to which the organization effectively seeks out new sources of value and develops new business models.
- **Innovation and investment architecture** is the fifth factor of DM which describes the way the organization fosters and manages innovation and the extent to which it invests in digital transformation.
- **Customer orientation and engagement** is the sixth factor of DM and refers to the extent to which and how the organization transforms its orientation towards and engages with its customers in the context of digital transformation.
- **Digital product innovation is** the seventh factor of DM and refers to the extent to which and how the organization exploits digital and other emerging technologies in the digital transformation of the product domain.
- **Workforce Enablement and Performance** is the eighth factor of DM which describes the way the organization empowers its employees to perform optimally and to transform the organization and employees to continuously improve their skills, which benefits employees' performance in the long run.

- **Digital Skills:** This is the nineth factor of DM and relates to the breadth and depth of digital skills in the organization and how they are developed.
- **Core processes and digitalization** tenth factor of DM and involves eliminating bottlenecks and inefficiencies in an organization through continuous improvements and digitalizing the core processes, especially in the exploitation of digital and emerging technologies.
- **IT/IS Excellence** is the final factor identified in the DM and relates to the effectiveness of the technology organizations in the successful digital transformation of IT and related units within the firm.
- **Digital ethics** is a crucial factor for DM and refers to the principles, norms, and values that assist management in decision-making.

1.8 Assumptions

The study used secondary data. Therefore, the assumption is that the population sample is significantly statistically enough to generate statistical results. Second, a master's degree has serious time constraints. The researcher is expected to have adequate time and support as stipulated for master's research.

1.9 Chapter Outline

Chapter 1 is the introduction to the research. It provides the purpose statement and background of the study, the research problem, the research objectives, the rationale, delimitations, and the definition of key terms and assumptions of the study. **Chapter 2** is the literature review. It critically reviews the literature on digital transformation and provides a theoretical framework and hypotheses. **Chapter 3** is the research methodology. It presents and justifies the research design, philosophy, methods, population and sampling, research instrument, data analysis strategies and interpretation, limitations of the research and validity and reliability of the results and ethical considerations of the study.

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

The literature critically examines the hypothesized relationships between factors of digital maturity and business results. Its review shows that organizations respond differently to the ever-changing environment (Kane et al., 2017). Accordingly, Armstrong and Lee (2021) further indicated that industries are exposed to the vortex of digital disruption to a greater or less extent at some point, forcing organizations to adapt quickly and transform their businesses. Several researchers have discovered that digital transformation is not just about implementing technologies but leans more on aligning culture, and people, improving business and efficiency (Armstrong & Lee, 2021; Deloitte, 2018; Kane et al., 2017; Nadeem et al., 2018). Further, Albukhitan (2020) and Deloitte (2018) mentioned that a digital transformation strategy helps leaders answer questions about the businesses' future and current digitalization level, identify gaps, and establish areas of improvement in line with their desired outcomes.

Accordingly, Diener and Špaček (2021) indicated that different businesses face uncontrollable factors in disruptive innovation, forcing firms to adapt quickly to keep abreast with today's global market changes. Further, Albukhitan (2020), Diener and Špaček (2021), and Salviotti et al. (2019) reiterated that companies that do not adapt fast to the digital landscape will not survive as they will be left behind. Hence, they need to adapt quickly to the fast-changing digital landscape and shift their focus to digital transformation and maturity.

The organization's level of maturity in each area depends on its business strategy, business model, and operation model (Deloitte, 2018; Kane, 2019). However, Armstrong and Lee (2021), Cuesta et al (2015), Friedrich et al (2011) and Omarini (2017) suggest that organizations need to continuously review their vision and strategies to remain competitive as the pace of change in different sectors is rapidly increasing due to new emerging technologies, new competitors, and changes in

customer lifestyle. There is no empirical evidence that digital maturity factors have a relationship to the desired business outcomes (Armstrong & Lee, 2021). The subsequent subsections discuss these relationships taking antecedents, behavior, and consequence approach as an organizing principle.

2.2 Definition of topic or background discussion

This section will define the key concepts used in the study. It starts by contextualizing and defining digital transformation and maturity, then defining a unified digital maturity model, proposed systematic model, digitalization, and business results.

The topic of digital transformation has gained tremendous attention in different sectors forcing organizations to rethink their business models (Heubeck, 2023; Mugge et al., 2020). Most organizations fail to implement digital transformation successfully as managers are not sure of the processes and lack guidance on actions to take (Bumann & Peter, 2020). The confusion between digitization, digitalization, digital transformation, and digital maturity is understandable, but knowing the meaning is crucial for managers to implement digital transformation successfully (Aras & Büyüközkan, 2023; Bloomberg, 2018). Bumann and Peter (2020) indicated that although digital transformation, digitization, and digitalization have different meanings, they are used interchangeably. Digitization is the first phase of transformation which is the conversion of analogue to digital, and the second phase is digitalization which is the process of using digital technologies and impact, and digital transformation is the broadest of them all, which encompasses the whole enterprise (Bumann & Peter, 2020). It is a reconceptualization and reconfiguration of processes and systems from analogue and physical-centric forms into maximally digital-centric forms (Armstrong & Lee, 2021, p.519). Bring these terms together, and digital transformation involves digitization, digitalization, and digital maturity to transform their journey successfully. Digital transformation is the umbrella concept through digitization that assists organizations in moving towards digital maturity (Aras & Büyüközkan, 2023; Armstrong & Lee, 2021; Bumann & Peter, 2020).

However, digital transformation and digital maturity cannot work in isolation, and in many cases, the definition of digital transformation leans more towards the definition of digital maturity (Armstrong & Lee, 2021; Deloitte, 2018). Accordingly, Aslanova and Kulichkina (2020) indicated that the term maturity is closely related to digital transformation, and digital maturity is a stage of digital transformation the companies want to achieve. Digitalization has accelerated digital transformation in most industries forcing them to adapt fast to keep up with the global competitive edge, and the ones left behind will not be sustainable (Armstrong & Lee, 2021; Eremina et al., 2019).

Berghaus and Back (2016) argue that digital transformation impacts many areas of organizations with different effects in many industries. Furthermore, Armstrong and Lee (2021), Deloitte (2018), Diener and Špaček (2021), Malar et al. (2019), and Teichert (2019) agreed that digital transformation is a journey and is complex and cumbersome. It affects multiple areas of the organization, which hinders the smooth and successful implementation of digital transformation (Armstrong & Lee, 2021). Accordingly, Aslanova and Kulichkina (2020) defined digital transformation as the application and use of modern technologies in the organization's business processes to achieve its goals and increase efficiency. However, our definition of digital transformation in this study is the sum total of an organization's change efforts in response to technological disruption resulting in a marked change in its form, nature, and improvement (Armstrong & Lee, 2021, p.514).

Digital transformation is an ongoing process, and at any specific point or stage, the level of digital transformation represents its digital maturity and can be measured. However, Aslanova and Kulichkina (2020) indicated that there is no single definition for digital maturity. For instance, Kane et al (2017) defined digital maturity as how an organization systematically prepares to adapt consistently to ongoing digital change. Chanias and Hess (2016) defined digital maturity as how the company performs tasks and handles information flows through information technology. It describes managerial interpretations of what the company has already achieved regarding its digital transformation change efforts. These definitions do not explicitly make a distinction between digital transformation and maturity because they take the time dimension for

granted. Therefore, our definition of digital maturity addresses this gap and defines digital maturity as a measure at a specific point in time of an organization's ability to achieve desired strategic and operational organizational outcomes while embracing technological change as it progresses on its digital transformation journey (Armstrong & Lee, 2021, p.544).

Several models of digital maturity exist but have been consolidated and condensed by Armstrong and Lee (2021) into a single framework called the unified digital maturity model (UDMM). According to them, the previous research examined the digital maturity models by different practitioners and scholars revealed no consensus on their relationships regarding the factors and dimensions of digital transformation and digital maturity. Although most of these models share the same features, they differ at some point, but none of them covers all the factors of digital maturity. In response to this gap, Armstrong and Lee (2021) consolidated and condensed all the models' elements and indicators into a UDMM to address the necessary digital maturity factors. The UDMM addresses all the critical questions about an organization's digital maturity and measures it using 56 indicators explained by 12 factors (Armstrong & Lee, 2021, p.559).

Further, Armstrong and Lee (2021) modify the UDMM into a proposed systematic model for digital maturity (PSM) to show the relationships and complexities between the factors of digital maturity. In contrast to the UDMM, they argue that business results are not a factor of digital maturity but an outcome that includes financial, customer, and operations measures. Overall, PSM is a framework for representing the relationships between various dimensions and factors of digital maturity designed to assist organizations in breaking down relationships into quantifiable measures (Armstrong & Lee, 2021). It is the most suitable model for this study because it breaks down assumed relationships into quantifiable measures that allow us to explore digital transformation in organizations. The subsequent section will discuss the literature on the relationship between the factors in section 2.3 and the evolution between previous digital maturity models into the UDMM and, eventually, the PSM in section 2.4.

2.3 Developing the relationships between the factors of digital maturity.

2.3.1 Leadership, vision, strategy

The above-mentioned are the drivers of digital transformation and the frameworks and structures that guide the organization in its digital transformation journey. Leadership, vision, and strategy refers to the extent of the leaders' commitment, a shared vision from the board of the firm to the shop floor and its integration to the business strategy and translation to a digital strategy. (Armstrong & Lee, 2021; Westerman et al., 2014). It involves rethinking and redesigning the business process when pursuing digital mastery of digital customer experience. Salviotti et al (2019) stressed the importance of top management's compelling vision to attain digital mastery. The Leadership enforces behavior that supports the digital transformation journey. Vision needs to be integrated into the business strategy to support the development of a strategy and new ways of doing business (Armstrong & Lee, 2021).

Accordingly, Teichert (2019) indicated that with regard to the unified model, it is evident that the dimension of Leadership and strategy will influence the dimension of digital application and impact. Similarly, each dimension can influence each other for example, culture is shaped by leadership, and the culture of the organization also shapes Leadership. Leadership attitudes and behaviors, and organizational Culture are the critical drivers of ethics. Leadership turns technology into transformation by strengthening company direction, building momentum, and ensuring companies follow through (Westerman et al., 2014).

Vision and strategy provide direction and drive the processes for digital transformation. The effective way to drive transformation is top-down Leadership with strong Leadership and governance, from executive management to the shop floor, coupled with methods that engage workers fostering change (Westerman et al., 2014). There is a mutual relationship between Leadership, vision and strategy, and organizational culture such that one shapes the other and vice versa and is vital for digital transformation (Armstrong & Lee, 2021). There is also another null hypothesis –

namely that there are no other material links from other blocks into the Leadership block.

Hypothesis 1: Leadership positively influences culture.

Hypothesis 2: Culture positively influences Leadership.

2.3.2 Organizational Culture

Organizational culture defines the structure's behavior and is considered one of the root factors of digital maturity. Cultural factors can either hinder or enable the success of digital transformation (Armstrong & Lee, 2021; Teichert, 2019). According to Weritz et al (2020) indicated, organizations need to consider new digital culture aspects that are digitally relevant to transform their structures, values, and assumptions in support of successful digital transformation. Teichert (2019) further iterated that culture is the biggest hurdle to success in digital transformation implementation and a barrier to digital effectiveness. Hence, culture has an influence on digital ethics and on how the organization is structured and governed. Accordingly, Radcliffe and Nodell (2020) indicated that culture influences digital ethics; however, it is crucial to integrate digital ethics principles within the organization's Leadership and employee code of conduct to allow awareness and transparent conversations.

Hypothesis 3: A positive relationship exists between culture and digital ethics.

Hypothesis 4: There is a direct and positive relationship between culture and organization and governance.

2.3.3 Digital Ethics

Digital ethics refers to the principles, norms, and values that assist management in decision-making (Behera et al., 2022). Digital ethics is essential in the organization because it defines the ethical structure within the digital transformation and assists leaders in shaping the personalities and values of the organization through culture (Armstrong & Lee, 2021; Behera et al., 2022; Radclyffe & Nodell, 2020). Digital ethics

assists leaders in promoting participation with business partners and stakeholders and engaging with customers and the public to create transparency and awareness regarding digital ethics (Radclyffe & Nodell, 2020).

Organizations must ensure the accountability of digital ethics within government structures (Radclyffe & Nodell, 2020). Mo and Shi (2018) confirmed in their study that ethics plays a vital role in fostering positive employee performance contributing to higher revenue for the company. Furthermore, Kane et al (2019) pointed out that disruptive innovation, mostly technology disruption, does not only challenge traditional business models but disrupts ethics and moral standards. Hence, digital ethics influence how organizations govern and organize systems and structures.

Hypothesis 5: A direct and positive relationship exists between Leadership and digital ethics.

Hypothesis 6: Digital ethics has a positive correlation with organization and governance.

2.3.4 Organization and governance

Organization and governance factor is concerned with empowerment and decentralization of decision-making, organizational agility and flexibility, and well-established digital organizational structures and systems for digital governance with clear mandates to support reliable execution of digital (Armstrong & Lee, 2021; Berghaus & Back, 2016; Bumann & Peter, 2020). The organization also involves change management programs synchronizing with digital transformation initiatives (Armstrong & Lee, 2021; MIT, 2011; Teichert, 2019). There is a need to foster a culture of good governance to support subordinates' empowerment and leadership style to react to environmental changes promptly (Ria et al., 2017). The organization needs to engage with employees and managers at all levels to support the alignment of the digital vision to implement digital transformation successfully (Aras & Büyüközkan, 2023; Salviotti et al., 2019).

Accordingly, Armstrong and Lee (2021) indicated that organizations need management structures and policies that support digital business, digital skills, and agile management to foster employee engagement on different hierarchal levels. The companies should focus on developing effective digital solutions and catering to new customer demands in an agile manner. There should be transparency among the departments working on the same project (Armstrong & Lee, 2021). Importantly, organization and governance impact digital ethics and digital ethics influence how the organization governs and organizes systems and structures, and together they impact business results (Aras & Büyüközkan, 2023; Armstrong &Lee 2021).

Hypothesis 7: A direct and positive relationship exists between Leadership and organization, and governance.

Hypothesis 8: There is a positive correlation between organizational governance and digital ethics**.**

2.3.5 Investment and innovation architecture

Investment and innovation architecture describes the way the organization fosters and manages innovation and the extent to which it invests in digital transformation (Armstrong & Lee 2022). The organization needs to align investment and innovation architecture to drive digital transformation. Different types of innovation may require different strategic approaches, which may not apply to every organization (Christensen et al., 2015). Therefore, managers must invest in skills, IT/IS excellence, new value streams, and business models. Importantly, the organization must invest in the direct drivers of business results, such as customer orientation and engagement, digital product innovation, workforce enablement, and enforcement and core process digitalization (Armstrong & Lee, 2021). Furthermore, managers must encourage employees to develop new ideas for digitalized working methods using lean innovation (Berghaus & Back, 2016; Westerman et al., 2014). Digital transformation needs continuous innovation and collaborative culture to promote experimentation, Teichart (2020) and Bumann and Peter (2019); therefore, leadership must provide innovative programs that support the organization's digital transformation. This also requires a

culture of innovation within the organizations to support digital transformation to drive business results (Armstrong & Lee, 2021). The use of digital technologies promotes a learning culture and upskilling and new ways of learning (Mukherjee, 2020; Zentner et al., 2022).

Since culture is shaped by leadership, there is a need to foster an environment that supports an innovative and collaborative culture (Schein & Schein, 2019). Organizational governance drives investment and innovation architecture positively. Culture can impact Investment and innovation architecture in how the organization innovates.

Hypothesis: 9: A direct and positive relationship exists between Leadership and investment and innovation architecture.

Hypothesis 10: A direct and positive relationship exists between culture, and investment and innovation architecture.

Hypothesis 11: A direct and positive relationship exists between Investment and innovation architecture and organizational governance.

Hypothesis 12: A direct and positive relationship exists between Investment and innovation architecture and IT/IS excellence.

2.3.6 Digital Skills

According to Armstrong and Lee (2021), the skills factor has been pulled out as a specific component of workforce enablement and performance in the unified digital maturity model. However, skills are critical for enabling other factors like customer orientation, digital product innovation, workforce enablement, core processes digitalization, and new value streams and have been pulled out as a separate factor of digital maturity.

The organization must have the necessary skills to support digital talent in digital transformation implementation. According to Bonnet and Westerman (2020),

employees' roles and engagement during digital transformation may influence business results positively or negatively. It is necessary to retain and attract top digital talent by focusing on learning goals of skills development to channel employee mindset and capability development (Armstrong & Lee, 2021; Bonnet & Westerman, 2020). Digital skills must be embedded in strategic areas across the organization to support digital transformation (Westerman et al., 2014).

Organizations must focus on investing in employees to become future-ready and enhance their productivity and performance to encourage them to work smart and faster (Bonnet & Westerman, 2020). Further, Lundberg and Westerman (2020) iterated that managers need to foster appropriate mindsets for employees like entrepreneurial and innovation, in addition to digital skills in building agility within the organization. Leadership, Culture, and digital skills are essential for successfully implementing digital transformation (Aras & Büyüközkan, 2023; Armstrong & Lee, 2021).

The organization needs to embed digital skills to foster success in digital transformation. Agile management and cross-functional collaboration create demand for hybrid digital skills bridging the communication gap between digital and business competencies (Aras & Büyüközkan, 2023; Westerman et al., 2014). Further, Shekshina (2021) suggested that leaders must create a conducive environment for individual and group performance to reduce barriers to collaboration and instill a learning culture which attracts, retain, and develop talent.

The organization needs to align the investment and innovation architecture with the right skills to drive digital transformation. Managers must invest in innovation training and skills, as skills are important in enabling all the other factors (Armstrong & Lee, 2021). It is important to have the right investment architecture and culture and find a way to innovate successfully (Armstrong & Lee, 2021). Culture impacts skills, for example, when the organization is trying to attract the right talent.

Hypothesis 13: A direct and positive relationship exists between Investment and innovation architecture and Skills.

Hypothesis 14: There is a positive correlation between culture and skills.

Hypothesis 15 There is a positive correlation between skills and IT/IS excellence.

2.3.7 New value streams and business models

New value streams refer to the organization's ability to continuously identify customer pain points and deliver and communicate the value as promised to their customer. This promise also considers the customer's expectations of how value will be acquired and experienced (Bolman & Deal, 2017; MIT, 2011). New value streams and business models enable organizations to be flexible to recent market trends and provide and capture growth opportunities. Likewise, the new value streams are a new way of working that transforms the operating model to focus on customer engagement and value proposition (Papyrus, 2021). The factor of new value streams and business models involves the creation of value through platforms, business models, and external networks in support of a digital transformation strategy (Armstrong & Lee, 2021; Evans et al., 2017; MIT, 2011; Rogers, 2016). According to Westerman et al (2014), implementing new business models requires vision, Leadership, and governance. Further, Christensen et al. (2015) indicated that the innovation business model contributes to effect disruption through product improvements and the introduction of new business models. The organization needs to ensure we have enough funding for investment models.

Leaders must rethink how to deliver customer value operationally to increase revenue and create new value from data analytics (Teichert, 2019). The factor value streams, and business models focus on how the organization makes value in producing new products, entering new segments, changing ways of working, and looking at the operating models that are fit for digital transformation to drive business results (Armstrong & Lee, 2021). How the organization engages with customers and applies new business models, precisely platform business models, is vital for successful digital transformation (Armstrong & Lee, 2021; Evans et al., 2017; Heubeck, 2023; Rogers, 2016).

Organization and governance drive new value streams and business models to influence business results which are critical for superior customer service but sometimes might not be sufficient to sustain superior performance in the future (Armstrong & Lee, 2021; Teece, 2010). Investment and innovation architecture impact new value streams and business models, providing a pathway for a competitive advantage (Teece, 2010). Skills development channels employees with a mindset to contribute towards innovation, which is a critical factor in enabling all the factors of digital application impact to drive business results in return for the organization's increased revenue (Armstrong & Lee, 2021).

Hypothesis 16: A direct and positive relationship exists between Investment and innovation architecture and new value streams and business models.

Hypothesis 17: A direct positive relationship exists between organization and governance and new value streams and business models.

Hypothesis 18: A direct and positive relationship exists between skills and new value streams and business models.

2.3.8 Customer orientation & engagement

Customer orientation and engagement involves customer participation and involvement in new product development, innovation, empowerment, and use of analytics for personalization and targeting (Berghaus & Back, 2016; Bumann & Peter, 2020; Teichert, 2019; Westerman et al., 2014). During the digital transformation journey, management must focus on customer needs and alignment to support a successful digital transformation (Armstrong & Lee, 2021). According to Teichert (2019), customers are at the heart of every business. Hence, the involvement of customers in the innovation process to drive business performance is critical during digital transformation. Accordingly, Berghaus and Back (2016); Bumann and Peter (2020) indicated that customer orientation and engagement involve using hybrid customer interaction and digital marketing communication channels to support digital

transformation. Organizations must deploy IT/IS systems to understand customers and attend to business problems while providing the best customer service.

Further, Westerman et al (2014) suggested that leaders need to foster the use of digital channels and improve customer orientation and engagement to drive business results. Osmundsen et al (2018) pointed out that digital transformation is often triggered by changes in customer behavior, expectations, and digital shifts in the organization industry, forcing organizations to engage in organizational transformation. Further, Osmundsen et al. (2018) suggested a need to engage in innovation and explore and develop new disruptive technologies to stay competitive, generate more revenue, keep up with changing customer behavior and expectations and maintain customer-centricity. To ensure a successful digital transformation, the organization must adopt a supportive culture for IT initiatives, Digital skills that promote openness and innovative ideas, and readiness for employees to embrace change (Osmundsen et al., 2018).

Hypothesis 19: A direct and positive relationship exists between organization and governance and customer orientation and engagement.

Hypothesis 20: A direct and positive relationship exists between Investment and innovation and architecture and customer orientation and engagement.

Hypothesis 21: A direct and positive relationship exists between skills and customer orientation and engagement.

2.3.9 Digital product innovation

Digital production innovation involves exploiting new technologies to see how they can bring new value to drive business performance. The use of innovative programs which are fine-tuned to digital transformation objectives fosters continuous and collaborative innovation (Teichert, 2019; Yang & Evans). Armstrong and Lee (2021), Bumann and Peter (2020), Ismail (2019) and Teichert (2019) indicated that management needs to

digitalize their product/service offerings, using data and analytics in products and data-based services and information-based products to support digital transformation.

Organizations must deliver digital experiences to customers by adopting digital-led platforms and applications to upgrade their existing products to support product innovation, improve revenue, and lower costs (Frames, 2012). There is a need to enhance existing products and deliver digital products to support product innovation to stay competitive and foster positive business performance (Frames, 2012; Osmundsen et al., 2018). According to Rogers (2016), product innovation is about how it creates new value for customers to drive business results. However, digital product innovation influences business results, while new value streams and business models, organization and governance, investment and innovation architecture, skills, and IT/IS excellence drive digital product innovation (Armstrong & Lee, 2021)

Hypothesis 22: A direct and positive relationship exists between new value streams and business models, and digital product innovation.

Hypothesis 23: A direct and positive relationship exists between organization and governance and digital product innovation.

Hypothesis 24: A direct and positive relationship exists between Investment and innovation architecture and digital product innovation.

Hypothesis 25: A direct and positive relationship exists between skills and digital product innovation.

2.3.10 Workforce enablement and performance

Performance management is concerned with upskilling the workforce and enabling employees to continuously improve their skills which benefits employees' performance in the long run. Employee empowerment instils confidence, motivation, and engagement among employees regarding digital transformation in managing resistance, promoting transparent, open communication, creating a spirit of innovation, and enabling knowledge sharing (Armstrong & Lee, 2021; Albukhitan,

2020; Berghaus et al., 2016; Teichert, 2019; Westerman et al., 2014). Management needs to foster knowledge management, continuous learning, and the development of new skills because this contributes to performance success (Westerman et al., 2014).

Digitalization assists the workforce in transforming, leading to positive business results by ensuring a high level of employee engagement and teamwork across the organization, promoting flexible working and agility (Berghaus & Back, 2016). Leadership assists in performance management since company leaders are responsible for the success of performance and empowerment. Employers must leverage technologies such as creating a collaborative environment for start-up methodologies to foster employee resistance to innovation, allowing the organization to master the successful digital transformation (Kane et al., 2017). Hence, workforce enablement might be critical for digital transformation to drive digital transformation results since the success of performance management depends on how well employees are rewarded for their contributions.

Hypothesis 26: A direct and positive relationship exists between organization and governance and workforce enablement and performance.

Hypothesis 27: A direct and positive relationship exists between investment and innovation architecture and workforce enablement and performance.

Hypothesis 28: A direct and positive relationship exists between skills and workforce enablement and performance.

2.3.11 Core processes digitalization

Core processes digitalization involves eliminating bottlenecks and inefficiencies in an organization through digitalizing the core processes. The organization can achieve this by automating processes, leveraging modern technologies, data-driven business to make better business decisions, continuous optimization, and fostering successful

digital transformation to drive business results (Armstrong & Lee, 2021; Berghaus & Back, 2016; Westerman et al., 2014).

Further, Armstrong and Lee (2021) stated that automating core processes fosters data-driven business and assists organizations in decision-making using data analytics to keep up with the ever-changing environment. The organization must continuously optimize its core processes by standardizing and empowering employees to support operational excellence and improve business performance (Westerman et al., 2014). However, core processes' digitalization factor drives business results.

Hypothesis 29: A direct and positive relationship exists between organization and governance and core process digitalization.

Hypothesis 30: A direct and positive relationship exists between Investment and innovation architecture and core process digitalization.

Hypothesis 31: A direct and positive relationship exists between skills and core process digitalization.

2.3.12 Information on technology (ITS)/ Information systems (IS) Excellence

According to Armstrong and Lee (2021), the organization needs the right IT/IS and platforms that fit its digitization and digital transformation. However, because of this, management must keep scanning their environment to protect their network and check how IT compliance is managed and how digitalization may impact other compliance and risk practices within the organization (Armstrong & Lee, 2021). The organization needs to ensure that the IT/IS organization is agile enough to deliver IT expertise effectively to achieve the required efficiencies and agility. Due to fast technological advancements, privacy threats have increased drastically, and organizations need to ensure IT security is aligned and compliant within the organization and with stakeholders (Berghaus & Back, 2016; Bumann & Peter, 2020; Teichert, 2019; Westerman et al., 2014).

According to Armstrong and Lee (2021), the organization needs to ensure they have suitable business models to digitize and enough funds in investment models. The organization must ensure the right IT/IS for new products and hybrid structures to support workforce performance and enablement during digital transformation to drive business results (Armstrong & Lee, 2021). There is a need for the organization to invest in innovation and architecture, IT/IS excellence, and new value streams and business models to drive business results.

Continuous innovation and new technology are critical in helping the organization create a sustainable competitive advantage. Investments and innovation architects influence IT/IS, which subsequently influences an organization's new value streams and business model, customer orientation and engagement, digital product innovation, workforce enablement, and core process digitalization and can lead to superior results or the opposite (Armstrong & Lee, 2021; Teichert (2019). For example, an organization can start offering digital services, which means its business model becomes digitally enabled, offering exponential value return.

Hypothesis 32: A direct and positive relationship exists between IT/IS excellence and core process digitalization.

Hypothesis 33: A direct and positive relationship exists between IT/IS excellence and workforce enablement and performance.

Hypothesis 34: A direct and positive relationship exists between IT/IS excellence and digital product innovation.

Hypothesis 35: A direct and positive relationship exists between IT/IS excellence and customer orientation and engagement.

Hypothesis 36: A direct and positive relationship exists between IT/IS excellence and new value streams and business models.

2.3.13 Business results

As defined previously, business results are not a factor of digital maturity but an outcome that includes financial, customer, and operations measures (Armstrong & Lee, 2021). Although results are not a factor of digital maturity, it is also true to say that an organization could not credibly claim to be digitally mature if there is no evidence of such maturity in their business results. It is, therefore, critical to measure results factors alongside the digital measurement instrument to validate that business results are a consequence of digital maturity and hence validate the model.

Further, Berghaus and Back (2016) and Westerman et al (2014) suggested that the organization must have a digitally ready infrastructure. This is to support innovation architecture, new value streams and business models, customer orientation and engagement, digital product innovation, workforce enablement, performance, and core process digitalization to drive business results. Digital ethics can negatively affect business results, mainly because of perceived failures in ethics, but when done well, it has a positive effect on business.

Hypothesis 37: Customer orientation and engagement directly and positively influence business results.

Hypothesis 38: Digital product innovation directly and positively influences business results.

Hypothesis 39: Workforce enablement and performance directly and positively influence business results.

Hypothesis 40: Core process digitalization directly and positively influences business results.

Hypothesis 41: Digital ethics directly and positively influence business results.

Hypothesis 42: New value streams directly and positively influence business results.

2.4 ANALYTICAL FRAMEWORK

2.4.1 Theoretical Framework

This study draws from a systematic analysis of different papers about digital transformation maturity models and frameworks to come up with consolidated factors of digital maturity. The study integrates digital maturity factors to understand their relationship and contribution to business results. The study first discusses the theoretical underpinnings of the proposed systems model for digital maturity.

Maturity models have become a growing topic of interest in recent years, forcing many organizations to adapt fast to the digital environment and develop specific capabilities that lead to higher digital maturity (Aras & Büyüközkan, 2023; Berghaus & Back, 2016; Salviotti et al., 2019; Westerman, 2014). The digital maturity model framework assists an organization in describing factors contributing to its maturity to improve its digital maturity (Armstrong & Lee, 2021). Maturity models can be descriptive, prescriptive, diagnostic, and normative (Armstrong & Lee, 2021; Berghaus & Back, 2016; Salviotti et al., 2019). The maturity of an organization needs to reflect the organization's age. However, it is how the organization responds to an environment appropriately through management practices (Thordsen et al., 2020).

Digital maturity models assist organizations in defining dimensions and criteria, which aid in identifying underlying areas of improvement towards maturity, thereby improving their competitiveness to achieve remarkable financial outcomes (Armstrong & Lee, 2021; Berghaus & Back, 2016; Salviotti et al., 2019). Digital maturity models assist organizations with an objective of a quantitative measure to assess where the organization is on its digital transformation journey. Digital maturity models guide where to start and an understanding of how to improve the Organization's performance concerning the factors of digital maturity (Armstrong & Lee, 2021).

Armstrong and Lee (2021) systematically analyzed all the papers and came up with consolidated factors of digital maturity. These digital models have been integrated into one called termed the unified digital maturity model (UDMM). They further modified it

into a proposed systems model for the digital maturity framework (PSM), as illustrated in Figure 1, to show relationships between its factors or factors and complex interactions between them. Their proposition is `that the relationships between various dimensions and factors of digital maturity are important for successful digital transformation and contribute to overall business results. For the sake of simplicity, the digital transformation factors which affect the overall business results can be grouped into antecedents that include Leadership, vision, and strategy, which are taken together as strategy showing the intent of the organizations, and culture, which provides the environment in which the intent occurs.

These antecedents lead to the first-level behaviors or organizational activities and supporting policies, including digital ethics, organization and governance, Investment and innovation architecture, new value streams and business models, and skills. In turn, these behavior or activities lead to subsequent activities focused on digital aspects or applications such as customer orientation and engagement, digital product innovation, workforce enablement and performance, and core processes digitalization, consequently leading to overall business results. However, as shown in Figure 1, some of the antecedents and earlier activities can also directly lead to overall business results. Hence the relationship between them must be seen as complex.

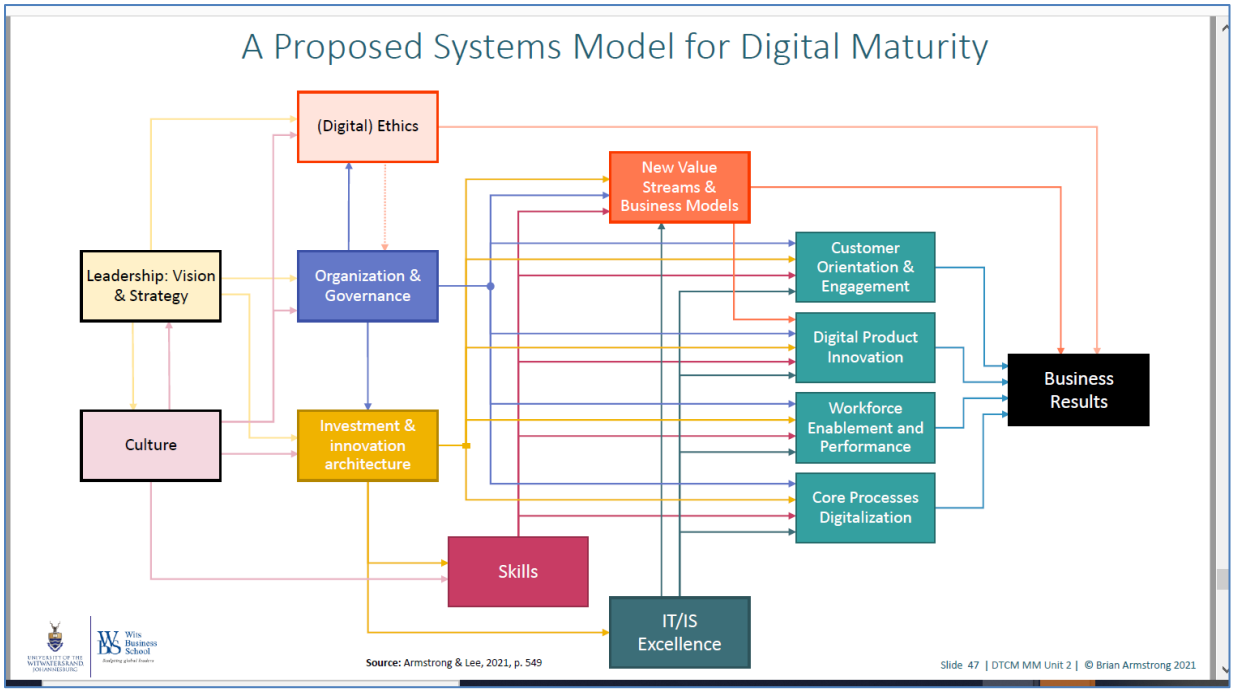


Figure 1: Proposed systems model (Armstrong and Lee, 2021, p.573). Reproduced courtesy of Silk Route Press.

2.5 Conclusion of Literature Review

In this proposal, digital transformation has been defined as the sum total of an organization's change efforts in response to technological disruption resulting in a marked change in its form, nature, and improvement (Armstrong & Lee, 2021). A distinction has been made between digital transformation and digital maturity. While the first refers to a journey, the second refers to a stage. Overall, the argument is that digital transformation is critical in any organization. Digital transformation assists organizations in responding fast to the current market changes to remain competitive and outperform their competitors (Armstrong & Lee, 2021; Weritz et al., 2020; Westerman et al., 2014). It also assists the organizations in understanding where it is currently and where they want to go and measure it in their transformation journey (Armstrong & Lee, 2021; Deloitte, 2018).

Accordingly, using the proposed systems model for the digital maturity framework, the proposition is that the relationships between various dimensions and factors of digital

maturity identified in the unified maturity are designed to assist organizations in breaking down relationships into quantifiable measures. While all the elements are important, culture is important such that it is likely to have a more significant influence than strategy. However, for organizations to be successful in digital transformation, they need to balance two things on the one hand, Leadership and strategy, and on the other hand, digital application aspects.

Two arguments emerge based on the literature review and the proposed systems model for the digital maturity framework. First, there is a relationship between these individual factors, such that an increase in one result in an increase in one. Second, the relationship between these factors is complex such that they interact to factor other factors and the overall business results. These relationships between factors of the digital maturity model can be hypothesized and illustrated in Figure 2. Overall, there are 42 hypotheses, as stated below.

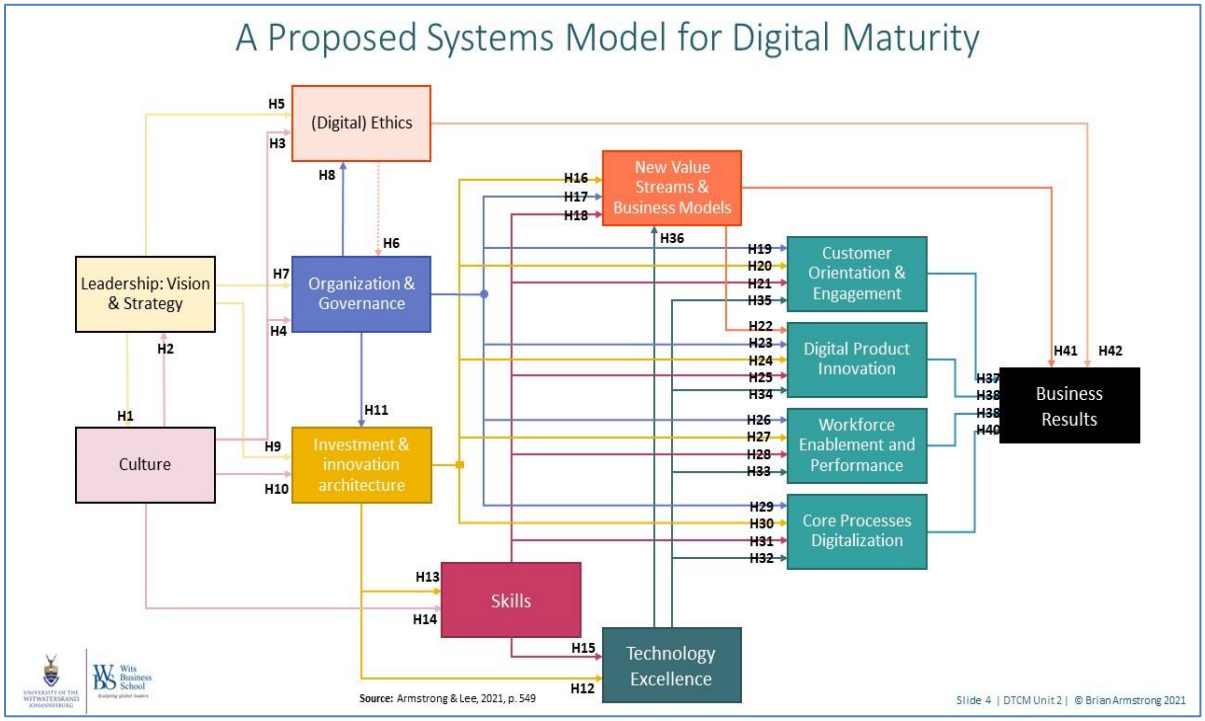


Figure 2: Adopted from the proposed systems model - Relationships (Armstrong and Lee, 2021, p.573**).**

Culture and Leadership

Hypothesis 1: Leadership positively influences culture.

Hypothesis 2: Culture positively influences Leadership.

Leadership, Culture, digital ethics, organizational governance

Hypothesis 3: A direct and positive relationship exists between culture and digital ethics.

Hypothesis 4: A direct and positive relationship exists between culture, organization, and governance.

Hypothesis 5: A direct and positive relationship exists between Leadership and digital ethics.

Hypothesis 6: Digital ethics has a positive correlation with organization and governance.

Hypothesis 7: A direct and positive relationship exists between Leadership, organization, and governance.

Hypothesis 8: There is a positive correlation between organizational governance and digital ethics**.**

Leadership, Culture, organizational and governance, Innovation, IT/IS

Hypothesis: 9: A direct and positive relationship exists between Leadership and investment and innovation architecture.

Hypothesis 10: A direct and positive relationship exists between Culture, and investment and innovation architecture.

Hypothesis 11: There is a high positive correlation between Investment and innovation architecture and organizational governance.

Hypothesis 12: A direct and positive relationship exists between Investment and innovation architecture and IT/IS excellence.

Digital skills, Investment, Culture, IT/IS

Hypothesis 13: A direct and positive relationship exists between Investment and innovation architecture and skills.

Hypothesis 14: There is a positive correlation between Culture and skills.

Hypothesis 15 There is a positive correlation between skills and IT/IS excellence.

New value streams, innovation, organization and governance, skills

Hypothesis 16: A direct and positive relationship exists between Investment and innovation architecture and new value streams and business models.

Hypothesis 17: A direct positive relationship exists between organization and governance and new value streams and business models.

Hypothesis 18: A direct and positive relationship exists between skills and new value streams and business models.

Organization and governance, customer orientation, Investment, skills

Hypothesis 19: A direct and positive relationship exists between organization and governance and customer orientation and engagement.

Hypothesis 20: A direct and positive relationship exists between Investment and innovation and architecture and customer orientation and engagement.

Hypothesis 21: A direct and positive relationship exists between skills and customer orientation and engagement.

New value streams, product innovation, organization and governance, skills

Hypothesis 22: A direct and positive relationship exists between new value streams and business models, and digital product innovation.

Hypothesis 23: A direct and positive relationship exists between organization and governance and digital product innovation.

Hypothesis 24: A direct and positive relationship exists between Investment and innovation architecture and digital product innovation.

Hypothesis 25: A direct and positive relationship exists between skills and digital product innovation.

Organization and governance, workforce enablement, innovation, skills

Hypothesis 26: A direct and positive relationship exists between organization and governance and workforce enablement and performance.

Hypothesis 27: A direct and positive relationship exists between Investment and innovation architecture and workforce enablement and performance.

Hypothesis 28: A direct and positive relationship exists between skills and workforce enablement and performance.

Organization and governance, core process, investment, skills

Hypothesis 29: A direct and positive relationship exists between organization and governance and core process digitalization.

Hypothesis 30: A direct and positive relationship exists between Investment and innovation architecture and core process digitalization.

Hypothesis 31: A direct and positive relationship exists between skills and core process digitalization.

IT/IS, Core process, workforce enablement, product innovation, customer orientation, new value streams and business models.

Hypothesis 32: A direct and positive relationship exists between IT/IS excellence and core process digitalization.

Hypothesis 33: A direct and positive relationship exists between IT/IS excellence and workforce enablement and performance.

Hypothesis 34: A direct and positive relationship exists between IT/IS excellence and digital product innovation.

Hypothesis 35: A direct and positive relationship exists between IT/IS excellence and customer orientation and engagement.

Hypothesis 36: A direct and positive relationship exists between IT/IS excellence and new value streams and business models.

Business results, customer orientation, product innovation, workforce enablement, core process, digital ethics, new value streams

Hypothesis 37: Customer orientation and engagement directly and positively influence business results.
Hypothesis 38: Digital product innovation directly and positively influences business results.
Hypothesis 39: Workforce enablement and performance directly and positively influence business results.
Hypothesis 40: Core process digitalization directly and positively influences business results.
Hypothesis 41: Digital ethics directly and positively influence business results.
Hypothesis 42: New value streams directly and positively influence business results.

CHAPTER 3. RESEARCH METHODOLOGY

This section is the research methodology. It first presents the research approach. It is followed by the research design. Third is a discussion on population and sample. This is followed by the research methods, limitations of the study, validity, and reliability. It concludes with limitations and ethical considerations.

In this study, the researcher takes an epistemological position on what is acceptable as science or the knowledge about reality (Saunders et al., 2016). The epistemological position is positivist where the researcher sees themselves as independent of social and physical reality (Askarzai & Unhelkar, 2017). It is more concerned with identifying and assessing the causes influencing outcomes (Saunders et al., 2016). The epistemological position we take also determines our ontology, which refers to our assumptions of the nature of what exists and how we see and study research objects (Saunders et al., 2016). Since the study takes a positivist approach, our ontological position is that reality is objective and, therefore, can be analyzed and interpreted using numerical forms such as numbers and graphs (Bryman, 2012; Creswell & Creswell, 2018; Greener, 2008; Saunders et al., 2016). Thus, we can make a deduction or use deductive logic to develop hypotheses, test theories, and generalize.

3.1 Research approach

Based on the epistemological and ontological position, the proposed research approach takes a quantitative approach, not a qualitative approach. A quantitative approach focuses on measuring things that can be counted and data analysis, whereas a qualitative approach focuses on people's experiences and meanings in their natural setting and data analysis in an inductive approach (Bryman, 2012; Creswell & Creswell, 2018). We develop hypotheses and test theories in quantitative methods by analyzing and interpreting data using numerical forms (Bryman, 2012; Creswell & Creswell, 2018; Saunders et al., 2016). The benefit of using quantitative research is that research findings are reliable and accurate. It can be used to make quantifiable predictions, allowing us to develop universal analytical laws in social

behaviors and statistical measures (Askarzai & Unhelkar, 2017). In this study, the purpose was to generalize, explain and predict the relationships between factors of digital maturity contributing to successful digital transformation and overall business results.

3.2 Research design

The proposed research design tested the hypothesized relationships between factors of digital maturity in different organizations in South Africa. The research was based on a cross-sectional study based on existing data or secondary data based on online surveys.

3.3 Data collection methods

The study used primary data previously collected by Professor Armstrong using a survey instrument. In this sense – for this study – it is secondary data. An online survey using a self-administered questionnaire was issued to collect data from the sample from the 763 respondents drawn from the student database studying digital business management courses at the Wits Business School during the period 2019 to 2022. The advantage is that online surveys can be accessed anytime, anywhere, because of their flexibility. The method is cheap and allows the researcher to obtain useful data in a short space of time (Broadens & Abbott, 2011; Salkind, 2012).

3.4 Population and sample

3.4.1 Population

The population for this study was mid-to junior-level managers and specialists in South African firms with an interest in and a working knowledge of digital transformation and digital maturity.

3.4.2 Sample

A sample is a subgroup of the entire population from which the researcher collects data (Saunders et al., 2016). In this study, the sample comprised 756 respondents drawn from the student database studying digital business management courses at the Wits Business School during the period 2019 to 2022 who have participated in the survey.

This sample of 763 students who participated in this study was primarily Masters – and Post-graduate Diploma level students studying at Wits Business School, who are assumed to be managers in South African organizations since these degrees a post-experience degree which mainly target junior – to - middle-level managers in their organizations. This group makes up the study population from which a sample was drawn to study digital transformation in South African companies.

3.4.3 Sampling method

This study used non-probability sampling based on both convenience and criterion. Convenience sampling is a method used by researchers to select participants that are available to participate in the research study and are conveniently selected and easily accessed (Sedgwick, 2013; Saunders & Lewis, 2012). Similarly, criterion refers to identifying a particular criterion of importance to identify weaknesses and areas of improvement (Bryman & Emma, 2011). In this case, criterion sampling was used as the students studying management courses at Wits are likely to be junior- to mid-level managers in their organizations and all of whom have had instruction in digital maturity and are knowledgeable about digital transformation in South African companies.

3.5 The research instrument.

The instrument used to collect the data used in this study was a self-administered online questionnaire developed by Armstrong and Lee (2021). The questions were

based on the 12 factors of digital maturity and business results, each with multi-item scale questions consisting of at least four to ten questions per factor, as shown in Table 2. The questions were derived primarily from the literature sources used to formulate the UDMM, but these were supplemented where the questions were inadequate or inappropriate. The survey instrument uses different Likert scales for various factors, as shown in Table 2. A detailed explanation of the survey instrument is in Appendix A.

Table 2: Research Instrument summarized.

Factors/ constructs	Sub-factors	Questions	Total number of questions	Scale	sources
Vision and strategy	Transformative scope of vision	5	**8**	7 – point Likert scale Scale of 1- 4 choices Scale of 1- 3 choices	Berghaus et al. (2016a, 2016b), Westerman et al. (2014,2012,2011), Tiechart (2020), Evans (2017)
	Vision integrated into business strategy.	2		7 – point Likert scale	Evans (2017), Global Advisory Firms (GAEs), Westerman et al. (2014,2012,2011), Bumann & Peter (2019), Tiechart (2020)
	Leadership alignment and commitment	1		Scale of 1-3 choices	Berghaus et al. (2016a, 2016b), Bumann & Peter (2019), Tiechart (2020), Evans (2017)
Organizational Culture	Leadership culture and transformation	2	**11**	7- point Likert scale	Westerman et al. (2014,2012,2011), Bumann & Peter (2019), Tiechart (2020)
	Approach to risk-taking and failure	1		Scale of 1- 4 choices	Berghaus et al. (2016a, 2016b), Tiechart (2020), (Rogers, 2016), Ismail et al., (2014), Evans (2017) GAEs, Bumann & Peter (2019),
	Organizational learning, exploration, and experimentation	5		7- point Likert scale	Tiechart (2020), Rogers, (2016)
	Collaboration culture	1		7- point Likert scale	Tiechart (2020), Bumann & Peter (2019)
Organization and Governance	Change management	1	**14**	Scale of 1-3 choices	Evans (2017)
	Digital governance structures	1		Scale of 1- 3 choices	Rogers (2016),
	Coordination of strategic activities	1		7- point Likert scale	Global Advisory Firms (GAEs)
	Roles and responsibilities	1		7- point Likert scale	Westerman et al. (2014,2012,2011),
	Digital organization and structures	**1**		7- point Likert scale	Berghaus et al. (2016a, 2016b), Westerman et al. (2014,2012,2011), Tiechart (2020), Evans (2017), GAEs
	Agile, empowering organizational structure	1		7- point Likert scale	Berghaus et al. (2016a, 2016b), Bumann & Peter (2019), Teichert (2020), Ismail et al., (2014), Global Advisory Firms (GAEs)
	Distribution of digital skills structures	1		Scale of 1- 4 choices	Tiechart (2020)
	Ecosystem engagement	7		Slider scale 0 – 100	Berghaus et al. (2016a, 2016b), Westerman et al. (2014,2012,2011), Bumann & Peter (2019), Tiechart (2020), Ismail et al., (2014), Global Advisory Firms (GAEs)
Innovation and Investment	Strategic approach to innovation	6	**11**	Scale of 1- 3 choices Scale of 1- 4 choices Slider scale 0 – 100	Berghaus et al. (2016a, 2016b), Bumann & Peter (2019), Tiechart (2020), Evans (2017)
	Lean and open innovation	**1**		Scale of 1- 4 choices	Westerman et al. (2014,2012,2011), Tiechart (2020), Rogers, (2016)
	Level and accessibility of funding	3		Scale of 1- 3 choices 7- point Likert scale	Tiechart (2020), Rogers (2016), Evans (2017), Global Advisory Firms (GAEs)
New value streams and business models	Platform business model usage	4		Scale of 1- 4 choices Scale of 1- 3 choices Scale of 1- 5 choice	Rogers, (2016), Evans (2017)
Digital Ethics	Transparency and awareness	7		4- point Likert scale	Radclyffe & Nodell (2020)

	Integration of product and business process	4		4- point Likert scale	Radclyffe & Nodell (2020)
	Participation and access	**4**	**21**	4- point Likert scale	Radclyffe & Nodell (2020)
	Ethics processes and governance structures	6		4- point Likert scale	Radclyffe & Nodell (2020)
Customer orientation and engagement	Customer participation and engagement	3	**11**	Scale of 1- 3 choices slider scale 0 – 100	Berghaus et al. (2016a, 2016b), Westerman et al. (2014,2012,2011), Bumann & Peter (2019), Tiechart (2020)
	Use of analytics for personalization and targeting	1		slider scale 0 – 100	Berghaus et al. (2016a, 2016b), Westerman et al. (2014,2012,2011), Bumann & Peter (2019), Tiechart (2020)
	Digital channels	1		slider scale 0 – 100	Westerman et al. (2014,2012,2011), Bumann & Peter (2019), Rogers (2017)
	Customer value focus	6		Slider scale 0 – 100	Bumann & Peter (2019), Tiechart (2020), Rogers (2016), Evans (2017), Global Advisory Firms (GAEs)
Digital product innovation	Digital nature of products and services	1	**7**	Scale of 1- 4 choices	Tiechart (2020), Global Advisory Firms (GAEs)
	Digital differentiation of products and services	1		3 - point Likert scale	Tiechart (2020)
	Social functionality of products and services	1		Scale of 1- 4 choices	Ismail et al., (2014)
	Data as an asset	1		Scale of 1- 4 choices	Tiechart (2020),
	Analytics and cloud technologies	1		Scale of 1- 4 choices	
Workforce enablement, Skills, and performance	Staff as community	1	**21**	Scale of 1- 4 choices	Berghaus et al. (2016a, 2016b), Westerman et al. (2014,2012,2011), Tiechart (2020), Ismail et al., (2014)
	Empowering digital talent	5		slider scale 0 – 100	Berghaus et al. (2016a, 2016b), Westerman et al. (2014,2012,2011), Tiechart (2020), Rogers, (2016), Ismail et al., (2014)
	Tapping into the community	1		Scale of 1- 4 choices	Ismail et al., (2014)
	Learning and development	9		7- point Likert scale	Berghaus et al. (2016a, 2016b), Westerman et al. (2014,2012,2011), Tiechart (2020), Rogers, (2016), Ismail et al., (2014)
	Performance management	5		Slider scale 0 – 100	Berghaus et al. (2016a, 2016b)
	Knowledge sharing and exploitation.	1		Scale of 1- 4 choices	Berghaus et al. (2016a, 2016b)
Core processes and Digitalization	Use of dashboards	1	**11**	Scale of 1- 4 choices	Ismail et al. (2014)
	Data-driven process management	1		Scale of 1- 4 choices	Berghaus et al. (2016a, 2016b)
	Experimentation	1		Scale of 1- 4 choices	
	Integration of digital technologies into operations	8		slider scale 0 – 100	Bumann & Peter (2019), Ismail et al. (2014)
IT/IS Excellence	IT-business alignment	4	**22**	slider scale 0 – 100	Westerman et al. (2014,2012,2011), Rogers, (2016), Global Advisory Firms (GAEs)
	Enterprise architecture	1		Scale of 1- 5 choices	Berghaus et al. (2016a, 2016b)
	Enterprise systems integration	1		Scale of 1- 5 choices	Berghaus et al. (2016a, 2016b), Westerman et al. (2014,2012,2011), Tiechart (2020)
	IT Infrastructure	3		slider scale 0 – 100	Global Advisory Firms (GAEs)
	IT organizational performance	**3**		slider scale 0 – 100	Berghaus et al. (2016a, 2016b), Westerman et al. (2014,2012,2011), Tiechart (2020)
	Cybersecurity	10		slider scale 0 – 100	Bumann & Peter (2019), Tiechart (2020)
Business Results	Digital initiatives generating value directly	Q12.1 DIGVD 1	**5**	Scale of 1- 3 choices	Tiechart (2020), Ismail et al., (2014)
	Functional / process improvements	Q12.2.1 FPI1		4 - point Likert scale	Evans (2017)
	Legacy business expanding	3		4 - point Likert scale	Berghaus et al. (2016a, 2016b)

3.6 Procedure for data collection

The survey instrument was first piloted and adjusted for correction before being rolled out to the potential respondents. Each participant had to complete the survey online via a link to the university website. An instruction was sent to participants before they completed the questionnaire, accompanied by the survey explaining the purpose, procedure, and ethical considerations of the survey.

3.7 Data analysis strategies and Interpretation

Since the collected data is unstructured and raw, the data was first cleaned and analyzed using Statistical software for data scientists (STATA). The data went through quality checks, including screening for errors and completeness. Several responses have several incomplete questions responses. Therefore, the data was cleaned to ensure data integrity was not compromised. Since the survey instrument uses different scales for different questions, the data was normalized to facilitate further analysis. The data was exported into the software package STATA and checked for missing values, reliability and validity, and statistical techniques used to test hypotheses.

In this study, the statistical analysis involved sequential stages. Firstly, a confirmatory factor analysis was conducted to see if the observed variables load onto the latent variables. The confirmatory analysis allows us to test the hypothesis that relationships between observed variables and their underlying latent constructs exist (Faller et al., 2006). The confirmatory factor analysis shows how each factor variable is related to the latent variable. Second, descriptive analysis was done to summarize data on variables and identify trends and patterns in the data; thirdly, correlation analysis was performed to analyze the relationship between the constructs (Faller et al., 2006).

Fourth, validity tests using Cronbach's alpha and Kaiser-Meyer Olkin (KMO) tests to measure the internal consistency of the variable factors used to represent a construct (Faller et al., 2006). The test seeks to establish how closely related variable factors are among the whole group of variable factors constituting a whole construct. The Cronbach's alpha test is used to measure the internal consistency of the variable

factors used to represent a construct (Collins, 2007). It compares the amount of shared covariance among the variable factors making up one construct. A high covariance among the related means the instrument making up the construct is reliable. A low covariance among the factor variable can be solved by removing inappropriate factor variables representing the construct. KMO measures sampling adequacy for each variable in the model and the complete model (Collins, 2007). A further test is Bartlett's test which determines whether the variances of two or more groups are equal (Collins, 2007). A KMO value over 0.5 and a significance level for Bartlett's test below 0.05 suggests there is a substantial correlation in the data, and the dataset is best suitable for factor analysis (Collins, 2007).

The last stage involved structural equation modelling (SEM) and examined the relationships between the variables for digital transformation as composed by Armstrong and Lee (2021) and overall business results using Statistical Software (STATA).

3.8 Limitations and challenges of the study

Since the study used secondary data, it comes with constraints. The structure of the questions and the scales used cannot be changed post-facto. There is a need to transfer secondary data from its original format. The data was cleaned, as some data was of no use (Greener & Martelli, 2018). Blank survey responses for individual questions were excluded from the analysis.

Also, data analysis from survey methods requires knowledge of the software and statistics and requires more time to analyze because of the large sample (Askarzai & Unhelkar, 2017). In terms of the sample, the cohorts represent a full diversity of organizations. The statistical implications of the heterogeneity of the sample need to be explored.

3.9 Quality Assurance

According to Saunders et al. (2016), the credibility of quantitative research depends on the research results' reliability, validity, and generalisability. The approaches for validity and reliability are presented.

3.9.1 External validity

External validity is the degree to which research findings can be applied to populations and settings other than those studied (Bryman, 2012). External validity is important because research conducted in one setting may not be applicable to other settings due to differences in participants, stimuli, methods, and environment (Bryman, 2012). Therefore, it is important to consider external validity when conducting and interpreting research to ensure that the research findings apply beyond the existing study (Heale & Twycross, 2015; Thiétart, 2011). A fitness test of the model was conducted to test the observed variables to ensure that the results were valid and reliable.

3.9.2 Internal validity

Internal validity refers to the extent to which one can infer a phenomenon based on the changes seen in the participants taking part in the study (Bryman, 2012). It is the extent to which a study can attribute the observed changes in the participants to manipulating the variables in the study (Bryman, 2012; Thiétart, 2011). The researcher needs to ensure validity during data analysis. This includes testing for correlation to ensure that no two variables are the same.

In this study, validity referred to both how the data was collected by looking at the data collection instrument and how the data was analyzed. For data collection, several steps were used to ensure validity. First, a validity test using Cronbach's alpha measure of the internal consistency of the variable factors was used to represent a construct. The test seeks to establish how closely related variable factors are among the whole group of variable factors constituting a whole construct.

3.9.3 Reliability

During data analysis, reliability tests were performed, sample adequacy test, internal consistency of the instrument, and fitness test. A Cronbach's α test was performed on the cleaned data to ensure that the selected variables were reliable and to determine the instrument's internal consistency. The result must be between 0 and 1, and an acceptable score must be at least 0.7 and higher. Secondly, the sample adequacy test uses the Kaiser–Meyer–Olkin (KMO) to test and assess the appropriateness of the variables. The same is confirmed using Bartlett's test of sphericity. A confirmatory analysis was done to confirm that we get the same results to show that we are measuring and testing the same constructs. The data were collected from 763 respondents drawn from the student database studying digital business management courses at the Wits Business School during the period 2019 to 2022.

3.10 Ethical considerations

The data is inherently anonymous. Students did not identify themselves in completing the surveys. The survey was entirely anonymous, and no personal student information was gathered. The purpose and outcome of the research were stated in an explicable language. The data is accessible by the research team but stored in a secure place and only allowed to authorized individuals (Oliver, 2003). Finally, this research conforms to ethical standards by being truthful, avoiding falsifying information, and producing biased outcomes. Therefore, the researcher followed the process set by the University of Wits ethics policy guidelines in handling the data, analyzing it, and reporting the findings (Wits, 2020).

CHAPTER 4. PRESENTATION OF RESULTS

This chapter will undertake the data analysis. The main aim of this chapter is to test the 42 hypotheses highlighted in Chapter 3. The chapter aims to present the statistics for each of the 147 factors variable and the diagnostic tests. The diagnostic test encompasses the correlation coefficient matrix of the factors to be included under each of the 13 constructs, 12 factors for digital maturity and 1 for business results. Then it establishes the validity of the factors under the respective construct using Cronbach's alpha. The diagnostic test assists in eliminating inappropriate variables when modelling the structural equation models.

4.1 Introduction

A quantitative research approach was used to conduct the study involving a cross-sectional survey design using an online survey captured from university students in South Africa and organizations of different sizes. The data collected through questionnaires were stirred in Qualtrics, awaiting data analysis. Since the collected data was unstructured and raw, the data was analyzed using the statistical analysis software (STATA).

In this study, the statistical analysis involved sequential stages. Firstly, we conducted a confirmatory factor analysis to see if the observed variables were loaded onto the latent variables. Second, the descriptive and correlation analysis. Thereafter, validity tests using Cronbach's alpha measure the internal consistency of the variable factors used to represent a construct. The test seeks to establish how closely related variable factors are among the whole group of variable factors constituting a whole construct. The sample adequacy test uses the Kaiser–Meyer–Olkin (KMO) to test and assess the appropriateness of the variables. The same is confirmed using Bartlett's test of Sphericity. The last stage is structural equation modelling SEM), examining the relationships between the variables for digital transformation as composed by Armstrong and Lee (2021).

4.2 Confirmatory factor analysis test

4.2.1 Confirmatory factor analysis

A confirmatory factor analysis was conducted to see if the observed variables are related or loaded onto the latent constructs, as shown in Table 3. Confirmatory analysis was used to assess the validity of each of the 13 constructs, 12 factors for digital maturity and 1 for business results. The confirmatory analysis shows that the formative scales form 12 latent constructs for digital maturity and 1 latent construct for business results. Factors with high variance were kept as they fulfilled the criteria for making up the construct reliable, and no factors were dropped. Table 3 displays the results of the confirmatory analysis. However, we observe that all the variables' constructs are positive and statistically significant; thus, all variables significantly explain the respective constructs. For example, the results shown in Table 3 show that the leadership construct, which is explained by three variables, namely LAC1, LCT1, and LCT2, the regression coefficients of the three variables are all positive (LAC1 1.724, LCT1 3.372, and LCT2 3.115). We also observe that the coefficients are all significant at the 5 per cent significant as represented by the three asterisks ***. The standard error also confirms the significant level. The standard errors remain below the regression coefficients after multiplying the standard errors by 2. This pattern is represented in all the variables under the remaining constructs.

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Table 3: Confirmatory factor analysis (CFA)

Construct: Leadership: Vision and Strategy		
Variables	Regression coefficient	Standard error
LAC1	1.724***	-0.181
LCT1	3.372***	-0.368
LCT2	3.115***	-0.371

Construct: Digital Ethics		
Variables	Regression coefficient	Standard error
TA1	1	0
TA2	0.385***	-0.0538
TA3	0.383***	-0.0629
TA4	1.016***	-0.0917
TA5	0.802***	-0.0983
TA6	0.852***	-0.0979
TA7	0.832***	-0.094
IPBP1	0.932***	-0.104
IPBP2	0.953***	-0.106
IPBP3	0.966***	-0.108
IPBP4	0.976***	-0.106
PA1	0.957***	-0.105
PA2	0.976***	-0.107

Construct: Culture		
Variables	Regression coefficient	Standard error
ARTF1	1.151***	-0.0832
OLEE1	2.232***	-0.205
OLEE2	2.556***	-0.218
OLEE3	2.656***	-0.246
OLEE4	2.571***	-0.227
OLEE5	1.724***	-0.181
CC1	1.975***	-0.202
CC2	2.198***	-0.214
CC3	2.285***	-0.22
ARTF1	0.458***	-0.0462
OLEE1	1.068***	-0.0765
OLEE2	1.160***	-0.0764
OLEE3	1.114***	-0.0748
OLEE4	1.151***	-0.0832
OLEE5	0.880***	-0.0728
CC1	0.979***	-0.0803
CC2	1.075***	-0.083
CC3	1.213***	-0.0853

Construct: Investment and innovation architecture		
Variables	Regression coefficient	Standard error
SAI1	1.086***	-0.073
SAI2	0.911***	-0.0488
SAI3	0.955***	-0.0508
SAI4	0.307***	-0.0273
SAI6	0.266***	-0.0189
LOI1	0.313***	-0.0232
LOI2	0.495***	-0.0648
LAF1	0.391***	-0.0575
LAF2	0.703***	-0.0503
LAF3	0.642***	-0.0467

Construct: Workforce enablement, Skills, and performance		
Variables		Standard error
PM1	0.726***	-0.0439
PM2	0.923***	-0.0296
PM3	1.029***	-0.0314
PM4	0.965***	-0.0482

Construct: Customer orientation and engagement

Construct: skills		
Variables	Regression coefficient	Standard error
EDT1	1.113***	-0.0605
EDT2	1.067***	-0.0685
EDT3	0.919***	-0.0644
EDT4	0.318***	-0.0282
EDT5	0.708***	-0.0497
LD1	0.761***	-0.0473
LD2	0.787***	-0.0458
LD3	0.726***	-0.0439
LD4	0.704***	-0.0446
LD5	0.804***	-0.051

Construct: New value streams and business models.		
Variables	Regression coefficient	Standard error
PBMU1	1.503***	-0.0631
PMU2	0.578***	-0.0651
PBMU3	2.304***	-0.203
PBMU4	2.373***	-0.208

Construct: Core processes and Digitalization

PA3	0.996***	-0.108
PA4	0.936***	-0.103
EPGS6	1.675***	-0.315
EPGS5	0.364***	-0.0528
EPGS4	0.764***	-0.0629
EPGS3	0.876***	-0.0996
EPGS2	0.922***	-0.102
EPGS1	0.885***	-0.0984

Construct: Organization and Governance

Variables	Regression coefficient	Standard error
CSA1	0.970***	-0.0683
RR1	0.406***	-0.0311
DOS1	0.381***	-0.0292
AEOS1	0.790***	-0.0683
DDSS1	1.134***	-0.0699
EE2	1.086***	-0.073
EE5	1.107***	-0.105

Construct: IT/ IS excellence

Variables	Regression coefficient	Standard error
ITBA1	1.139***	-0.0633
ITBA2	0.992***	-0.0677
ITBA3	0.970***	-0.0683
ITBA4	0.347***	-0.0345
EA1	0.345***	-0.0311
ESI1	0.866***	-0.0709
ITI2	0.971***	-0.0704
ITI3	0.699***	-0.0644
ITOP1	0.784***	-0.0649
ITOP2	0.770***	-0.0644
ITOP3	1.097***	-0.0619
C1	1.073***	-0.0622
C2	0.997***	-0.0597
C3	1.074***	-0.0591
C4	1.103***	-0.0605
C5	1.114***	-0.0633
C6	1.096***	-0.0595
C7	1.115***	-0.0623
C8	1.139***	-0.0633
C9	1.181***	-0.0674
C10	0.162***	-0.0166

Variables	Regression coefficient	Standard error
CPE1	1.553***	-0.16
CPE2	0.907***	-0.0507
CPE3	1.079***	-0.0569
UAPT1	1.090***	-0.0532
DC1	1.148***	-0.0526
CVF1	1.503***	-0.0631
CVF2	1.546***	-0.0633
CVF3	1.511***	-0.0627
CVF4	0.200***	-0.021

Construct: Digital product innovation

Variables	Regression coefficient	Standard error
DDPS1	1.090***	-0.0532
DDPS2	1.439***	-0.146
DDPS3	0.972***	-0.124
SFPS1	1.636***	-0.159
DA1	1.553***	-0.16
ACT1	4.343***	-0.418

Variables	Regression coefficient	Standard error
UD1	1.079***	-0.0569
DDPMIa	1.460***	-0.119
E1	5.310***	-0.334
IDTO1	5.300***	-0.336
IDTO2	5.464***	-0.34
IDTO3	3.965***	-0.342
IDTO4	3.723***	-0.315
IDTO5	5.679***	-0.375
IDTO6	5.362***	-0.366
IDTO7	4.280***	-0.338
IDTO8	3.514***	-0.262

Construct: Business results.

Variables	Regression coefficient	Standard error
DIGVD1	1	0
FPI1	1.192***	-0.0801
LBE1	1.298***	-0.0863
LBE2	1.292***	-0.0896

Source: Stata output using the survey dataset

4.3 Diagnostics tests

4.3.1 Descriptive statistical analysis

The descriptive analysis provides an in-depth understanding of the study population, and its purpose is to describe results and summarize data of all dependent and independent variables through means, deviation, and scores (Creswell & Creswell, 2018; Saunders et al., 2016). The data can be presented in tables and graphs. Appendix F is the summary statistics of all the data. Although an SEM analysis provide the inferential analysis at the end, we do not observe the 13 variables directly but are latent variables that come out as a result of our CFA. Therefore, we provide the summary statistics showing the number of observations, the arithmetic mean, standard deviation, and minimum and maximum values of all 147 observed variables for the individual indicators per each of the 13 latent variables, 12 for digital maturity and 1 latent variable for business results. The data was collected from 23 cohorts from 2019-2022. The total number of observations is 756, but some factor variables have less than 756 observations as some observations are recorded as missing. A sample size of 756 is good and considered normal, and the standard deviation shows many variations among the observations. All the 147-factor variables have a minimum value of 1, but they have different maximum values depending on the Likert scale and options of the various questions.

Additionally, a normality as shown Appendix G was carried to show that the 147-factor variable are normally distributed and the latent variables they give are accurate. To determine if the normally distributed we undertook the Shapiro-Wilk normality test. The regression estimation is based on the assumption that the dataset is normally distributed. The null hypothesis of the Shapiro Wilk test is that the variable is normally distributed. If the p-value of the test is less than some significance level (common choices include 0.01, 0.05, and 0.10), then we can reject the null hypothesis and conclude that there is sufficient evidence to say that the variable is not normally distributed. The standard significant value to use is the 5% (0.05). Thus, if the p-value is less than 0.05 then the variable is regarded as normally distributed. The table in

Appendix G, show that all the variables are normally distributed as the p-values are below the 0.005. This is consistent with the rule of thumb which say as long as the sample size is greater than 30 then the variables turn to be normally distributed. Therefore, it can be argued that the actual 13 latent factors are also normally distributed, and we can infer the relationship between them as accurate and generalizable.

4.3.2 Correlation Analysis

Following the summary statistics presented in Appendix F and normality test in Appendix G, we undertook a correlation analysis of the factors shown in Appendix H. The idea behind the correlation analysis is to justify the inclusion of various factor variables under the same constructs. If multiple factor variables represent the same construct, they all must be strongly correlated and positive, with a correlation coefficient greater than 0.5. If they do not meet these criteria, they have been dropped. Appendix H shows the correlation coefficients and the p-values of the variable representing each of the 13 constructs.

A close look at the correlation coefficient tables shows the strong and significant correlation of all factor variables under the vision and strategy construct; Innovation and Investment construct; New value streams and business models construct; Digital Ethics construct; Digital product innovation construct; Core processes and Digitalization construct; IT/IS Excellence construct, which make the 12 factors for digital maturity, and 1 for business results construct. Therefore, all the factor variables are accepted.

Under the organization governance construct, variable factors EE1, EE3, and EE4 negatively correlate with another variable within the same construct; thus, CM1 will be dropped. Similar explanations are also made for variable factors CVF5 under the Customer orientation and engagement construct, SCI, PM5 under Workforce enablement and performance construct LD6, LD7, LD8, and LD9 under Skills constructs. The rest of the factor variables meet the conditions and are acceptable. Therefore, they can explain the 13 latent variables (12 factors for digital maturity and

1 latent variable for business results). The subsequent sub-section goes further to test the validity and consistency of these variables.

4.3.3 Validity and consistency tests

A Cronbach's alpha of 0.70 and above is good, while 0.80 and above is better, but a value of 0.90 and above is best. Validity tests of the variable factors under the 13 constructs are displayed in Table 4. Table 4 shows the alpha values of each factor variable and then the scale values, which are the alpha value for the whole construct. The IT/IS Excellence construct has the highest alpha value of 0.9687, followed by the Digital Ethics construct with a value of 0.9580. The Workforce enablement and performance construct has the lowest value of 0.7608, which can be rounded off to 0.8. Thus, all the constructs have an average alpha value of above 0.8. This means there is internal validity of the factor variables included under each construct.

Table 4: Construct validity tests

IT/IS Excellence		**Digital Ethics**		**Organizational Culture**		**Innovation and Investment**		**Core processes and Digitalization**	
Item	alpha	Item	Alpha	Item	alpha	Item	alpha	Item	alpha
ITBA1	0.9667	TA1	0.9580	LCT1	0.9031	SAI1	0.8676	UD1	0.9166
ITBA2	0.9668	TA2	0.9582	LCT2	0.9093	SAI2	0.8707	DDPMIa	0.9165
ITBA3	0.9670	TA3	0.9578	ARTF1	0.9092	SAI3	0.8678	E1	0.9061
ITBA4	0.9688	TA4	0.9567	OLEE1	0.8989	SAI4	0.8794	IDTO1	0.9069
EA1	0.9687	TA5	0.9574	OLEE2	0.8927	SAI5	0.8736	IDTO2	0.9048
ESI1	0.9680	TA6	0.9555	OLEE3	0.8943	SAI6	0.8722	IDTO3	0.9135
ITI1	0.9671	TA7	0.9556	OLEE4	0.8968	LOI1	0.8717	IDTO4	0.9126
ITI2	0.9670	IPBP1	0.9549	OLEE5	0.8996	LOI2	0.8834	IDTO5	0.9070
ITI3	0.9680	IPBP2	0.9548	CC1	0.8987	LAF1	0.8857	IDTO6	0.9095
ITOP1	0.9675	IPBP3	0.9551	CC2	0.8988	LAF2	0.8708	IDTO7	0.9098
ITOP2	0.9675	IPBP4	0.9543	CC3	0.8972	LAF3	0.8719	IDTO8	0.9155
ITOP3	0.9666	PA1	0.9544	**Test scale**	**0.9082**	**Test**	**0.8843**	**Test scale**	**0.9183**
C1	0.9667	PA2	0.9542	**Organization and Governance**		**Skills**		**Customer orientation and engagement**	
C2	0.9672	PA3	0.9543	Item	alpha	Item	alpha	Item	alpha
C3	0.9666	PA4	0.9549	CM1	0.8722	EDT1	0.8316	CPE1	0.9097
C4	0.9665	EPGS1	0.9547	DGS1	0.8699	EDT2	0.8246	CPE2	0.9114
C5	0.9669	EPGS2	0.9545	CSA1	0.8537	EDT3	0.8271	CPE3	0.9100
C6	0.9666	EPGS3	0.9556	RR1	0.8583	EDT4	0.8354	UAPT1	0.9091
C7	0.9666	EPGS4	0.9572	DOS1	0.8580	EDT5	0.8280	DC1	0.9050
C8	0.9667	EPGS5	0.9585	AEOS1	0.8618	LD1	0.8248	CVF1	0.9060
C9	0.9668	EPGS6	0.9581	DDSS1	0.8489	LD2	0.8217	CVF2	0.9051
C10	0.9696	**Test scale**	**0.9580**	EE2	0.8522	LD3	0.8238	CVF3	0.9057
Test scale	**0.9687**			EE5	0.8586	LD4	0.8251	CVF4	0.9279
Business Results		**New value streams and business model**				EE6	0.8567	CVF6	0.9294
Item	alpha	Item	Alpha	EE7	0.8576	**Test**	**0.8464**	**Test scale**	**0.9203**
DIGVD1	0.8961	PBMU1	0.7900	**Test scale**	**0.8685**			**Vision and strategy**	
FPI1	0.8327	PMU2	0.7904					Item	alpha
LBE1	0.8310	PBMU3	0.7078					TSV1	0.8826
LBE2	0.8475	PBMU4	0.6777					TSV2	0.8859
Test scale	**0.8855**	**Test scale**	**0.7946**	**Digital product innovation**		**Workforce enablement and performance**		TSV3	0.8846
				Item	alpha	Item	alpha	TSV4	0.8787
				DNPS1	0.7745	SC1	0.7816	TSV5	0.8779
				DDPS1	0.7802	PM1	0.6907	VBS1	0.8955
				DDPS2	0.7792	PM2	0.6883	VBS2	0.8816
				DDPS3	0.8011	PM3	0.6849	LAC1	0.9021
				SFPS1	0.7749	PM4	0.6998	**Test**	**0.8990**
				DA1	0.7807	PM5	0.7695		
				ACT1	0.7884	KSE1	0.7794		
				Test scale	**0.8078**	**Test**	**0.7608**		

Source: Stata output using the survey dataset

4.3.4 Sample adequacy test- Internal reliability

Table 5 below shows that the variables are better suited for factor analysis as they all have a significant Bartlett test and KMO values above 0.5.

Table 5: Sample adequacy test- Internal reliability

	Bartlett test of sphericity				
Construct	**Determinant**	**Chi-square**	**Degrees of freedom**	**p-value**	**KMO**
Vision and strategy	0.016	1798.370	28	0.000	0.913
Organizational Culture	0.002	2666.150	55	0.000	0.925
Organization and Governance	0.000	5438.773	91	0.000	0.889
Innovation and Investment	0.005	2156.242	55	0.000	0.845
New value streams and business model	0.221	980.885	66	0.000	0.707
Digital Ethics	0.000	7176.993	210	0.000	0.964
Customer orientation and engagement	0.000	5924.381	55	0.000	0.899
Digital product innovation	0.148	816.765	21	0.000	0.854
Workforce enablement and performance	0.020	1623.928	21	0.000	0.813
Skills	0.000	3579.773	91	0.000	0.895
Core processes and Digitalization	0.000	6035.664	91	0.000	0.891
IT/IS Excellence	0.000	10676.94	231	0.000	0.956
Results	0.093	1047.210	6	0.000	0.813

Source: Stata output using the survey dataset

4.4 Regressions from the Structural Equation Modelling

The interest in this subsection is to show the proposed 42 relationships or hypotheses, first between the proposed 12 factors of digital maturity (H1-H36) and second between 12 factors of digital maturity and business results (H37 – H42), as shown in Figure 3. We do not show or explain the observed variables, as this has been done in section 4.2.1 on confirmatory factor analysis and shown in Table 4.1.

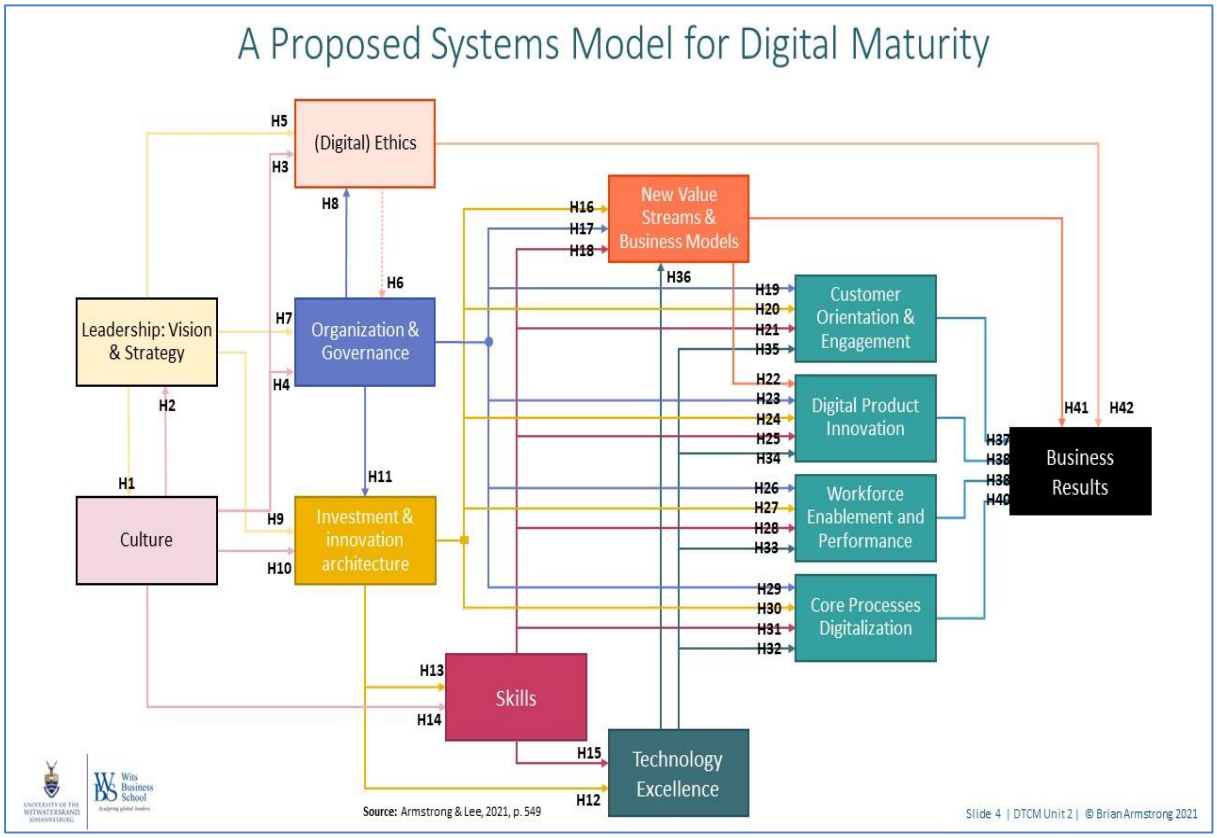


Figure 3: Adopted from the model of the proposed system - Relationships (Armstrong and Lee, 2021, p.573).

Tables 6 to 8 are the multiple regressions of the SEM, which show the relationship between the 12 factors of digital maturity. The findings in Table 6 show that culture strongly influences Leadership, and the relationship is positive and significant. However, the relationship is stronger from the culture side to the leadership: vision and strategy, which is strongly very significant, with a large coefficient (1.432) compared to the opposite relation, which is strongly significant with a lower regression

coefficient (0.657). The relationship between digital ethics and culture is positive and statistically significant. Organization and governance, and culture are also positively and statistically related. The same applies to digital ethics, which positively influences organization and governance. However, the relationship is stronger from the organization and governance side to the digital ethics side, as shown by the regression coefficient of 1.612 compared to 0.348. The results also accept propositions of hypotheses H3, H4, H5, H7, H9, H10, H11, and H12, which are positive and significant at P-Value (0.001).

The results in Table 7 show mostly significant and positive relationships and accept hypotheses H13- H25. We can see that skills have a very significant and positive influence on investment and Innovation. It also has a very significant and positive relationship with ITS/IS excellence. The same applies to new value streams and business models, customer orientation and engagement, and digital product innovation.

Table 8 presents the results for H26 – H36 and shows a mixed picture where some factors are positive, and some are negative. However, hypotheses H29, H30, H31, H32, H34, H35, and H36 were supported and showed a significant and positive relationship. Whereas H26, H28, and H33 showed a negative relationship and insignificant relationship, and H27 showed a negative and significant relationship. However, we can see that some work-related factors are negative and significant, and others are negative and not significant.

Lastly, Table 9 presents the results for the relationship between the 12 factors for digital maturity and business results. It shows support for H37, H38, H40, and H42 and no support for H39. However, business results are the most popular variable here, influencing digital ethics, new value streams, business models, digital product innovation and core processes, and digitalization. These results concluded that there was no relationship between hypothesis H39. However, the hypothesis H37, H38, H40, H41, and H42 were supported and showed a significant positive relationship.

Table 6: Regression estimation of the structural regression models hypotheses H1- H12.

Hypothesis	Constructs	Leadership	Culture	Digital Ethics	Organization and governance	Investment and innovation architecture	Investment and innovation architecture
H1	Culture	1.432***					
H 2	Leadership		0.657**				
H 3	Digital Ethics		0.603***				
H 4	Organization and governance		1.153***				
H 5	Digital Ethics	1.225***					
H 6	Organization and governance			1.612***			
H 7	Organization and governance	2.886***					
H 8	Digital Ethics				0.348***		
H 9	Investment and innovation architecture	5.121***					
H10	Investment and innovation architecture		1.651***				
H 11	Organizational and governance					0.575***	
H 12	IT/IS excellence						0.561***

Source: Stata output using the survey dataset, *** p<0.01, ** p<0.05, * p<0.1
NB: For some of the factors, there is no data to indicate a relationship is absent has been deleted to make the table neat.

Table 7: Regression estimation of the structural regression models hypotheses H13- H25.

Hypothesis	Constructs	Culture	Organization and governance	Investment and innovation architecture	Investment and innovation architecture	Skills	New Value Streams and business models
H13	Skills			0.843***			
H 14	IT/IS excellence	1.021***					
H 15	IT/IS excellence					2.003***	
H 16	New Value Streams and business models				0.289***		
H 17	New Value Streams and business models		0.400***				
H 18	New Value Streams and business models					0.890***	
H 19	Customer orientation and engagement		0.777***				
H 20	Customer orientation and engagement				0.746***		
H 21	Customer orientation and engagement					2.642***	
H 22	Digital Product Innovation						0.525***
H 23	Digital Product Innovation		0.287***				
H 24	Digital Product Innovation				0.178***		
H 25	Digital Product Innovation					0.539***	

Source: Stata output using the survey dataset, *** p<0.01, ** p<0.05, * p<0.1.
NB: For some of the factors, there is no data to indicate a relationship is absent has been deleted to make the table neat.

Table 8: Regression estimation of the structural regression models hypotheses H26- H36

Hypotheses	Constructs	Organization and governance	Investment and innovation architecture	IT/IS excellence	Skills
H26	Workforce Enablement and Performance	-0.0189			
H27	Workforce Enablement and Performance		-0.0897*		
H28	Workforce Enablement and Performance				-0.228
H29	Core process Digitization	0.255***			
H30	Core process Digitization		0.196***		
H31	Core process Digitization				0.663***
H32	Core process Digitization			0.195***	
H33	Workforce Enablement and Performance			-0.0908	
H34	Core process Digitization			0.151***	
H35	Customer orientation and engagement			0.814***	
H36	New Value Streams and business models			0.193***	

Source: Stata output using the survey dataset, *** p<0.01, ** p<0.05, * p<0.1
NB: For some of the factors, there is no data to indicate a relationship is absent has been deleted to make the table neat.

Table 9: Regression estimation of the structural regression models hypotheses H37- H42

Hypothesis	Constructs	Digital Ethics	New Value Streams and business models	Customer orientation and engagement	Digital product and innovation	Workforce enablement and engagement	Core process Digitalization
H37	Business results			0.179***			
H38	Business results				1.170***		
H39	Business results					-0.00995	
H40	Business results						0.921***
H41	Business results	0.607***					
H42	Business results		0.619***				

Source: Stata output using the survey dataset, *** p<0.01, ** p<0.05, * p<0.1
***NB**: For some of the factors, there is no data to indicate a relationship is absent has been deleted to make the table neat.*

4.4.1 Fitness of the Model

Appendix (J) shows the fitness of the structural equation models. Root mean squared error of approximation test, Comparative fit index test, Tucker-Lewis's index test, and the Chi2 test are used to determine the fitness of the 42 regression models. For the model to be regarded as fit, the Root mean squared error of the approximation value should be less than 0.06 (Browne & Cudeck, 1993). The comparative fit index test value should be greater than or equal to 0.9 (Bentler, 1999). Tucker-Lewis's index test should be greater than or equal to 0.9, Hu and Bentler (1999), and the Chi2 test should be significant. However, models H26, H27, H28, H33, and H39 are not fit using the above test. All the other model ranges from weakly fit to strong fit.

4.5 Summary of the Results/ Findings

In conclusion, the results have confirmed the factors of digital maturity as proposed by Armstrong and Lee (2021), and they have a positive influence and are essential for achieving digital maturity. Organizations using these factors are likely to succeed in their digital transformation journey. Based on the results, our hypothesized model is a good fit for the data, and our items indeed measure the 13 constructs, i.e., 12 factors for digital maturity and 1 business results construct. We also used correlations to understand how the 12 factors for digital maturity as well as the 1 for business results, are related. The diagnostic test confirms this validity and strong support for consistency. The structured model confirms the digital maturity model proposed by Armstrong and Lee (2021). All the hypothesized relationships have been accepted except for H26, H28, H33, and H39 were rejected as their regression coefficients were negative, not statistically significant, and H27, which is negative and significant. Also, the findings show that while there is a positive and very significant two-way relationship between the culture side and leadership, the relationship is stronger on the culture side.

CHAPTER 5. DISCUSSION OF THE RESULTS OR FINDINGS

5.1 Introduction

Following the data analysis and the regression estimation from Chapter 4, this chapter discusses the regression estimations, and the hypotheses 42 hypotheses were formulated in Chapter 3. The hypotheses were then tested in Chapter 4. Of the 42 hypotheses, 37 were accepted, while 5 were rejected. This chapter will unpack all 42 hypotheses substantiating the acceptance and rejection and situating the findings in the body of literature. This means empirical literature will be used to support the discussions of the findings.

5.2 Demographic profile of respondents

The survey was circulated among students studying at Wits Business School, who are assumed to be managers in SA firms. The online survey data collection was employed, with convenience sampling being drawn through an electronic link to the students. Approximately 763 respondents participated in the survey, and only 756 of these responses were used.

5.3 Discussion pertaining to the hypotheses and regression estimations.

The findings show a two-way relationship between culture and leadership, strategy, and vision, but the relationship is stronger from the cultural side. These findings help resolve the debate, e.g., culture positively influences Leadership as culture shapes Leadership, which are key drivers of digital transformation Armstrong and Lee (2021), between which of the two takes matter more than the other. The findings show that while both have a strong relationship with digital aspects and business results, culture has an even stronger relationship (Armstrong & Lee, 2021). However, these results are consistent with Klein et al.

(2013), Simosi and Xenikou (2010) and Tsait (2011), who show a positive association between leadership and culture. Prior studies show that leadership has a strong relationship with organizational culture in influencing success in implementing a successful digital transformation (Poturak et al., 2020). These findings suggest that organizations need to set the environment by ensuring the right culture, leadership, vision, and strategy and invest in innovation and governance to foster successful digital transformation (Armstrong & Lee, 2021; Dinsdale, 2017; Schein, 2005).

Furthermore, the study confirmed that the relationship between culture, digital ethics, organization and governance is positive and significant. There is a two-way relationship between digital ethics and organization and governance, which is stronger from the organization and governance side to the digital ethics side. These findings are critical because they highlight culture's positive influence on digital ethics, as culture influences the adoption and development of digital ethics norms and values (Armstrong & Lee, 2021; Radclyffe & Nodell, 2020). Conversely, digital ethics shapes culture by influencing people on how they communicate, share information, and interact with each other (Radclyffe & Nodell, 2020). However, these findings are consistent with Ampofo et al (2011) and İbrahimoğlu et al (2014), who show a positive and direct relationship between culture and digital ethics which implies better ethical decisions. These findings are also consistent with Sari et al (2018), showing a positive and significant relationship between culture, organization, and governance. In the same vein, Applegate et al (2009), Armstrong and Lee (2021), Hofstede (2021), and Teichert (2019) also argue that organization and governance could also shape culture by ensuring that the policies and procedures put in place to manage organizational activities can influence the behaviors and attitudes of people within the organization.

Furthermore, ethics can impact organization governance as adopting ethical principles can influence how the company is managed and controlled as ethical consideration has to be an integral part of the decision-making process (Ampofo

et al., 2011; OECD, 2022). Culture, Digital Ethics, and Organization and Governance are essential factors when considering ethical issues in the digital transformation journey (Armstrong & Lee, 2021).

The study findings show that the relationship between leadership, organization and governance, and digital ethics was positive and significant. These findings are critical because they highlight leadership's positive influence on digital ethics on organizational and governance as digital ethics shape the governance of the organization and on leadership as leaders can create a culture that values ethical behavior. This culture inspires and influences others toward achieving digital transformation successfully. These findings are consistent with Floridi (2018) and Guo (2022), which show that the relationship between leadership and digital ethics is positive and significant. In addition, these findings are consistent with Akparep et al (2019) and Tsait (2011), who show a positive and direct relationship between Leadership, organization and governance.

Armstrong and Lee (2021), Behera et al (2022), and Radclyffe and Nodell (2020) suggested that leaders who prioritize digital ethics set an excellent example for others by adopting ethical behaviors for digital transformation. Effective leadership is critical in shaping the organizational culture and values, promoting ethical behaviors, and ensuring effective government practices (Kane et al., 2017; Poturak et al., 2020; Radclyffe & Nodell, 2020). Overall, the relationship between digital ethics and organizational governance is mutual and can influence each other as digital ethics shapes organizational and governance, both vital for digital transformation. However, Ciulla (2002) has argued that the relationship is not always direct, as leaders face too much pressure to prioritize factors like maximizing profit or Innovation over ethical considerations (Wirtz et al., 2023). Therefore, organizational and governance systems must work together to promote ethical behaviors and ensure digital technologies are used ethically (Lobschat et al., 2021).

This research further revealed a significant and positive relationship between leadership, culture, investment and innovation architecture, organization and

governance, and IT/IS excellence. Effective leadership promotes investment and innovation architecture, positively influencing leadership, culture, organizational and governance, and IT/IS excellence. Prior research shows that a company that invests in innovation architecture has a high chance of creating an effective digital transformation strategy that supports the business's overall objectives (Armstrong & Lee, 2021). However, the study findings are consistent with previous research that says leaders play a crucial role in shaping and defining organizational strategies that contribute to leadership and a culture that promotes investment and innovation (Szczepańska-Woszczyna, 2015). Combining investment, innovation architecture, and IT/IS excellence assists organizations in creating a solid foundation for digital transformation, creating new value for their customers, and leading to the successful execution of strategic objectives (Armstrong & Lee, 2021; Bolman & Deal, 2017). A culture that values innovation and change combined with effective governance structures can assist organizations in navigating to challenges of digital transformation successfully (Armstrong & Lee, 2021).

The findings further show a positive and significant relationship between investment and innovation architecture, culture, skills, and IT/IS excellence. These findings are consistent with OECD (2016), which supports that investment and innovation architecture positively influence skills. Similarly, these findings are consistent with Tsait (2011) and Tunde Joel et al (2013), who show that skills positively influence IT/IS excellence. Effective investment and innovation architecture are critical for skills development by providing opportunities for individuals to learn and practice new skills that align with organizational strategic objectives and innovation goals (Armstrong & Lee, 2021). However, market conditions, resource constraints, and a competitive environment can impact the effectiveness of investment and innovation architecture (OECD, 2018). In turn, investment and innovation architecture can also affect organizational culture and employee behavior (Efrat, 2014). Overall, a positive culture assists in attracting and retaining employees giving the organization a competitive edge in the changing market landscape (Dinsdale, 2017; Thrassou, 2013). Lastly, the

success of digital transformation initiatives depends on the skills and expertise of IT professionals, and they need to embed digital skills in their transformation journey (Armstrong & Lee, 2021; Westerman et al., 2014).

This research shows the positive and significant relationship between new value streams and business models, Investment and innovation architecture, organization and governance, and skills. These findings are particularly important because they highlight new value streams and business models' positive influence on investment and innovation architecture, organization and governance, and skills. These findings are consistent with (Cho and Pucik, 2005; Foss and Saebi, 2018). According to Armstrong and Lee (2021), Papyrus (2021), Teresko (2008), Westerman et al (2014), and Westerman et al (2011) suggested that it is imperative to develop the right skills to drive digital transformation and develop new digital solutions, value streams and business models.

Moreover, developing new value streams and business models requires diverse skills such as data analytics, software development, and design thinking (Provost & Fawcett, 2013). By prioritizing the development of skills across the organization, organizations create a culture of Innovation, driving digital transformation to better align with changing market conditions, and stay ahead in the digital age (Kane et al., 2019; Teichert, 2019). These findings suggest that Investment and innovation architecture plays a critical role by providing the necessary resources and fostering a culture of Innovation, leading to a successful digital transformation (Armstrong & Lee, 2021; Kane et al., 2017; Teichert, 2019; Westerman et al., 2014).

This study has found a positive and significant relationship between customer orientation and engagement, organization and governance, Investment and Innovation architecture, and skills. The literature suggests that effective organization and governance structures are essential for companies to drive customer orientation and engagement in digital transformation (Armstrong & Lee, 2021; Teichert, 2019). By doing so, these companies stay ahead of their competitors and meet the changing customer needs in the digital age (Teichert,

2019). These structures provide frameworks for collaboration between teams enabling companies to initiatives that drive customer engagement and digital transformation to meet customer expectations and needs (Armstrong & Lee, 2021; Bolman & Deal, 2017; MIT, 2011). In summary, the relationships between innovation and architecture, customer orientation, and engagement and skills are interconnected, and there is a need for the company to balance these to remain sustainable in the digital age as they play a crucial role in the success of the business (Teichert, 2019). A company that invests in research, development, marketing, and other areas outperforms its competitors (Busru & Shanmugasundaram, 2017). Similarly, companies that prioritize skills development and mindset are more likely to succeed in engaging customers and attaining business goals (Barreto & Lopez-Fresno, 2020; Thrassou, 2013).

Furthermore, the findings show a positive and significant relationship between digital product innovation, new value stream and business models, Investment and innovation architecture, organization and governance, and skills. These findings are essential because they highlight new value streams and business models' positive influence on organization and governance, Investment and innovation architecture, and skills in digital product innovation. Effective organization and governance play a critical role in enabling digital product innovation, and a culture that supports experimentation, risk-taking, and learning from failures is essential (Armstrong & Lee, 2021; Schein, 2005; Senge, 2007). Armstrong and Lee (2021) and Busru and Shanmugasundaram (2017) further suggested that investment in digital product innovation and effective innovation architecture can also drive digital transformation. Embracing digital transformation and exploring new value streams and business models can help companies to stay ahead of the competition and create sustainable growth in the fast-changing digital landscape (Albukhitan, 2020; MIT, 2011).

The evidence suggests a positive and significant relationship between core process digitalization, organization and governance, and skills. A solid governance structure ensures that digitalization efforts align with business

objectives and strategy, which assist with the prioritization of digital initiatives and the effectiveness of resource allocation results (Armstrong & Lee, 2021; Berghaus & Back, 2016; Westerman et al., 2014). The critical success factors of core process digitalization are investment and innovation architecture, organization and governance, and skill. Through investing in technology and creating an environment that supports innovation, businesses and organizations can successfully implement digital transformation and outperform their competitors (Armstrong & Lee, 2021).

The study findings show a positive and significant relationship between IT /IS excellence, core process digitalization, digital product innovation, customer orientation and engagement, and new value streams and business models. The results are consistent with those of (Lee et al., 2016). These findings highlight the importance of IT/IS excellence in digital product innovation, new value streams and business models, customer orientation and engagement, and core process digitalization for the success of digital transformation and staying competitive.

As indicated in Chapter 2, business results are not a factor of digital maturity. The study findings support that customer orientation and engagement, digital product innovation, core process digitalization, digital ethics, new value streams, and business models directly and positively and statistically significantly influence business results. New value streams can assist businesses in generating additional revenue streams by offering new products or services, leveraging new channels to reach customers, diversifying their revenue streams, and reducing costs depending on a single product or service (Stokes, 2018). Whilst digital product innovation can help businesses increase revenue, reduce costs, improve customer experience, have a competitive advantage, stay ahead of the curve, and thrive in today's fast-paced digital economy (Heubeck, 2023; Cho & Pucik, 2005). Taken together, these findings suggest that organization that prioritizes digital ethics continuously innovate, adapt to changing market demands and customer needs, and identify factors that hinder workforce enablement and performance from creating an environment that fosters employee engagement

and enables them to perform at their best, contributing to improved business results success (Armstrong & Lee, 2021; Bolman & Deal, 2017; Chakraborty & Ganguly, 2019).

Surprisingly, the findings show that workforce enablement and performance have a negative and insignificant relationship with business results, IT/IS excellence, skills, and organization and governance. However, workforce enablement and performance have a negative and significant relationship with investment and innovation architecture. These findings contradict the initial hypothesis stating that there is a positive and significant relationship between the above-mentioned factors. However, the negative relationship implies that employees may resist change and not see the need to follow the organization and governance structures, particularly if they feel the change will negatively impact their job (Armstrong & Lee, 2021; Albukhitan, 2020; Kitsios et al., 2021). Secondly, the negative relationship between IT/IS excellence and workforce enablement and performance may be due to IT/IS initiatives not aligning with the workforce's needs and capabilities (Armstrong & Lee, 2021; Westerman et al., 2014). Armstrong and Lee (2021) further argued that cultural resistance to change could hinder the success of digital transformation, making it more difficult for organizations to adapt to digital change.

The negative findings suggest that organizations must address the underlying issues and ensure employees are motivated and empowered to follow the organization and governance. It is essential to involve the employee in the decision-making processes, provide necessary training and support, communicate the benefits of Investment and innovation architecture, and address concerns to overcome resistance (Aras & Büyüközkan, 2023; Armstrong & Lee,2021; Albukhitan, 2020; Kitsios et al., 2021). By doing this, the organization can create a culture of Investment and innovation architecture and continuous improvement leading to a more engaged and higher-performing workforce (Chakraborty & Ganguly, 2019).

However, organizations prioritizing all the mentioned factors of digital maturity are digital masters with knowledgeable and influential leaders prioritizing change management and alignment, leading to successful digital transformation (Westerman et al., 2014). Nevertheless, the findings suggest that for organizations to be successful in digital transformation, they need to balance two things in the proposed systems model: leadership and strategy, and on the other hand, digital application aspects to contribute successfully to business results (Armstrong and Lee, 2021).

5.4 Conclusion

The study confirmed and validated the 12 factors of digital maturity. The factors can be classified into two main dimensions or composite indicators: leadership and digital aspect (Armstrong & Lee, 2021). The leadership aspects include vision and strategy; culture, organization and governance; Innovation and Investment; new value streams, business models, and digital Ethics. The digital application aspects include customer orientation and engagement, digital product innovation, skills, workforce enablement and performance, core processes and digitalization, and IT/IS Excellence.

Most of the findings for SEM are consistent with the literature, e.g., Akparep et al (2019), Ampofo et al (2011), Cho and Pucik (2005), Floridi (2018), Foss and Saebi (2018), Guo (2022), İbrahimoğlu et al (2014), Klein et al (2013), OECD (2016), Simosi and Xenikou (2010), Tsait (2011) and Tunde Joel et al (2013) show a positive and significant relationship between factors of digital maturity and support the hypothesized model. The exceptions are H26, H28, H27, H33, and H39, which are rejected as their regression coefficients are negative and statistically insignificant, with H27 regression coefficients is negative and significant. The same applies to the relationship between the 12 factors of digital maturity and business results. Overall and consistent with the literature, for example, Vial (2019) and Armstrong and Lee (2021), these findings highlight the

interconnectedness of various factors of digital maturity in an organization and how they contribute to business success.

However, surprising findings are that workforce enablement and performance have a negative and insignificant relationship with skills, organization and governance, IT/IS excellence, and business results but a significant one with investment and Innovation architecture. These negative relationships suggest that digital transformation may have unintended consequences in organizations Marsh et al 2022 and Piccoli et al (2018), and it may be due to employee resistance and lack of trust in leadership (Albukhitan, 2020; Kitsios et al., 2021; Kane et al., 2017). Overall, the study emphasizes the importance of these factors in driving digital transformation and business results.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter concludes the result of this study on the three objectives that will be discussed and the implications thereof, followed by recommendations for practitioners and managers, limitations, and suggestions for future research.

The overall objectives are.

1. To validate the factors of Armstrong and Lee's unified model for digital maturity.
2. To quantitatively examine the relationships between each of the factors of digital maturity to validate and refine the model of the proposed system for digital maturity.
3. To establish the relationships between the factors of digital maturity and the business results.

6.2 Findings

6.2.1 Research objective 1

To validate the factors of the model of the proposed system for digital transformation.

The research aimed to validate the factors for the digital maturity model proposed by Armstrong and Lee's unified model for digital maturity. The CFA using a formative scale confirms that all the respective variables or indicators loads onto or form the 12 constructs. Thus, all variables significantly explain the respective constructs. Therefore, the 12 constructs: Leadership: Vision and strategy, Culture, Organization and Governance; Innovation and Investment, New value

streams and business models; Digital Ethics, Customer Orientation and Engagement, Digital product innovation; Skills, Workforce Enablement and Performance, Core processes and Digitalization, and IT/IS Excellence collectively comprise the factors of the digital maturity model.

Furthermore, the validity tests of the 12 constructs were conducted and confirmed that all the variables had a high covariance among the factors, which means the instrument making up the construct is reliable and consistent. Thus, regarding objective one, the findings show that the factors have been validated and were found to be accurate and relevant. Consistent with the literature (Westerman et al., 2014; Armstrong & Lee, 2021), the proposed systems model for digital maturity can be valuable for identifying factors that contribute to digital maturity. Thus, these identified factors are essential capabilities organisations must strengthen to implement digital transformation initiatives effectively.

6.2.2 Research objective 2

To quantitatively examine the relationships between each factor to validate and refine the model of the proposed system for digital transformation.

This research's findings show a significant and strong positive relationship between the factors of digital maturity and shows support for 36 of the hypotheses (namely H1-H25, H29 – H32 and H34, H35, H37, H38, H41, and H42). These findings also show a two-way relationship between Culture and Leadership, with the relationship stronger on the cultural side than the other. The findings contribute new insights into the debate on which leads the other culture or strategy and suggest the culture plays a bigger role but the two work together. Similarly, there is a two-way relationship between digital ethics and organization and governance, with the relationship being stronger from the organization and governance side to the digital ethics side.

However, there is no support for hypothesized relationships for H26, H28, H33 and H39, as the correlation is not statistically significant, and that which there is

negative. Similarly, H27 got negative but significant results. All of these represent relationships that feed into the factor of workforce enablement and performance or from workforce enablement and performance into business results. This is surprising as one would expect positive and significant relationships. The negative results may imply that employees resist the changes that come with digital transformation initiatives (Albukhitan, 2020). The reason is that they may not engage fully with the training and development opportunities provided, leading to delays in acquiring new skills and knowledge necessary for digital transformation. Also, these findings suggest the need for strategies and effective implementation of change management. Alternatively, this could suggest that the instrument may not accurately measure workforce enablement and performance or that the construct thereof needs to be refined.

Overall, regarding objective two, the findings show that the model has been broadly validated (notwithstanding 5 of the 42 relationships not being validated) and can be refined to understand better the factors contributing to digital maturity, help organizations to their digital capabilities, and drive better results for sustainable growth (Aras & Büyüközkan, 2023; Westerman et al., 2011). The results are consistent with the literature, for example, (Armstrong and Lee, 2021), that no single factor is more important than the other and that organizations must pay equal attention to them.

6.2.3 Research objective 3

To establish the relationships between the factors of digital maturity, and the business results

The objective of the study was to establish if there is a direct relationship between six factors of digital maturity and business results. The six digital maturity factors are digital ethics, new value streams and business models, customer orientation and engagement, digital product innovation, and core processes and digitization. The findings show a significant and strong positive relationship between five of these six factors and business results. However, as noted above, a surprising

finding is that there is a negative but insignificant relationship between workforce enablement and performance and business results. Like other relationships involving workforce enablement and performance, the negative relationship may imply that employees resist the changes that come with digital transformation initiatives (Albukhitan, 2020). In summary, understanding the factors of digital maturity and their relationships to business outcomes can help organizations make informed decisions about their digital strategies and investments, leading to organizations achieving better outcomes like customer satisfaction, productivity, efficiency, and innovation (Armstrong & Lee, 2021; Kitsios et al., 2021; Westerman et al., 2014).

6.3 Recommendations

The proposed unified digital maturity model has been validated as a tool that can be used to help organizations improve their digital capabilities and achieve better business results. Therefore, managers can deploy this tool to help build and evaluate their efforts on digital transformation. This also required that they do the following things:

Managers must cultivate the right culture to achieve digital maturity and supportive culture that embraces collaboration, openness to innovative ideas, trust, transparency, risk-taking, and experimentation (Armstrong & Lee, 2021; Bumann & Peter, 2019; Evans et al., 2017; G. C. Kane et al., 2017; Mukherjee, 2020; Radclyffe & Nodell, 2020; Schein, 2005; Schein & Schein, 2019; Senge, 2007); Teichart, 2020) and,

- To drive business results, managers must foster an organizational culture prioritizing digital ethics, innovation, and customer engagement.
- Managers must prioritize employee skills development in digital literacy and customer services to achieve their business goals.
- Digital ethics must be embedded into organizational and government decision-making processes (Armstrong & Lee, 2021).

- Managers must implement the best practices and leverage IT/IS excellence to improve Core processes, digitalization, workforce enablement, and customer engagement.

6.4 Implications of the research

This research has demonstrated that eleven of the twelve factors of digital maturity, as described by Armstrong and Lee's (2021) unified model for digital maturity, are valid and representative antecedents of digital maturity. However, the research raises questions as to the validity of workforce enablement and empowerment as a factor of digital maturity, and this needs to be further explored (see Further research below).

Secondly, this research has shown that the factors of digital maturity are inter-related, as postulated in Armstrong and Lee's proposed systems model for digital maturity. We noted in Chapter 1 that although authors such as Vial (2019) and Armstrong and Lee (2021) postulate more systems-like models for digital maturity and the interconnections between its factors, they have not proposed the relative strengths of the relationships or demonstrated such connections based on empirical data. This research demonstrates that there is indeed a statistically significant relationship between the various factors of digital maturity and the relative strengths of these relationships.

Thirdly, and importantly, this research adds to the growing body of evidence (e.g., Westerman et al., 2014) that there is a positive relationship between the factors of digital maturity and business results. In other words, improving organizational capability in each of the factors of digital maturity is likely to improve organizational business performance.

Broadly, as mentioned above, the proposed unified digital maturity model has been validated as a tool that can be used to help organizations improve their digital capabilities and achieve better business results. Therefore, managers can deploy this tool to help build and evaluate their efforts on digital transformation.

The study will also assist managers in developing risk management strategies that address the unique challenges digital transformation poses. The study will assist managers in differentiating themselves from competitors by investing in digital abilities that improve agility, customer service, and innovation.

Overall, the research could significantly influence organizations by providing valuable insights into the factors contributing to digital maturity and their impact on organizational performance. By using this information, organizations can make better-informed decisions, improving their chances of success in the digital world.

6.5 Suggestions for further research

Most of the 12 factors or indicators showed a positive and significant relationship with each other, and one factor showed a negative and significant relationship. Further research should explore further why the other factors of digital maturity do not exhibit a positive and significant relationship with workforce enablement and performance and why it does not exhibit a positive and significant relationship with business results.

Furthermore, we did not adjust the model to see what happens when we drop the inter-relationships with the factors not showing any significant relationship. Future studies could adjust the model and see what happens.

The two-way relationship between culture and leadership aspects could be revisited and understand further how it manifests. Additionally, this research looked at the twelve factors of digital maturity without grouping them into “dimensions,” as some scholars do (e.g., Westerman et al., 2014). Armstrong and Lee (2021) suggest two possible “dimensions”, namely Leadership and Architecture and Digital Application and Impact. While these findings implicitly suggest that organizations need to balance these two” dimensions” of digital maturity, the study did not examine the interplay between these dimensions nor their relationship with Business Results. Future research could look at this.

This study only used postgraduate students as being representative of their employer organizations. Further research could test the model in the actual organization, not using only students, because students' perceptions may be influenced by their enhanced appreciation of the subject matter compared to actual practice. This study used a sample which may be non-representative of actual practice. Future studies could use a more fully representative sample to maximize the generalizability and applicability of findings.

Lastly, since the research was cross-sectional, a longitudinal approach could assist in how these factors evolve. Finally, other studies can focus on comparing the digital maturity of organizations that have adopted different digital strategies, providing insights into strategies of digital maturity.

6.6 Concluding remarks

The research study objective was to validate the factors of the model and use them to test the hypotheses or explore the relationships influencing digital transformation in South African organizations. Accordingly, the study has contributed to both theory and practice.

Theoretically, it provides empirical support for the proposed systems model for digital maturity, which postulates a precedence and high-level causality between the individual factors of digital maturity, as well as between these factors and business results. and

Practically, it gives practitioners a tool that they can use to measure their "capability maturity" for the factors of digital maturity and hence their digital maturity as a whole. This can enable them to establish their "baseline" digital maturity and evaluate their organizations' digital transformation efforts as they progress.

The study also contributes by making suggestions for expanding the research agenda on digital transformation.

REFERENCES

Akparep, J. Y., Jengre, E., & Mogre, A. A. (2019). The Influence of Leadership Style on Organizational Performance at TumaKavi Development Association, Tamale, Northern Region of Ghana. Open Journal of Leadership, 08(01), 1–22. https://doi.org/10.4236/ojl.2019.81001

Albukhitan, S. (2020). Developing Digital Transformation Strategy for Manufacturing. Procedia Computer Science, 170, 664–671. https://doi.org/10.1016/j.procs.2020.03.173

Ampofo, A., Mujtaba, B., Cavico, F., & Tindall, L. (2011). The Relationship Between Organizational Ethical Culture and The Ethical Behavior of Employees: A Study of Accounting and Finance Professionals in The Insurance Industry of United States. Journal of Business & Economics Research (JBER), 2(9). https://doi.org/10.19030/jber.v2i9.2915

Applegate, L. M., Austin, R. D., & Soule, D. L. (2009). Corporate Information Strategy and Management: Text and Cases.

Armstrong, B., & Lee, G. J. (2021). 2 nd Edition Silk Route Press.

Aras, A., & Büyüközkan, G. (2023). Digital Transformation Journey Guidance: A Holistic Digital Maturity Model Based on a Systematic Literature Review. *Systems*, *11*(4), 1–31. https://doi.org/10.3390/systems11040213

Askarzai, W., & Unhelkar, B. (2017). Research Methodologies: An Extensive Overview. 6(4).

Aslanova, I. V., & Kulichkina, A. I. (2020). Digital Maturity: Definition and Model. 138(Mtde), 443–449. https://doi.org/10.2991/aebmr.k.200502.073

Barreto, M., & Lopez-Fresno, P. (2020). LET'S GO DIGITAL! implementation challenges of digital transformation in government institutions for enhancing trust, leading to intellectual capital and innovativeness. Proceedings of the

International Conference on Intellectual Capital, Knowledge Management and Organizational Learning, ICICKM, 2020-October. https://doi.org/10.34190/IKM.20.056

Behera, R. K., Bala, P. K., Rana, N. P., & Kizgin, H. (2022). Cognitive computing based ethical principles for improving Organizational reputation: A B2B digital marketing perspective. Journal of Business Research, 141(July 2021), 685–701. https://doi.org/10.1016/j.jbusres.2021.11.070

Berghaus, S., & Back, A. (2016). Stages in Digital Business Transformation: Results of an Empirical Maturity Study. Mediterranean Conference on Information Systems (MCIS), Paper 22, 1–17. http://aisel.aisnet.org/mcis2016%0Ahttp://aisel.aisnet.org/mcis2016

Berghaus, S., Back, A., & Kaltenrieder, B. (2016). Digital maturity & transformation report 2016. Crosswalk AG.

Beugelsdijk, S., Koen, C. I., & Noorderhaven, N. G. (2006). Organizational culture and relationship skills. Organization Studies, 27(6), 833–854. https://doi.org/10.1177/0170840606064099

Bolman, L. G., & Deal, T. E. (2017). Reframing Organizations. In Reframing Organizations. https://doi.org/10.1002/9781119281856

Bloomberg, J. (2018). Digitization, Digitalization, And Digital Transformation: Confuse Them at Your Peril I write and consult on digital transformation in the enterprise. 2–7. https://www.forbes.com/sites/jasonbloomberg/2018/04/29/digitization-digitalization-and-digital-transformation-confuse-them-at-your-peril/#78e677fd2f2c

Broadens, K S & Abbott, B. B. (2011). Research Design and Method A Process Approach. In Journal of Chemical Information and Modeling (Vol. 53, Issue 9). https://doi.org/10.1017/CBO9781107415324.004

Browne, M and Cudeck, R. (1993). Alternative ways of assessing model fit. Testing structural equation models. 136–162.

Bryman, A., & Emma, B. (2011). Business research methods (3rd ed.).

Bumann, J., & Peter, M. K. (2020). Action Fields of Digital Transformation - A Review and Comparative Analysis of Digital Transformation Maturity Models and Frameworks. March.

Busru, S. A., & Shanmugasundaram, G. (2017). Effects of innovation investment on profitability and moderating role of corporate governance: empirical study of Indian listed firms. Indian Journal of Corporate Governance, 10(2), 97–117. https://doi.org/10.1177/0974686217730938

Chakraborty, T., & Ganguly, M. (2019). Crafting Engaged Employees Through Positive Work Environment. May, 180–198. https://doi.org/10.4018/978-1-5225-7799-7.ch011

Chanias, S., & Hess, T. (2016). Understanding digital transformation strategy formation: Insights from Europe's automotive industry. Pacific Asia Conference on Information Systems, PACIS 2016 - Proceedings, June 2016.

Cho, H. J., & Pucik, V. (2005). Relationship between innovativeness, quality, growth, profitability, and market value. Strategic Management Journal, 26(6), 555–575. https://doi.org/10.1002/smj.461

Christensen, C. M., Raynor, M. E., Rory, M., & McDonald, R. (2015). What is disruptive innovation? Harvard Business Review, 93(12), 44–53. https://hbr.org/2015/12/what-is-disruptive-innovation

Ciulla, J. B. (2002). Introduction to Ethics of Leadership.

Collins L.M. (2007), Research Design and Methods, Encyclopedia of Gerontology (Second Edition), Pages 433-442, ISBN 9780123708700, https://doi.org/10.1016/B0-12-370870-2/00162-1.

Creswell, J. &, & Creswell, D. (2018). Research Design.

Deloitte. (2018). Digital Maturity Model. February.

Diener, F., & Špaček, M. (2021efrst). Digital transformation in banking: A managerial perspective on barriers to change. Sustainability (Switzerland), 13(4), 1–26. https://doi.org/10.3390/su13042032

Dinsdale, R. (2017). The Role of Leaders in Developing a Positive Culture. BU Journal of Graduate Studies in Education, 9(1), 42–45.

Efrat, K. (2014). The direct and indirect impact of culture on innovation. Technovation, 34(1), 12–20. https://doi.org/10.1016/j.technovation.2013.08.003

Eremina, Y., Lace, N., & Bistrova, J. (2019). Digital maturity and corporate performance: The case of the Baltic states. Journal of open innovation: technology, market, and complexity, 5(3), 54.

Evans, S., Vladimirova, D., Holgado, M., van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business Model Innovation for Sustainability: Towards a Unified Perspective for Creation of Sustainable Business Models. Business Strategy and the Environment, 26(5), 597–608. https://doi.org/10.1002/bse.1939

Faller, H., Kohlmann, T., Zwingmann, C., & Maurischat, C. (2006). Exploratory and confirmatory factor analysis. Rehabilitation, 45(4), 243–248. https://doi.org/10.1055/s-2006-940029

Floridi, L. (2018). Soft Ethics and the Governance of the Digital. Philosophy and Technology, 31(1). https://doi.org/10.1007/s13347-018-0303-9

Foss, N. J., & Saebi, T. (2018). Business models and business model innovation: Between wicked and paradigmatic problems. Long Range Planning, 51(1), 9–21. https://doi.org/10.1016/j.lrp.2017.07.006

Frames, A. (2012). Digital Product Innovation: 1–3.

Friedrich, R., le Merle, M., Gröne, F., & Koster, A. (2011). Measuring industry digitalization: Leaders and laggards in the digital economy. Strategy&, 24. http://www.strategyand.pwc.com/media/file/Strategyand-Measuring-Industry-Digitization-Leaders-Laggards-Digital-Economy.pdf

Geert H. Hofstede, G. H. (2021). Culture's consequences: Comparing Values, behaviors, institutions, and organizations across nations (2nd Edition).

Greener, S., & Martelli, J. (2018). An introduction to business research methods.

Guo, K. (2022). The Relationship Between Ethical Leadership and Employee Job Satisfaction: The Mediating Role of Media Richness and Perceived Organizational Transparency. Frontiers in Psychology, 13(May), 1–13. https://doi.org/10.3389/fpsyg.2022.885515

Heubeck, T. (2023). Managerial capabilities as facilitators of digital transformation? Dynamic managerial capabilities as antecedents to digital business model transformation and firm performance. *Digital Business*, *3*(1), 100053. https://doi.org/10.1016/j.digbus.2023.100053

Hu, L. T., and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct. Equat. Model. Multidiscipline. 6, 1–55. https://doi.org/10.1080/10705519909540118

İbrahimoğlu, N., Çiğdem, Ş., & Seyhan, M. (2014). Relationship between Culture & Ethic: A Research in Terms of Cultural Diversity. Procedia - Social and Behavioral Sciences, 143(August), 1117–1119. https://doi.org/10.1016/j.sbspro.2014.07.563

Kane, G. (2019). The Technology Fallacy: People Are the Real Key to Digital Transformation. Research Technology Management, 62(6), 44–49. https://doi.org/10.1080/08956308.2019.1661079

Kane, G. C., Palmer, D., Phillips, A. N., & Kiron, D. (2017). Winning the digital war for talent. MIT Sloan Management Review, 58(2), 17–19.

Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2017). Achieving Digital Maturity. MIT Sloan Management Review and Deloitte University Press, 59180.

Kitsios, F., Giatsidis, I., & Kamariotou, M. (2021). Digital transformation and strategy in the banking sector: Evaluating the acceptance rate of e-services. Journal of Open Innovation: Technology, Market, and Complexity, 7(3). https://doi.org/10.3390/joitmc7030204

Klein, A. S., Wallis, J., & Cooke, R. A. (2013). The impact of leadership styles on organizational culture and firm effectiveness: An empirical study. Journal of Management and Organization, 19(3), 241–254. https://doi.org/10.1017/jmo.2013.34

Lee, G.J. (2016). Business Statistics from Scratch to Intermediate with SAS. Silk Route Press.

Lobschat, L., Mueller, B., Eggers, F., Brandimarte, L., Diefenbach, S., Kroschke, M., & Wirtz, J. (2021). Corporate digital responsibility. Journal of Business Research, 122(November 2019), 875–888. https://doi.org/10.1016/j.jbusres.2019.10.006

Malar, D. A., Arvidsson, V., & Holmstrom, J. (2019). Digital transformation in banking: Exploring value co-creation in online banking services in India. Journal of Global Information Technology Management, 22(1), 7-24.

MIT Center for Digital Business. (2011). Digital transformation: a roadmap for billion-dollar organizations. 1–68. www.capgemini-consulting.com

Mo, S., & Shi, J. (2018). The Voice Link: A Moderated Mediation Model of How Ethical Leadership Affects Individual Task Performance. Journal of Business Ethics, 152(1), 91–101. https://doi.org/10.1007/s10551-016-3332-2

Mugge, P., Abbu, H., Michaelis, T. L., Kwiatkowski, A., & Gudergan, G. (2020). Patterns of Digitization: A Practical Guide to Digital Transformation. Research Technology Management, 63(2), 27–35. https://doi.org/10.1080/08956308.2020.1707003

Mukherjee, A. S. (2020). 5 Musts for Next-Gen Leaders. MIT Sloan Management Review, 61(4), 62–65.

Muringani, J., & Noll, J. (2021). Societal security and trust in digital societies: A socio-technical perspective. 14th CMI International Conference - Critical ICT Infrastructures and Platforms, CMI 2021 - Proceedings, November. https://doi.org/10.1109/CMI53512.2021.9663764

Nadeem, A., Abedin, B., Cerpa, N., & Chew, E. (2018). Editorial: Digital transformation & digital business strategy in electronic commerce - The role of organizational capabilities. Journal of Theoretical and Applied Electronic Commerce Research, 13(2), i–viii. https://doi.org/10.4067/S0718-18762018000200101

OECD. (2016). Innovating Education and Educating for Innovation. OECD 2016. https://doi.org/10.1787/9789264265097-en

OECD. (2018). Maintaining competitive conditions in the era of digitalisation. July 1–17. http://www.oecd.org/g20/Maintaining-competitive-conditions-in-era-of-digitalisation-OECD.pdf

OECD. (2022). Good Practice Principles for Data Ethics in the Public Sector. Organization for Economic Co-Operation and Development, 1–16. https://www.oecd.org/digital/digital-government/good-practice-principles-for-data-ethics-in-the-public-sector.htm

Oliver, P. (2003). The student' s Guide to Research Ethics Paul Oliver. Journal, 2003, 166. www.openup.co.uk

Osmundsen, K., Iden, J., & Bygstad, B. (2018). Digital Transformation: Drivers, Success Factors, and Implications. Mediterranean Conference on Information Systems Proceedings, 12(January 2019), 1–15. https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1004&context=mcis2018

Papyrus. (2021). AFP Viewer a New Way of Working! https://www.isis-papyrus.com/e15/pages/solutions/value-streams-e.html

Poturak, M., Mekić, E., Hadžiahmetović, N., & Budur, T. (2020). Effectiveness of Transformational Leadership among Different Cultures. International Journal of Social Sciences and Educational Studies, 7(3), 119–129. https://doi.org/10.23918/ijsses.v7i3p119

Provost, F., & Fawcett, T. (2013). Data Science and its Relationship to Big Data and Data-Driven Decision Making. Big Data, 1(1), 51–59. https://doi.org/10.1089/big.2013.1508

Radclyffe, C., & Nodell, R. (2020). Ethical by Design: Measuring and Managing Digital Ethics in the Enterprise. January 1–20.

Ria, M. Y., Muhammad, G. H., & Shinta, D. T. (2017). Strategic Leadership, Good Governance: Analysis and The Effect to Performance. July 2018. https://doi.org/10.2991/icame-17.2017.16

Rogers, D. L. (2016). The digital transformation playbook: Rethink your business for the digital age. Columbia University Press.

Salkind, N. J. (2012). Exploring Resarch.

Salviotti, G., Gaur, A., & Bocconi, U. (2019). Strategic Factors Enabling Digital Maturity: An Extended Survey. The 13th Mediterranean Conference on Information Systems (MCIS), 1–13. https://aisel.aisnet.org/mcis2019/15

Sari, M., Lubis, A. de F., Maksum, A., & Lumbanraja, P. (2018). The influence of organization’s culture and internal control to corporate governance and is

impact on bumn (State-owned enterprises) corporate performance in Indonesia. Journal of Advanced Research in Law and Economics, 9(2), 681–691. https://doi.org/10.14505/jarle.v92(32).30

Saunders, M., & Lewis, P. (2012). IN BUSINESS & An Essential Guide to Planning Your Project.

Saunders, M., Lewis, P., & Thornhill, A. (2016). Research methods for business students.

Schein, E. H. (2005). Organization, culture, and leadership. https://doi.org/10.4324/9780203006986

Schein, E. H., & Schein, P. A. (2019). A new era for culture, change, and leadership. MIT Sloan Management Review, 60(4), 52–58.

Sedgwick, P. (2013). Convenience sampling. Bmj, 347(oct25 2), f6304–f6304. https://doi.org/10.1136/bmj.f6304

Senge, P. M. (2007). The fifth discipline: the art and practice of the learning organization (Vol. 44, Issue 05). https://doi.org/10.5860/choice.44-2797

Simosi, M., & Xenikou, A. (2010). The role of organizational culture in the relationship between leadership and organizational commitment: An empirical study in a Greek organization. International Journal of Human Resource Management, 21(10), 1598–1616. https://doi.org/10.1080/09585192.2010.500485

Stokes, R. (n.d.). The Essential guide to marketing in a digital world. In The Red & Yellow Creative School of BusinesS (6th ed.). The Red & Yellow Creative School of Busines. ww.soldesign.co.za

Szczepańska-Woszczyna, K. (2015). Leadership and Organizational Culture as the Normative Influence of Top Management on Employee’s behavior in the

Innovation Process. Procedia Economics and Finance, 34(15), 396–402. https://doi.org/10.1016/s2212-5671(15)01646-9

Teece, D. J. (2010). Business models, business strategy and innovation. Long Range Planning. https://doi.org/10.1016/j.lrp.2009.07.003

Teichert, R. (2019). Digital transformation maturity: A systematic review of literature. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, 67(6), 1673–1687.

Teresko, J. (2008). Winning with Digital. Digital Manufacturing, 44–47. http://link.aip.org/link/PSISDG/v4109/i1/p150/s1&Agg=doi

Thordsen, T., Murawski, M., & Bick, M. (2020). How to Measure Digitalization? A Critical Evaluation of Digital Maturity Models. Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 12066 LNCS, 358–369. https://doi.org/10.1007/978-3-030-44999-5_30

Thrassou, D. V. and A. (2013). Innovative Business Practices.

Tidd, J. (2001). Innovation management in context: environment, organization, and p. International Journal of Management Reviews, 3(3), 169–183. https://doi.org/10.1111/1468-2370.00062

Tsait, Y. (2011). Relationship between organizational culture, leadership behavior and job satisfaction. BMC Health Services Research, 11, 98. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed10&NEWS=N&AN=21569537

Tunde Joel, A., Abasido, U., Benjamin, N., & Muhibeedeen, A. (2013). The Relationship between the Information Technology Skills Acquired by Secretarial Teachers in Nigeria Colleges of Education and Their Utilization of Internet for Effective Teaching. World Journal of Education, 3(2), 71–79. https://doi.org/10.5430/wje.v3n2p71

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. The Journal of Strategic Information Systems, 28(2), 118–144. https://doi.org/10.1016/J.JSIS.2019.01.003

Weritz, P., Braojos, J., & Matute, J. (2020). Exploring the Antecedents of Digital Transformation: Dynamic Capabilities and Digital Culture Aspects to Achieve Digital Maturity. Proceedings of the 26th Americas Conference on Information Systems (AMCIS 2020), July 1–10.

Westerman, G., B. D., & M. A. (2014). Leading digital: Turning technology into business transformation.

Westerman, G., Tannou, M., Bonnet, D., Ferraris, P., & McAfee, A. (2012). The Digital Advantage: How Digital Leaders Outperform their Peers in Every Industry. MIT Sloan Management Review, 1–24. http://www.capgemini.com/resource-file-access/resource/pdf/The_Digital_Advantage__How_Digital_Leaders_Outperform_their_Peers_in_Every_Industry.pdf

Westerman, G, Calméjane, C., Bonnet, D., Ferraris, P. McAfee, A. (2011). DIGITAL TRANSFORMATION. MIT Center for Digital Business and Capgemini Consulting, 16, 1–68. https://doi.org/10.4028/www.scientific.net/KEM.726.460

Wirtz, J., Kunz, W. H., Hartley, N., & Tarbit, J. (2023). Corporate Digital Responsibility in Service Firms and Their Ecosystems. *Journal of Service Research*, *26*(2), 173–190. https://doi.org/10.1177/10946705221130467

Wits, (2020). Wits Research Integrity Procedures. 1–8

Xenikou, A., & Simosi, M. (2006). Organizational culture and transformational leadership as predictors of business unit performance. Journal of Managerial Psychology, 21(6), 566–579. https://doi.org/10.1108/02683940610684409

Zentner, H., Spremić, M., & Zentner, R. (2022). Effect of Management's

Competencies and Digital Skills on Digital Business Model Maturity for SMEs. Interdisciplinary Description of Complex Systems, 20(5), 514–532. https://doi.org/10.7906/indecs.20.5.2

Appendix (A): Digital Maturity Survey Research Instrument

The introduction block will be tailored for each Organization surveyed. Survey responses will be individually anonymous, but the Organization and Organizational sub-units will be identified.

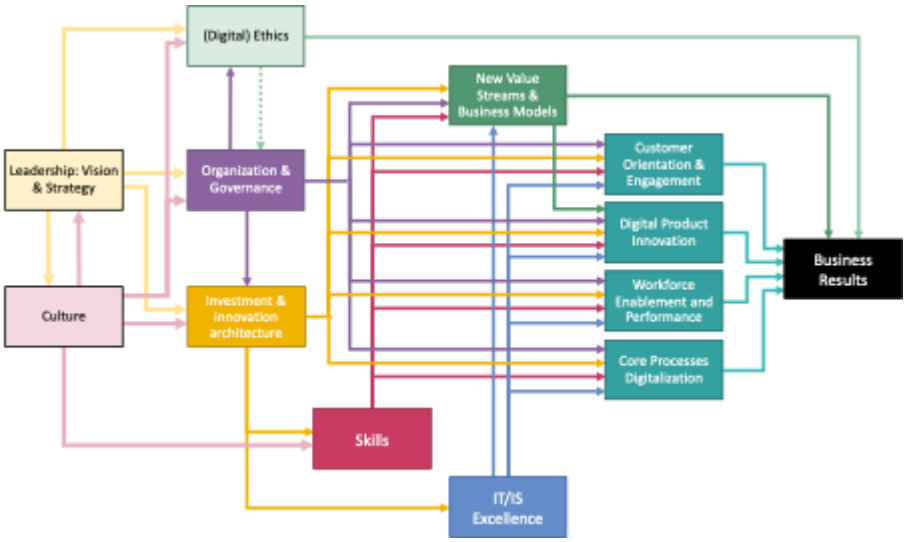
When used for teaching purposes the respondent will be asked to enter a confidential identifier so they can identify their individual results as part of the collective set of responses, as per the below.

Introduction

Welcome to this survey in which we assess the digital maturity of your organization in terms of the unified model for digital maturity. More information on this model can be found in:

Armstrong, B and Lee, G, (2021), *Digital Business*, 2nd Edition, Silk Road Press.

This model can be summarised as per the figure below. In this survey we assess the current level of maturity of your organization or Organizational unit in terms of each of these factors of digital maturity, working from left to right.



Please respond as to how you see your current Organization as it really is, not how the organization presents itself or as you would like it to be.

This is quite a long survey and should take you about 25 minutes to complete. Digital maturity is a multi-faceted concept, and it is important that we explore it thoroughly.

We appreciate your time and effort in completing the survey.

Please enter your personal identifier here. Only you will know that this identifier refers to your survey results. You will use this identifier to be able to know which of the results, when presented in the spreadsheet next week.

Q.1 Vision and Strategy

Q1.1 Senior executives and the Board have a transformative vision of the digital future of the Firm.

Completely Disagree			Neither Agree nor Disagree			Completely Agree
○	○	○	○	○	○	○

Q1.2 Please select the most appropriate response for your organization that describes your current transformation objectives:

- ○ Our objectives do not consider digital transformation.
- ○ Our objectives are narrowly targeted in a limited number of specific areas such as the digital workplace and improving operations.
- ○ Our objectives include re-thinking and re-designing our business processes as well as several coordinated initiatives related to the digital customer experience.
- ○ Our objectives encompass re-thinking and re-designing our business models and processes and we are pursuing a mastery of the digital customer experience.

Q1.3 The digital transformation vision incorporates customer experience priorities, product offering renewal/evolution and internal operations.

Completely Disagree			Neither Agree nor Disagree			Completely Agree
○	○	○	○	○	○	○

Q1.4 The Board, senior executives, middle managers, and employees share a common vision of the digital future of our company and the digital transformation journey to get there.

Completely Disagree			Neither Agree nor Disagree			Completely Agree
○	○	○	○	○	○	○

Q1.5 Please select the most appropriate response for your organization that corresponds to your current leadership approach:

- ○ Our leadership makes digital transformation a key consideration, but digital initiatives are still loosely coordinated and aligned with one another.
- ○ Our leadership makes digital transformation a necessity, and we pursue digital initiatives in a well-coordinated manner.
- ○ Our leadership makes digital transformation a necessity, enforces behaviors, and keeps programs chartered and aligned with the external perspective in mind.

Q1.6 The vision is well integrated into the core strategy of our organization.

Completely Disagree			Neither Agree nor Disagree			Completely Agree
○	○	○	○	○	○	○

Q1.7 The digital vision and strategy has well-articulated objectives and measures of success which are captured on the Organization's scorecard and cascaded through the business.

Completely Disagree			Neither Agree nor Disagree			Completely Agree
○	○	○	○	○	○	○

Q1.8 Please select the most appropriate response for your organization that describes the overall priority of your digital transformation initiatives:

- ○ It is not among our top 3 priorities.
- ○ It is among our top 3 CEO-level priorities.
- ○ It is among our top 3 Board-level prioritie.

Q.2 Organizational Culture

Click to write the question text.

- Click to write Choice 1
- Click to write Choice 2
- Click to write Choice 3

Q2.1 The senior leadership in our organization are tech-savvy. They are aware of technology developments and use new technology products comfortably in their daily and personal lives.

Completely Disagree			Neither Agree nor Disagree			Completely Agree

Q2.2 Please select the most appropriate response for your organization that describes your current culture with regard to change.

We are inflexible and heavily committed to our current ways of working and thinking.			We are open to change when the business case is compelling.			We embrace substantial and continuous change and reinvention as being inevitable and a necessary ingredient of future success.

Q2.3 To what extent do you tolerate failure and encourage risk-taking?

- Failure is not an option (NASA) and is a Career Limiting Move (CLM)
- Failure and Risk are encouraged, but in name only and not tracked or quantified.
- Failure and risk-taking are allowed and measured but sandboxed in Skunkworks or very defined boundaries (e.g., Lockheed skunkworks).
- Failure and risk-taking are expected, pervasive, measured and even celebrated across the organization (e.g., Amazon, Google, P&G Heroic Failure Award)

Q2.4 Please rate the firm in terms of the following behaviors.

Q.3 Organization & Governance

Q3.1 Change **Management**: Please select the most appropriate response for your organization that describes your program:

- ○ We have limited and/or fragmented change management capabilities across the organization.

	Completely Disagree			Neither Agree nor Disagree			Completely Agree
We actively promote data-driven decision making	○	○	○	○	○	○	○
We actively promote the exploration of new ideas and experimentation at all levels	○	○	○	○	○	○	○
Leadership is adopting new behaviors required for digital transformation	○	○	○	○	○	○	○
We encourage rapid and independent decision making	○	○	○	○	○	○	○
Employees can collaborate digitally with other employees as needed	○	○	○	○	○	○	○
Employees actively share their knowledge through collaborative digital platforms (e.g., Slack, Jira, Skype)	○	○	○	○	○	○	○
It is easy and commonplace to collaborate across boundaries in the Organization	○	○	○	○	○	○	○
We live out the ethos that learning from mistakes is more important than not making them	○	○	○	○	○	○	○
We reward the behaviors that comprise our desired digital culture, like data-driven decision making or digital-first mindset	○	○	○	○	○	○	○

- ○ We have a formal enterprise-wide change management capability but have not yet fine-tuned it for our digital transformation initiatives.

- ○ We have a formal enterprise-wide change management capability, which has been fine-tuned for the broader and deeper change impacts brought about by digital transformation initiatives.

Q3.2 Digital **Governance Structures**:
Please select the most appropriate response for your organization that describes your program:

- ○ We have limited and/or fragmented organizational structures for digital governance.
- ○ We have some organizational structures for digital governance, such as committees or individual roles, but are not yet addressing all our traditional silos.
- ○ We have well-established organizational structures for digital governance which include specialized committees as well as individual roles.

Q3.3 Coordination of strategic digital activities: The initiatives are coordinated across silos (Divisions, BUs, functions).

Completely Disagree			Neither Agree nor Disagree			Completely Agree
○	○	○	○	○	○	○

Q3.4 Roles & Responsibilities: Roles and responsibilities for governing digital interventions or initiatives are well defined and understood.

Completely Disagree			Neither Agree nor Disagree			Completely Agree
○	○	○	○	○	○	○

Q3.5 KPIs: Digital Initiatives are assessed through a common set of KPIs, and broader Organizational KPIs have been adjusted to align with our digital vision and objectives.

Completely Disagree			Neither Agree nor Disagree			Completely Agree
○	○	○	○	○	○	○

Q3.6 Organizational agility: We are an agile Organizational, through staff empowerment, decentralized decision-making, and active use of agile management methods.

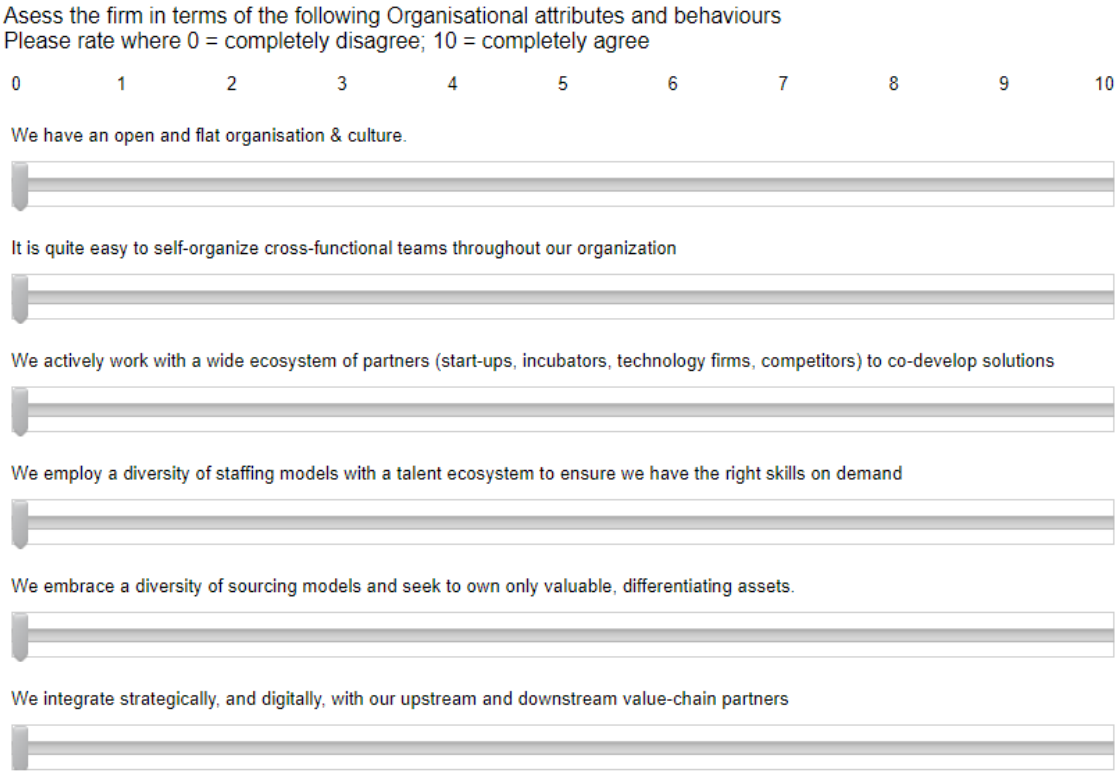
Completely Disagree			Neither Agree nor Disagree			Completely Agree
○	○	○	○	○	○	○

Organizational structure: Distribution of digital skills

3.7 Please select the most appropriate response for your organization that describes your current level and distribution of digital skills:

- ○ We have limited digital skills, and these are confined in isolated pockets in the business.
- ○ We have moderate to good digital skills located in some strategic areas or initiatives, but they are not available to the broader Organization.
- ○ We have good digital skills in identified centres of excellence, and these are made available to the broader Organization.
- ○ We have strong digital skills embedded in throughout the Organization and in all strategic areas and programs.

Q3.9



Q3.10 Structure: Does your organization operate with large, hierarchical structures or small, multi-disciplinary, self-organizing teams?

- ◉ Traditional corporate hierarchy with large, specialized groups operating in silos.
- ○ Some small, multi-disciplinary teams operating at the edges, away from the core.
- ○ Some small, multi-disciplinary teams accepted and embraced within the core organization.
- ○ Small, multi-disciplinary, networked, self-organizing teams are the primary operating structure across the organization.

Q.4 Innovation and Investment

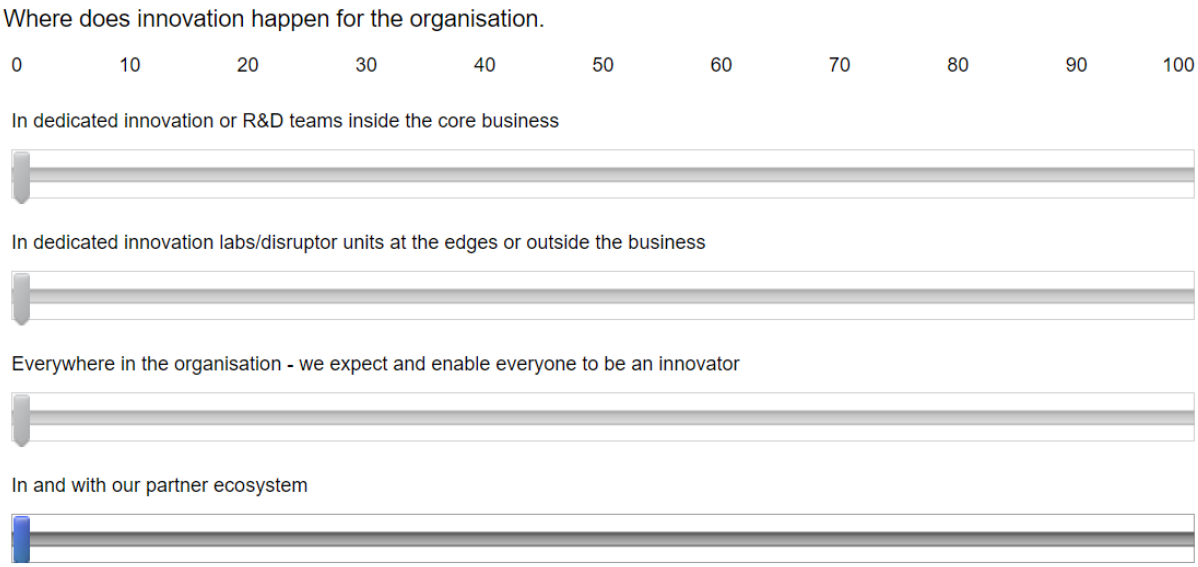
Q4.1 Innovation: Please select the most appropriate response for your organization that describes your program:

- ○ We have limited and/or fragmented innovation programs across the organization.
- ○ We have a formal enterprise-wide innovation program but have not yet tuned it for our digital transformation objectives.
- ○ We have a formal enterprise-wide innovation program, which has been fine-tuned for our digital transformation objectives, and which enables continuous and collaborative innovation.

Q4.2 What innovation processes are used in the Organization.

- ○ Innovation is not deliberately pursued and only happens by chance or because of individual persistence.
- ○ Innovation processes are linear, traditional and "waterfall" in nature.
- ○ Lean Innovation / Lean-startup is spoken about and occasionally pursued, but in silos and consistently.
- ○ Lean Innovation / Lean start-up methodologies are the Organization-wide approach to innovation and are actively encouraged and pursued.

Q4.3



Q4.4 Which metrics do you track about your organization and your product innovation portfolio? (e.g., Lean Startup Analytics)

- Only traditional KPIs monthly/quarterly/annually (e.g., sales, costs, profits).
- Some real-time, traditional metrics from transactional systems like ERP.
- All real-time, traditional metrics and use some Lean Startup metrics.
- All real-time traditional metrics and Lean Startup (value and learning) like repeat usage, monetization, referral and NPS.

Q4.5 Please **select the most appropriate response for your organization that describes your current level of investment allocated to digital transformation**:

- We have little or no investment specifically allocated to digital transformation.
- We have investments allocated to short-, medium- and long-term horizons, including several focused on digital transformation.
- We have major investments specifically allocated to digital transformation.

Q4.6 We have a clear view of how much of our current business (revenue, profit) is likely to be disrupted in the short, medium, and long term?

Completely Disagree			Neither Agree nor Disagree			Completely Agree

Q4.7 We have determined how much we need to be investing now to prepare for these future disruptions to our existing business.

Completely Disagree			Neither Agree nor Disagree			Completely Agree

Q.5 New Value Streams and Business Models

Q5.1 Please **select the most appropriate response for your organization that describes how you pursue new value streams:**

- We use digital technologies and practices to optimize the performance of our existing products and channels.
- We use digitalisation opportunistically to access new market segments and extend our customer reach and coverage.
- We use digitalisation deliberately and systematically to access new market segments and extend our customer reach and coverage.
- We are executing a strategic process of using digitalisation to materially extend existing value streams and find new ones.

Q5.2 Please select the most appropriate response for your organization that describes your use of platform business models:

- We have no current use or plans for platform business models.
- We are actively investigating platform business models and their technical architectures.
- Platform business models are already a core part of our digital transformation strategy.

Q5.3 Please **select the most appropriate response for your organization that describes your use of new and disruptive business models, including new revenue models.**

- We do not invest in new business models.
- We make small and sporadic investments in new business models.
- We actively invest significantly in new business models in a deliberate and structured way.

Q5.4 Please **select the most appropriate response for your organization that describes your use of new business models:**

- We have not considered or experimented with new ways of "packaging", pricing, or selling our offerings.
- We have experimented with new business models and new ways of "packaging", pricing, or selling but have not move to scaling these experiments up or making them new ways of doing business.
- We have launched some new business models and new ways of "packaging", pricing, and selling or these are now a small part of our revenue mix.
- We have launched new business models and new ways of "packaging", pricing, or selling and these are now a major part of our revenue mix.
- Our business is based entirely on new business models and new ways of "packaging", pricing, or selling.

Q.6 Digital Ethics
Q6.1 Digital Ethics processes and structures present in the Organization.

	Never	Occasionally	Most of the time	Always
Suggestion box or other anonymous issue reporting system. Whistle-blower mechanism.				
Provision of internal ombudsman service.				
Customer focus groups for insight into digital ethics perspectives				
External expertise and Interdisciplinary advisory board in the development and assessment of digital ethics principles.				
Explicit, well explained digital ethics principles.				

	Never	Occasionally	Most of the time	Always
Publicly holding firm to account on well-explained digital ethics principles				
Regular internal survey of continued relevance and application of principles.				

Q6.2 Integration **of Digital Ethics considerations into product design and business processes: To what extent does your organization exhibit the following practices.**

	Never	Occasionally	Most of the time	Always
Digital Ethics checkpoints throughout process and product design stages.				
Post-release follow-up of digital ethics compliance				
Accountability of digital ethics within product and process governance structure.				
Regular internal survey of continued relevance and application of principles.				

Q6.3 Participation in and access to Digital Ethics processes and governance structures in the Organization.

	Never	Occasionally	Most of the time	Always
Commitment to visiting committee review and accreditation				
Firmwide participation, engagement with business partners and stakeholders, engagement with customers and the wider public.				
Engagement by representatives of the market the firm operates in.				
Optional training and development for ant staff who wish to become more proficient in digital ethics				

Q.7 Customer Orientation and Engagement

Q7.1 Customer Centricity: Please select the most appropriate response for your organization that describes your current approach to customer-centricity in your transformation journeys:

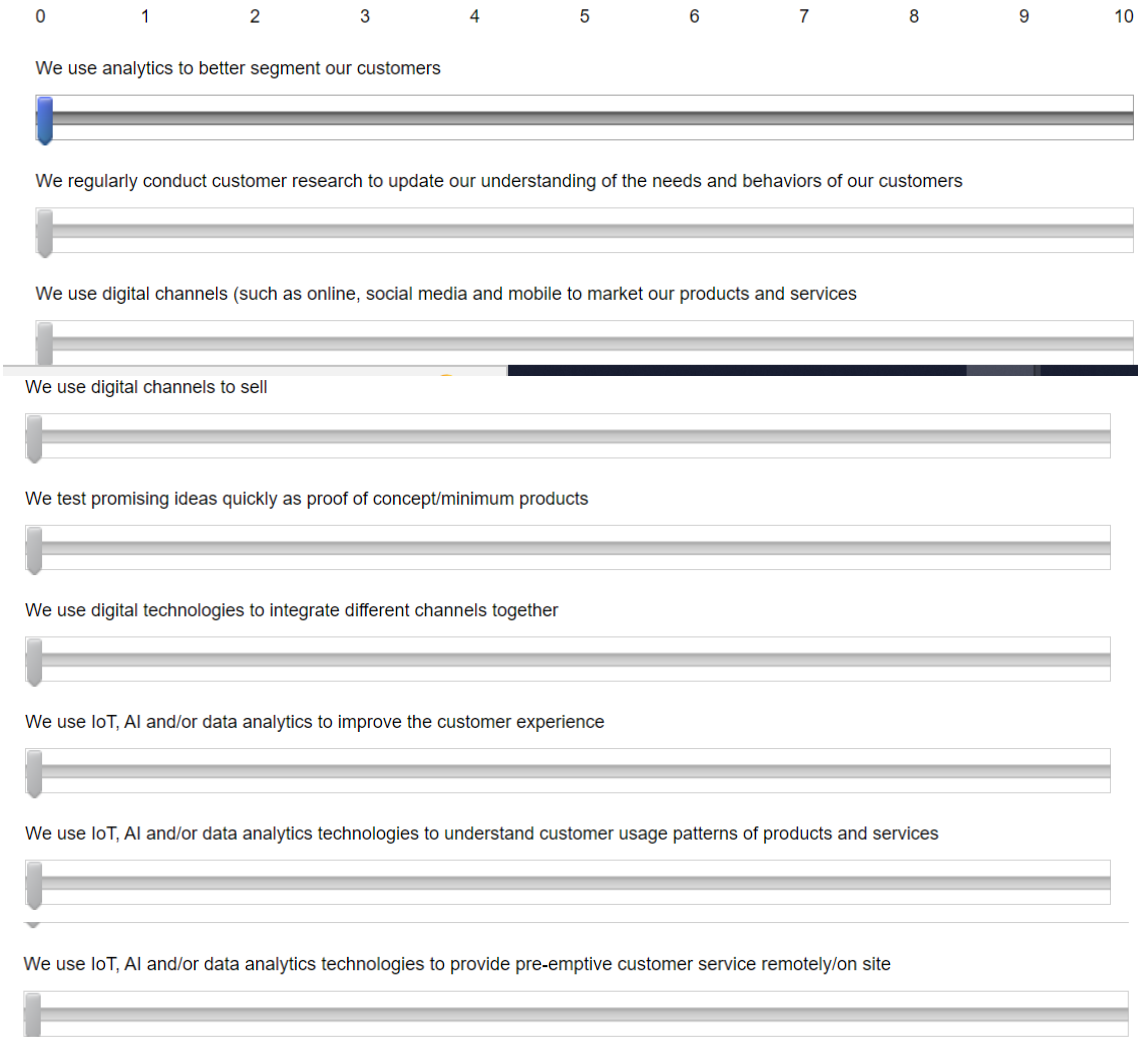
- It drives some of our initiatives but is consistently and irregularly applied.
- It drives and informs most of our initiatives and provides a regular touchstone for focus.
- It drives all of our initiatives, and we continuously adjust based on changing demands.

Q7.2 Customer Involvement: Please select the most appropriate response for your organization that describes your current approach to customer-involvement in your transformation journeys:

- We base our decisions on market research and customer feedback.
- We constantly commission research and monitor social media and customer feedback to inform our decisions.
- We actively involve customers in our decision processes.

Q7.3

Please describe the firm in terms of how it is using technology and "digital" methodologies to understand and engage with customers
Please rate where 0 = completely disagree; 10 = completely agree



Q.8 Digital Product Innovation

Q8.1 Digital nature of Products & Services: To what extent are your products/services information based?

- Product/services are physical in nature.
- Products/services are physical, but their delivery and/or production is information-based (e.g., Amazon)
- Products/services are physical, but services are information based and revenue generating (e.g., iPhone/App store).

- Entirely information-based (e.g., LinkedIn, Facebook, Spotify, Netflix).

Q8.2 Digital differentiation of Products and Services: To what extent do you use digital technologies to....

	Insignificant	Significant	Truly differentiating
enhance and differentiate your product features or performance			
enhance and differentiate the user experience of you customers			
reduce the intrinsic cost of production and support of your products and services.			

Q8.3 Social functionality in Products & Services: To what extent is social functionality and collaboration a central element of your product/service offering?

- None of these aspects is designed into our products/services (e.g., buying a lawnmower).
- These structures are bolted onto existing products/services (e.g., products have a Facebook page or Twitter feed).
- This functionality is used to enhance or deliver product/service offerings (e.g., 99Designs, Indiegogo, TaskRabbit).
- These inputs actually build our products/services offering (e.g., Yelp, Waze, Foursquare).

Q8.4 Data as an asset: Do you share strategic data assets internally across the company or expose them externally to your community?

- We do not share data, even between departments.
- Data shared between departments (i.e., use internal dashboards, activity streams and wiki pages).
- We expose some data to key suppliers (e.g., EDI interfaces or via APIs).
- We expose some data to our external ecosystem via open APIs (e.g., Flickr, Google, Twitter, Ford).

Q8.5 Social, mobile, analytics and cloud technologies:
Please select the most appropriate response for your organization that describes how emerging and disruptive technologies are embedded in your products:

- We do not exploit or embed SMAC (social, mobile, analytics and cloud) technologies in our products and services.
- We occasionally exploit or embed SMAC (social, mobile, analytics and cloud) technologies in our products and services.
- We often exploit or embed use SMAC technologies, as well as occasionally using next-generation enablers (such as the IoT and intelligent automation) SMAC (social, mobile, analytics and cloud) technologies in our products and services.
- We consistently exploit or embed SMAC technologies as well as a strategic set of next-generation enablers (such as the IoT and intelligent automation) in our products and services.

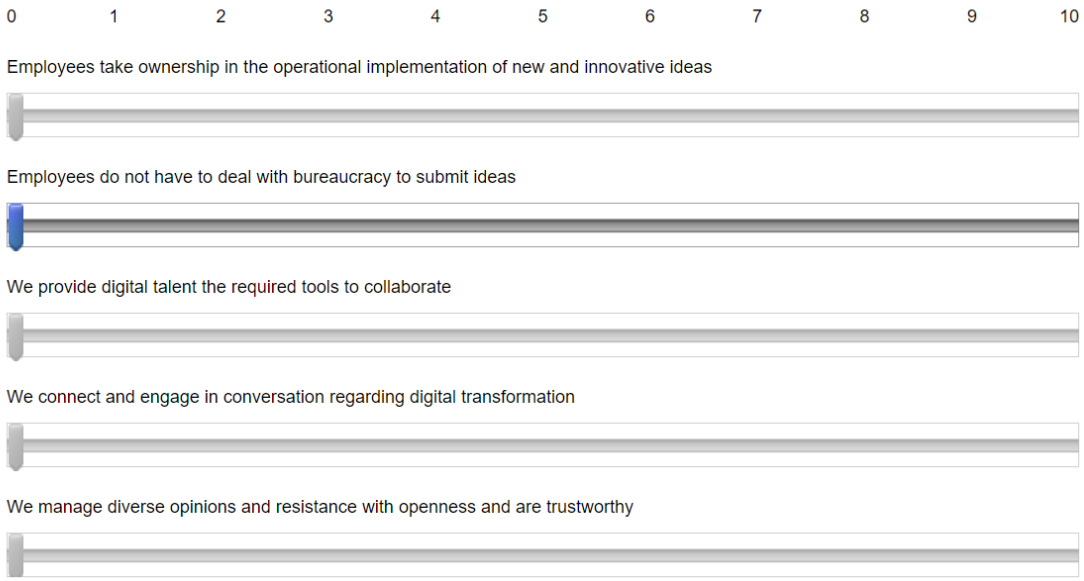
Q.9 Workforce Enablement, Skills, and Performance

Q9.1 Staff as a "Community": How do you engage your Staff as a Community?

- No engagement beyond standard Human Capital services (e.g., traditional HCM).
- Community is centralized and communication is “one to many.”
- Community is decentralized and communication is “many to many” but passive & single purpose (e.g., LinkedIn, Facebook).
- Community is decentralized, communication is “many to many” and drives peer-to-peer value creation.

Q9.2

Empowering Digital Talent:
Please rate the firm in terms of how you treat modern ("Digital") talent:Please rate where 0 = completely disagree; 10 = completely agree



Q9.3 Tapping into the external community: How do you actively convert "the Crowd" (general employees) into Community members?

- Standard techniques like internal PR to increase awareness.
- Leveraging social media for internal communication and engagement purposes
- Gamification and incentive competitions
- Our systems and processes are inherently designed to convert crowd into Community.

Q9.4 Learning and Development 1: Please rate the firm in terms of how you acquire and develop talent.

	Completely Disagree			Neither Agree nor Disagree			Completely Agree
We use personal touch and HR analytics to understand employees' preferences (e.g., career development, training)							
We use foresight and HR analytics to identify the skills needed both today and into the future							
Upskilling/reskilling on digital skills is a top priority for our company							
Leadership actively promotes digital skills learning and development for our employees							
We actively recruit and hire new talent with strong digital skills							
We have a formal program for digitally reskilling							

	Completely Disagree				Neither Agree nor Disagree					Completely Agree
employees (e.g., training, mentoring)										

Q9.5

Learning and Development 2: Please rate the firm in terms of how your acquire and develop talent

Completely Disagree — Neither Agree nor Disagree — Completely Agree

0 10 20 30 40 50 60 70 80 90 100

We know which new skills we need to develop in the next 3–5 years

We have the necessary learning infrastructure to upskill our employees

We create an environment that prioritizes and rewards learning and establish a supportive and cooperative atmosphere.

Q9.6

Performance management:
Please rate the firm in terms of how you management performance (including at operational levels)

0 10 20 30 40 50 60 70 80 90 100

We use dashboards and data as the foundation of managing performance

To help bring about a culture shift, we ensure we are giving continuous feedback on our employees' performance, especially when we expect them to do things in a different way than they are doing today. We need to encourage the new behaviors for this new way of working".

The way we manage performance encourages teamwork and cross-functional collaboration

We have adapted, and continue to adapt, our metrics and performance measures to reflect the changing context and strategy

Q9.9 Knowledge sharing and exploitation: Do you use advanced social tools for knowledge-sharing, communication, coordination and/or collaboration?

- ○ No, email is our primary communication vehicle.
- ○ Some teams use social tools, but not across the organization.
- ○ Most business units use social tools (and some external vendors/partners, though often unauthorized.
- ○ Use is mandated across the organization as policy.

Q.10 Core Processes Innovation and Digitalisation

Q10.1 Dashboards: To what extent do you use real-time dashboards to track and optimize operational performance?

- We use traditional weekly/monthly measurements to track operational performance.
- We use daily charts for some measures with real-time readouts of key operational metrics available at their point of control (i.e., traditional process control).
- Our key operational processes all have real time dashboards for optimization at the point of control, with limited reporting up into the Organization.
- We have organization-wide, real-time measures of all key operational indictors (including those of key partners), visible across the Organization and to external partners, as necessary.

Q10.2 Data-driven process management: To what extent do you use analytics, algorithms, and machine learning to make meaningful operational decisions?

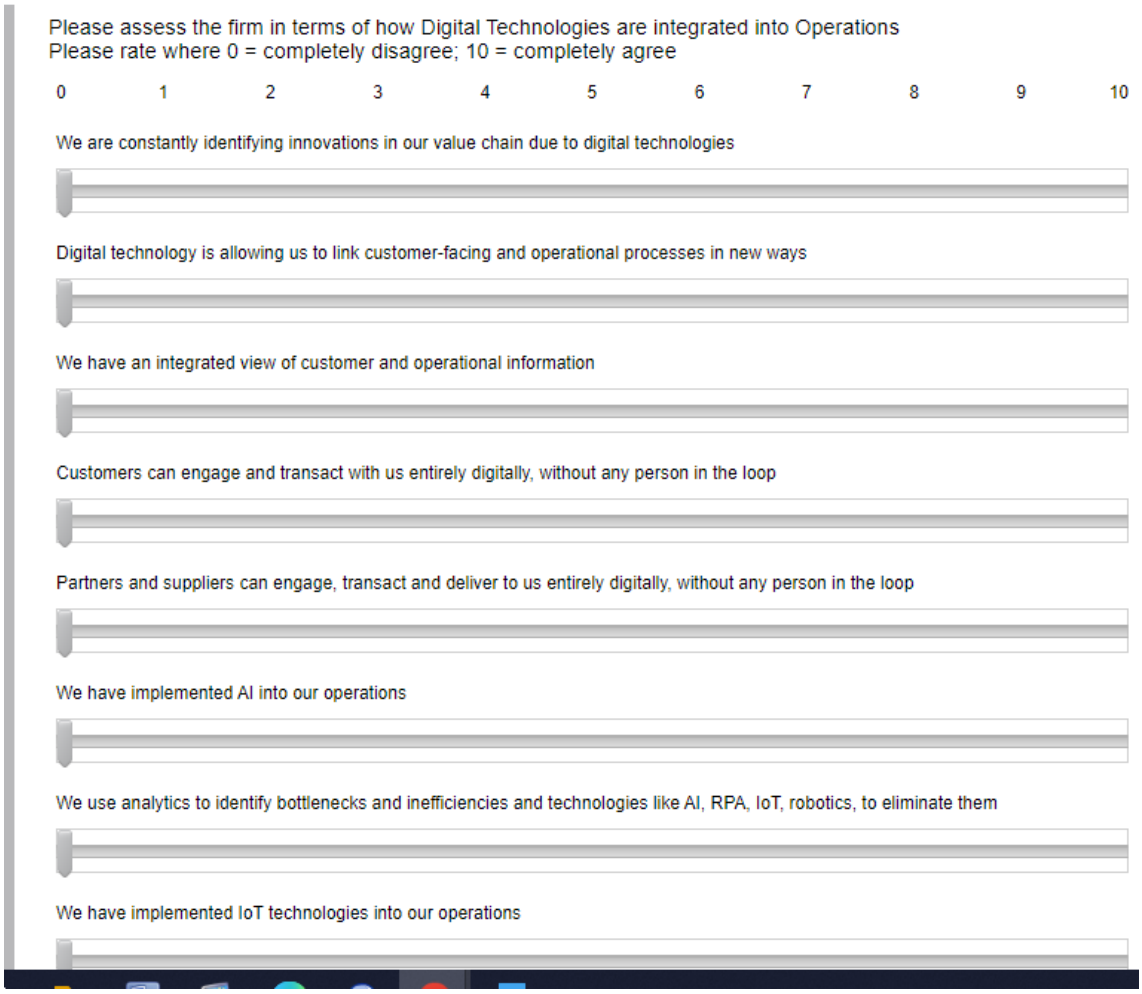
- We do not do any meaningful analysis; operational managers and operators make decisions on the basis of their insight and experience.
- We collect and analyze data mostly via reporting systems; operational managers and operators use this to inform their decisions.
- We use analytics and machine learning algorithms to analyze data and drive actionable decisions by operational managers and operators.
- Our core processes are built around algorithms and machine learning.

Q10.3

Does your organization constantly optimize processes through experimentation, A/B testing and short feedback loops? (e.g., Lean Startup methodology).

- No, we use traditional business process management (BPM).
- We use the Lean approach (or similar) for customer facing areas like marketing.
- We use the Lean approach for product innovation and product development.
- We use the Lean approach for all core functions (innovation, marketing, sales, service, HR, even legal!).

Q10.4



Q.11

IT/IS Excellence

IT - Business Alignment
Please rate where 0 = completely disagree; 10 = completely agree

0 1 2 3 4 5 6 7 8 9 10

The IT unit's performance meets the needs of the company

Business and IT leaders work together as partners

The CIO, IT, and business teams are all aligned with the objectives of the program

Our business functions and IT departments work with each other and their objectives are aligned

Q11.2 Enterprise Architecture:
Please assess your organization in terms of the extent of integration of your enterprise management and core business systems. (Feel free to use intermediate tick-boxes)

Our enterprise architecture is ad-hoc and dominated by legacy systems.		Our enterprise architecture is well defined and-fit for-purpose for our digital transformation, but we are only part-way complete in implementing the target enterprise architecture.		Our enterprise architecture is well defined and-fit for-purpose for our digital transformation and has been fully implemented.

Q11.3 Enterprise Systems Integration:
Please assess your organization in terms of the extent of integration of your enterprise management and core business systems (Feel free to use intermediate tick-boxes)

Our main enterprise systems are not integrated; we integrate data using spreadsheets and manual systems.		Our core enterprise management systems are integrated but several ancillary systems are not. The core systems in divisions or business units are not integrated.		All of our enterprise management and core business systems are integrated.

Q11.4

IT Infrastructure
Please assess you organisation in terms of the following factors. 0 = not at all; 10 = completely, everywhere in the organisation

0 1 2 3 4 5 6 7 8 9 10

Systems are implemented in the Cloud

All parts of the business are digitally connected (quality, speed, reliability)

All parts of the business are provided with appropriate, current generation IT tools (hardware and software)

Q11.5

IT Organisational performance:
Please assess you organisation in terms of the following factors. 0 = not at all; 10 = completely

0 1 2 3 4 5 6 7 8 9 10

The IT Organisation delivers on-time and on-budget

The IT organisation responds to the needs of the business and is agile and business-oriented

The IT organisation delivers systems and infrastructure which perform as required and meet the needs of the business

11.6

Cybersecurity
Please assess you organisation in terms of the following factors. 0 = not at all; 10 = completely
(Note: this is a simplification of a more detailed Cybersecurity Capability Maturity Model)

0 1 2 3 4 5 6 7 8 9 10

Risk Management – We have an effective management strategy for identifying, analyzing, and managing risk

Asset, Change, and Configuration Management: we keep inventories of information technology, operational technology, and information assets; establishing configuration baselines for assets; evaluating and logging changes to assets

Identity and Access Management – We effectively provision and deprovision identities for asset users; granting and revoking access; managing privileges

Threat and Vulnerability Management – we Identify and respond to threats; identify and reduce vulnerabilities

Situational Awareness – We perform logging and monitoring; collect information about the organization's current state of cybersecurity; and communicate the current state of cybersecurity to stakeholders

Information Sharing and Communications – We completely fulfil cybersecurity reporting obligations; sharing cybersecurity information with internal and external stakeholders; participating in information sharing and analysis centers

6

Event and Incident Response, Continuity of Operations – We are effective at detecting, analyzing, and escalating events; responding to incidents; maintaining and exercising incident response plans; sustaining operations during incidents; recovering from incidents

Supply Chain and External Dependencies Management – We identify important customer and supplier dependencies; we manage risks due to dependencies; and establish cybersecurity requirements for suppliers

Workforce Management: We assign clear responsibility for cybersecurity activities; conducting personnel vetting; training cybersecurity personnel; providing cybersecurity awareness activities for all personnel

Cybersecurity Program Management – We have created a cybersecurity program strategy and program; obtained sponsorship for the cybersecurity program; established a cybersecurity architecture; performed secure software development

Q.12 Results

Q12.1

Please select the most appropriate response for your organization that describes your business results to date with digital transformation:

- ○ We have realized limited or no results to date.
- ○ We have already realized incremental benefits (1x)
- ○ We have already realized transformational benefits (10x)

Q12.2 Benefits delivery: Please assess the extent to which digital transformation activities can be seen in the performance of the Organization.

(See the comment box below for definitions, if required)

	Not at all	In isolated pockets in the Organization	Widespread across the Organization, and some of these improvements are mutually reinforcing or interconnected	Pervasive across the Organization and These improvements are mutually reinforcing or interconnected
Digital transformation activities have delivered no discernible improvement in business performance				
Digital transformation activities have delivered a discernible improvement relative to the prior trend				
Digital transformation activities have delivered a material improvement relative to the prior trend, which is of strategic significant at a sub-Organizational, BU or functional level.				
Digital transformation activities have delivered a transformational improvement which differentiates the Organization from competitors at the overall Organizational level.				

Definitions for benefits delivery

The Organizational scope / breadth of the results achieved.

Level	Definition
Nowhere	Discernible improvements in indicators of results are not visible in any significant portion of the Organization. (A "significant" part of the Organization could be a Layer 1 Organizational unit (Layer 0 = parent Organization being assessed), or a lower-level unit of strategic significance)
Isolated pockets	At least discernible improvements are visible in a minority of individual Layer 1 or strategically significant Layer 2/3 units, and these improvements are not mutually reinforcing or interconnected
Widespread, integrating	At least discernible improvements are visible in a majority of individual Layer 1 and strategically significant Layer 2/3 units, and some of these improvements are often mutually reinforcing or interconnected
Pervasive and integrated	At least discernible improvements are visible in all individual Layer 1 and strategically significant Layer 2/3 units. These improvements are mutually reinforcing or interconnected leading to discernible improvements in key Layer 0 Organizational results indicators.

Size of the impact / results delivered:

Level	Definition	Examples
None	No discernible improvement in the indicator in question	
Discernible	A discernible improvement relative to the prior trend, where "discernible" requires that the improvement be materially greater than the volatility of the indicator.	Improvement > 1 sigma variation.
Material	A material improvement relative to the prior trend, where "material" requires that the improvement be meaningful at the next higher Organizational level and differentiates the Organization from competitors in respect to that indicator	10% reduction in Cost-to-income ratio in a mature bank 30-point improvement in NPS in a consumer business
Transformational	A transformational improvement in the indicator which and differentiates the Organization from competitors at the overall Organizational level.	2x improvement in share price 30% improvement in revenue in mature firms

End of Survey

We thank you for your time spent taking this survey.

Your response has been recorded.

(Your respondent's response summary will appear here)

Appendix (B): Consistency matrix

RO #	Research Objective	Hypothesis number	State Hypothesis	Data collection detail	Data analysis method
1	To validate the factors of Armstrong and Lee's unified model for digital maturity	1	Leadership has a positive correlation with Culture	Structured survey questionnaire see Appendix A	Structural Equation Modelling (SEM)
		2	Culture has a positive correlation with Leadership	Structured survey questionnaire see Appendix A	SEM
		3	A direct and positive relationship exists between Culture and digital ethics	Structured survey questionnaire see Appendix A	SEM
		4	A direct and positive relationship exists between Culture, and organization and governance	Structured survey questionnaire see Appendix A	SEM
		5	A direct and positive relationship exists between Leadership and digital ethics	Structured survey questionnaire see Appendix A	SEM
		6	Digital ethics has a positive correlation with organization and governance	Structured survey questionnaire see Appendix A	SEM
		7	A positive relationship exists between Leadership, and organization and governance	Structured survey questionnaire see Appendix A	SEM
		8	There is a positive correlation between organizational governance and digital ethics.	Structured survey questionnaire see Appendix A	SEM
		9	A direct and positive relationship exists between Leadership and investment and innovation architecture.	Structured survey questionnaire see Appendix A	SEM
		10	A direct and positive relationship exists between Culture, and Investment, and innovation architecture	Structured survey questionnaire see Appendix A	SEM
		11	A direct and positive relationship exists between Investment and innovation architecture and organizational governance	Structured survey questionnaire see Appendix A	SEM
		12	A direct and positive relationship exists between Investment and innovation architecture and IT/IS excellence.	Structured survey questionnaire see Appendix A	SEM
		14	There is a positive correlation between Culture and skills	Structured survey questionnaire see Appendix A	SEM
		15	There is a positive correlation between skills and IT/IS excellence	Structured survey questionnaire see Appendix A	SEM
		16	A direct and positive relationship exists between Investment and innovation architecture and new value streams and business models.	Structured survey questionnaire see Appendix A	SEM

RO #	Research Objective	Hypothesis number	State Hypothesis	Data collection detail	Data analysis method
2	To quantitatively examine the relationships between each of the factors of digital maturity to validate and refine the model of the proposed system for digital maturity.	17	A direct positive relationship exists between organization and governance and new value streams and business models.	Structured survey questionnaire see Appendix A	SEM
		18	A direct and positive relationship exists between skills and new value streams and business models.	Structured survey questionnaire see Appendix A	SEM
		19	A direct and positive relationship exists between organization and governance and customer orientation and engagement.	Structured survey questionnaire see Appendix A	SEM
		20	A direct and positive relationship exists between Investment and innovation and architecture and customer orientation and engagement.	Structured survey questionnaire see Appendix A	SEM
		21	A direct and positive relationship exists between skills and customer orientation and engagement	Structured survey questionnaire see Appendix A	SEM
		22	A direct and positive relationship exists between new value streams and business models, and digital product innovation.	Structured survey questionnaire see Appendix A	SEM
		23	A direct and positive relationship exists between organization and governance and digital product innovation	Structured survey questionnaire see Appendix A	SEM
		24	A direct and positive relationship exists between Investment and innovation architecture and digital product innovation	Structured survey questionnaire see Appendix A	SEM
		25	A direct and positive relationship exists between skills and digital product innovation.	Structured survey questionnaire see Appendix A	SEM
		26	A direct and positive relationship exists between organization and governance and workforce enablement and performance.	Structured survey questionnaire see Appendix A	SEM
		27	A direct and positive relationship exists between Investment and innovation architecture and workforce enablement and performance.	Structured survey questionnaire see Appendix A	SEM
		28	A direct and positive relationship exists between skills and workforce enablement and performance.	Structured survey questionnaire see Appendix A	SEM
		29	A direct and positive relationship exists between organization and governance and core process digitalization.	Structured survey questionnaire see Appendix A	SEM

RO #	Research Objective	Hypothesis number	State Hypothesis	Data collection detail	Data analysis method
		30	A direct and positive relationship exists between Investment and innovation architecture and core process digitalization	Structured survey questionnaire see Appendix A	SEM
		31	A direct and positive relationship exists between skills and core process digitalization	Structured survey questionnaire see Appendix A	SEM
		32	A direct and positive relationship exists between IT/IS excellence and core process digitalization	Structured survey questionnaire see Appendix A	SEM
		33	A direct and positive relationship exists between IT/IS excellence and workforce enablement, and performance	Structured survey questionnaire see Appendix A	SEM
		34	A direct and positive relationship exists between IT/IS excellence and digital product innovation	Structured survey questionnaire see Appendix A	SEM
		35	A direct and positive relationship exists between IT/IS excellence and customer orientation and engagement	Structured survey questionnaire see Appendix A	SEM
		36	A direct and positive relationship exists between IT/IS excellence and new value streams and business models.	Structured survey questionnaire see Appendix A	SEM
3	To establish the relationships between the factors of DM, and the business results	37	Customer orientation and engagement directly and positively influence business results	Structured survey questionnaire see Appendix A	SEM
		38	Digital product innovation directly and positively influences business results	Structured survey questionnaire see Appendix A	SEM
		39	Workforce enablement and performance directly and positively influence business results.	Structured survey questionnaire see Appendix A	SEM
		40	Core process digitalization directly and positively influences business results.	Structured survey questionnaire see Appendix A	SEM
		41	Digital ethics directly and positively influence business results	Structured survey questionnaire see Appendix A	SEM
		42	New value streams directly and positively influence business results	Structured survey questionnaire see Appendix A	SEM

APPENDIX (C): Waiver letter

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

Registration number: REC-101114-044

11 April 2023

Re: Miss Joice Nkomazana (2503527)

Waiver letter number: HRECNMW23/04/05

To whom it may concern,

Miss Nkomazana is a registered Masters student at the Wits Business School at the University of the Witwatersrand, Johannesburg. This letter is to confirm that, at the time of writing, Miss Nkomazana does not need ethical clearance for her Masters study entitled *'Exploring the relationship between the factors of Digital Maturity'*. This decision has been reached based upon a description of the project supplied by Miss Nkomazana to the University Human Research Ethics Committee (Non-Medical), which has been evaluated by the Chairs and Deputy Chairs. If, however, if Miss Nkomazana changes the methods of data collection and analysis for this study, this decision may no longer be valid. If such changes take place, this should be communicated to the University Human Research Ethics Committee (Non-Medical) as soon as possible. This waiver letter is valid until 10 April 2026.

Please feel free to contact me should you require any further information.

Thank you.

Yours sincerely,
S Schoeman

Shaun Schoeman (Administrative Officer)
Solomon Mahlangu House, 10th Floor, Room 10004, Jorissen Street, Braamfontein, Johannesburg
Private Bag 3, Wits 2050
T + 27(0)11 717 1408 | **E** Shaun.Schoeman@wits.ac.za | hrec-medical.researchoffice@wits.ac.za
www.wits.ac.za/research/about-our-research/ethics-and-research-integrity/

APPENDIX (D): Letter requesting Permission.

Unit 21 Sunset Villas Complex

Vorna Valley

Midrand

January 23, 2023

Dear Sir/Madam,

Re: Request permission to use secondary data from the University of the Witwatersrand collected from an online survey questionnaire by Professor Armstrong.

My name is Joice Nkomazana and studying for a Master of Management in Digital Business at Wits Business School, the University of the Witwatersrand. I am applying for retrospective approval to use secondary data for my thesis. The data was collected in class as part of a teaching exercise collected in a survey by Professor Armstrong among students in Digital Business at Wits Business School. The student consented to participate in the survey.

Although initial permission for data collection was sought in the past by Professor Armstrong, I must get the same explicit approval to handle and analyze this data from the University of the Witwatersrand since I was not part of the original team. The data is inherently anonymous. Students did not identify themselves in completing the surveys. The purpose and outcome of the research were started in an explicable language.

I am researching on Exploring the relationship between the factors of Digital Maturity. The motivation for the research is that while digital transformation has become a topic of interest, existing research on digital maturity models to measure or evaluate it remains theoretical and lacks empirical studies to understand the same phenomenon. Therefore, there is a need to understand and explain the factors that influence digital transformation in different organizations in South Africa. Specifically, the research has three objectives: to validate the factors of Armstrong and Lee's unified model for digital maturity. Secondly, to quantitatively examine the relationships between the factors of the digital maturity model to refine the proposed systems model for digital maturity. Thirdly, to establish the relationships between the factors of DM, the dimensions of DM, and the business results.

The importance of this study is that it will contribute to theory by examining the relationships between each factor of digital maturity and testing their relationships and how they influence successful digital transformation and business results. Also, it has practical implications. It will provide valuable insights for guiding managerial practices on how managers can implement a successful digital transformation journey and reap superior business results in South African organizations.

I will treat the data with confidentiality and ensure that the name of the University of the Witwatersrand remain anonymous.

Your assistance is highly appreciated in this matter.

Yours sincerely,

Joice Nkomazana

Student Masters in Digital

Master of Management in Digital Business
0718548796
2503527@students.wits.ac.za

APPENDIX (E): Permission letter

Wits Business School
University of the Witwatersrand
2 St David's Place
Parktown
Johannesburg
2193

8 February 2023

Dear Sir/Madam,

Permission to use Digital Maturity Survey data

Over the last number of years, as part of their course on Digital Transformation and Change Management, MM-DB and PDM-DB students have done an exercise in which they complete a digital maturity survey, similar to those used to assess the digital maturity of firms.

The survey is entirely anonymous and no personal student information is gathered, other than the syndicate group of which the student is a member.

Joice Nkomazana (Student Number 2503527) is studying for a Master of Management in Digital Business at Wits Business School, the University of the Witwatersrand. I hereby grant her permission to use the accumulated data from these exercise surveys for research to improve the validity and reliability of the instrument.

Sincerely,

Prof. Brian Armstrong
Chair of Digital Business
Wits Business School

APPENDIX (F): Descriptive statistics

Constructs	Factor name	Variable	Observations	Mean	Standard deviation	Minimum	Maximum
		Year	756	2020.581	0.8885423	2019	2022
		cohort	756	12.52249	6.845757	1	23
Vision and strategy	Transformative scope of vision	TSV1	751	5.41012	1.612321	1	7
		TSV2	637	3.020408	0.8133465	1	4
		TSV3	751	5.354194	1.651579	1	7
		TSV4	753	4.536521	1.759188	1	7
		TSV5	753	5.143426	1.62858	1	7
	Vision integrated into business strategy.	VBS1	745	1.653691	0.7748156	1	3
		VBS2	456	4.563596	1.698193	1	7
	Leadership alignment and commitment	LAC1	749	2.041389	0.7364797	1	3
Organizational Culture	Leadership culture and transformation	LCT1	705	4.990071	1.673206	1	7
		LCT2	752	3.470745	1.991111	1	7
	Approach to risk-taking and failure	ARTF1	754	2.371353	0.9348081	1	4
	Organizational learning, exploration, and experimentation	OLEE1	754	5.217507	1.622521	1	7
		OLEE2	751	4.849534	1.621521	1	7
		OLEE3	750	5.010667	1.606859	1	7
		OLEE4	753	4.50996	1.690939	1	7
		OLEE5	749	5.448598	1.724808	1	7
	Collaboration culture	CC1	753	5.053121	1.814494	1	7
		CC2	457	5.028446	1.669272	1	7
		CC3	457	4.501094	1.686017	1	7
Organization and Governance	Change management	CM1	757	1.863937	0.7301024	1	3
	Digital governance structures	DGS1	757	1.994716	0.6919596	1	3

	Coordination of strategic activities	CSA1	751	4.370173	1.816624	1	7
	Roles and responsibilities	RR1	295	4.881356	1.813449	1	7
	Digital organization and structures	D1S1	293	4.232082	1.910872	1	7
	Agile, empowering organizational structure	AEOS1	752	4.586436	1.723335	1	7
	Distribution of digital skills structures	DDSS1	752	2.172872	1.135041	1	4
	Ecosystem engagement	EE1	736	5.275815	2.662669	1	10
		EE2	741	6.22942	2.656201	1	10
		EE3	738	5.49729	2.390192	1	10
		EE4	757	3.125495	3.098275	1	10
		EE5	736	5.400815	2.556241	1	10
		EE6	743	5.244953	2.407149	1	10
		EE7	299	1.826087	1.063356	1	4
Innovation and Investment	Strategic approach to innovation	SAI1	453	1.710817	0.7744781	1	3
		SAI2	450	2.548889	1.009338	1	4
		SAI3	445	5.501124	2.363027	1	10
		SAI4	751	4.617843	1.930568	1	10
		SAI5	744	6.443548	2.589873	1	10
		SAI6	738	5.49729	2.390192	1	10
	Lean and open innovation	LOI1	661	2.582451	0.9806896	1	4
		LOI2	450	2.064444	0.9638581	1	4
	Level and accessibility of funding	LAF1	455	1.997802	0.7163875	1	3
		LAF2	453	3.89404	1.951238	1	7
		LAF3	450	3.491111	1.729132	1	7
New value streams and business models	Platform business model usage	PBMU1	750	2.002667	1.075268	1	4
		PBMU2	750	2.073333	0.652577	1	3
		PBMU3	658	2.041033	0.6480178	1	3
		PBMU4	662	3.037764	1.231247	1	5
Digital Ethics		TA1	455	2.373626	1.091097	1	4

	Transparency and awareness	TA2	745	2.162416	0.8686193	1	4
		TA3	698	2.434097	1.020218	1	4
		TA4	700	2.801429	1.003141	1	4
		TA5	451	2.445676	1.165637	1	4
		TA6	451	2.414634	1.036515	1	4
		TA7	453	2.496689	0.9767712	1	4
	Integration of product and business process	IPBP1	453	2.695364	1.0475	1	4
		IPBP2	451	2.572062	1.073321	1	4
		IPBP3	455	2.525275	1.075825	1	4
		IPBP4	452	2.570796	1.019472	1	4
	Participation and access	PA1	449	2.545657	1.00813	1	4
		PA2	450	2.646667	1.02401	1	4
		PA3	451	2.447894	1.025806	1	4
		PA4	455	2.487912	1.00624	1	4
	Ethics processes and governance structures	EPGS1	452	2.513274	0.9932369	1	4
		EPGS2	453	2.503311	0.9947262	1	4
		EPGS3	452	2.668142	1.040447	1	4
		EPGS4	750	2.326667	0.8063224	1	4
		EPGS5	449	2.363029	1.068864	1	4
		EPGS6	732	2.474044	1.042534	1	4
Customer orientation and engagement	Customer participation and engagement	CPE1	746	2.013405	0.6428397	1	3
		CPE2	746	1.97319	0.6254811	1	3
		CPE3	745	6.934228	2.73217	1	10
	Use of analytics for personalization and targeting	UAPT1	733	5.484311	2.58914	1	10
	Digital channels	DC1	741	6.22942	2.656201	1	10
		CVF1	744	6.270161	2.535003	1	10

	Customer value focus	CVF2	720	5.352778	3.00958	1	10
		CVF3	719	5.095967	2.952356	1	10
		CVF4	751	4.617843	1.930568	1	10
		CVF5	757	2.587847	2.673456	1	10
		CVF6	757	4.785997	3.644473	1	10
Digital product innovation	Digital nature of products and services	DNPS1	453	2.273731	0.8065789	1	4
	Digital differentiation of products and services	DDPS1	449	1.966592	0.6452071	1	3
		DDPS2	745	1.973154	0.6280443	1	3
		DDPS3	747	1.942436	0.6493188	1	3
	Social functionality of products and services	SFPS1	750	2.369333	1.071973	1	4
	Data as an asset	DA1	747	2.542169	0.9738	1	4
	Analytics and cloud technologies	ACT1	747	2.46988	0.9824685	1	4
Workforce enablement, Skills, and performance	Staff as community	SC1	740	2.436486	0.7958067	1	4
	Tapping into the community	TPC1	732	2.474044	1.042534	1	4
	Empowering digital talent	EDT1	739	5.622463	2.717919	1	10
		EDT2	445	5.782022	2.614864	1	10
		EDT3	442	5.823529	2.451449	1	10
		EDT4	438	5.753425	2.588201	1	10
		EDT5	721	4.841886	2.785871	1	10
	Learning and development	LD1	747	4.147256	1.859618	1	7
		LD2	746	4.690349	1.885825	1	7
		LD3	749	4.837116	1.847866	1	7
		LD4	748	4.574866	1.80094	1	7
		LD5	745	4.297987	2.041849	1	7
		LD6	753	3.223108	1.543051	1	7
		LD7	728	5.994505	2.517607	1	10
		LD8	725	5.591724	2.550363	1	10
		LD9	487	5.451745	2.641321	1	10
	Performance management	PM1	487	5.995893	2.16405	1	10

		PM2	487	5.761807	2.058991	1	10
		PM3	487	5.589322	2.258894	1	10
		PM4	487	5.451745	2.641321	1	10
		PM5	738	5.819783	2.467435	1	10
	Knowledge sharing and exploitation.	KSE1	450	2.273333	1.050379	1	4
Core processes and Digitalization	Use of dashboards	UD1	745	2.15302	0.7464573	1	4
	Data-driven process management	DDPM1	749	2.23498	1.043597	1	4
	Experimentation	E1	732	2.474044	1.042534	1	4
	Integration of digital technologies into operations	IDTO1	728	5.653846	2.548773	1	10
		IDTO2	725	5.591724	2.550363	1	10
		IDTO3	442	5.574661	2.761098	1	10
		IDTO4	439	4.995444	2.601366	1	10
		IDTO5	703	4.540541	2.857637	1	10
		IDTO6	690	4.666667	2.853799	1	10
		IDTO7	429	5.006993	2.772941	1	10
		IDTO8	741	6.004049	2.284787	1	10
IT/IS Excellence	IT-business alignment	ITBA1	736	5.98913	2.36353	1	10
		ITBA2	740	5.983784	2.396944	1	10
		ITBA3	739	5.903924	2.380527	1	10
		ITBA4	449	5.819599	2.274857	1	10
	Enterprise architecture	EA1	445	3.060674	1.087772	1	5
	Enterprise systems integration	ESI1	456	3.083333	1.272562	1	5
	IT Infrastructure	ITI1	444	5.761261	2.509887	1	10
		ITI2	438	6.230594	2.416434	1	10
		ITI3	443	5.841986	2.199825	1	10
	IT organizational performance	ITOP1	440	6.013636	2.276911	1	10
		ITOP2	442	6.264706	2.214173	1	10
		ITOP3	449	7.093541	2.219069	1	10
	Cybersecurity	C1	449	6.864143	2.238419	1	10

		C2	443	7.31377	2.10869	1	10
		C3	447	7.355705	2.149378	1	10
		C4	446	7.143498	2.189257	1	10
		C5	442	6.995475	2.278755	1	10
		C6	447	7.120805	2.148874	1	10
		C7	444	6.686937	2.224167	1	10
		C8	444	7.009009	2.283499	1	10
		C9	442	7.0181	2.343445	1	10
		C10	739	7.158322	2.174774	1	10
	Digital initiatives generating value directly	DIGVD1	451	1.858093	0.6410373	1	3
Results	Functional / process improvements	FPI1	447	2.642058	0.7407567	1	4
	Legacy business expanding	LBE1	448	2.676339	0.7715135	1	4
		LBE2	448	2.59375	0.8083215	1	4
		LBE3	441	2.45805	1.048239	1	4

Appendix (G): Normality Test

Variable	Obs	W	V	Z	p-value
TSV1	751	0.94723	25.651	7.940	0.00000
TSV2	637	0.99482	2.169	1.881	0.03000
TSV3	751	0.94508	26.696	8.037	0.00000
TSV4	753	0.98506	7.278	4.858	0.00000
TSV5	753	0.96873	15.234	6.665	0.00000
VBS1	745	0.99385	2.967	2.660	0.00391
VBS2	456	0.98687	4.066	3.358	0.00039
LAC1	749	0.99991	0.045	-7.565	0.00000
LCT1	705	0.97643	10.818	5.811	0.00000
LCT2	752	0.97692	11.231	5.919	0.00000
ARTF1	754	0.99763	1.157	0.357	0.00062
OLEE1	754	0.96427	17.429	6.995	0.00000
OLEE2	751	0.98515	7.220	4.837	0.00000
OLEE3	750	0.97663	11.346	5.943	0.00000
OLEE4	753	0.99108	4.346	3.595	0.00016
OLEE5	749	0.94517	26.585	8.026	0.00000
CC1	753	0.96522	16.945	6.926	0.00000
CC2	457	0.97587	7.485	4.819	0.00000
CC3	457	0.99459	1.679	1.240	0.00743
CM1	756	0.96983	14.752	6.588	0.00000
DGS1	756	0.95736	20.850	7.435	0.00000
CSA1	751	0.99175	4.008	3.397	0.00034
RR1	751	0.99920	0.389	-2.312	0.00061
DOS1	752	0.99988	0.059	-6.916	0.00000
AEOS1	752	0.98581	6.907	4.729	0.00000
DDSS1	753	0.99446	2.698	2.429	0.00758
EE1	751	0.99327	3.273	2.902	0.00186
EE2	749	0.98803	5.807	4.304	0.00001
EE3	745	0.99389	2.947	2.644	0.00410
EE4	756	0.94084	28.929	8.236	0.00000
EE5	736	0.99519	2.295	2.032	0.00110
EE6	743	0.97663	11.346	5.943	0.00000
EE7	736	0.99238	3.636	3.156	0.00080
SAI1	447	0.97663	11.346	5.943	0.00000
SAI2	444	0.99397	1.824	1.437	0.00041
SAI3	445	0.99207	2.404	2.097	0.00800
SAI4	752	0.99379	3.024	2.708	0.00338
SAI5	299	0.97617	5.062	3.806	0.00007
SAI6	750	0.99837	0.793	-0.567	0.00051

LOI1	661	0.97663	11.346	5.943	0.00000
LOI2	454	0.95200	14.802	6.450	0.00000
LAF1	451	0.87578	38.083	8.709	0.00000
LAF2	456	0.98989	3.130	2.731	0.00315
LAF3	453	0.99190	2.492	2.186	0.00442
PBMU1	750	0.98459	7.484	4.925	0.00000
PMU2	752	0.97663	11.346	5.943	0.00000
PBMU3	660	0.98735	5.469	4.135	0.00002
PBMU4	659	0.99183	3.527	3.067	0.00108
TA1	455	0.97663	11.346	5.943	0.00000
TA2	750	0.97663	11.346	5.943	0.00000
TA3	700	0.97663	11.346	5.943	0.00000
TA4	700	0.97663	11.346	5.943	0.00000
BC	455	0.97663	11.346	5.943	0.00000
TA5	451	0.97663	11.346	5.943	0.00000
TA6	451	0.96476	17.005	6.931	0.00000
TA7	453	0.98442	7.520	4.935	0.00000
IPBP1	453	0.96476	17.005	6.931	0.00000
IPBP2	451	0.96476	17.005	6.931	0.00000
IPBP3	455	0.98442	7.520	4.935	0.00000
IPBP4	452	0.96476	17.005	6.931	0.00000
PA1	449	0.98567	6.694	4.644	0.00000
PA2	450	0.96476	17.005	6.931	0.00000
PA3	451	0.98442	7.520	4.935	0.00000
PA4	455	0.98567	6.694	4.644	0.00000
EPGS1	452	0.99843	0.483	-1.740	0.00905
EPGS2	453	0.98442	7.520	4.935	0.00000
EPGS3	452	0.99780	0.677	-0.933	0.00448
EPGS4	743	0.98442	7.520	4.935	0.00000
EPGS5	448	0.98567	6.694	4.644	0.00000
EPGS6	745	0.98442	7.520	4.935	0.00000
CPE1	744	0.98551	6.984	4.754	0.00000
CPE2	751	0.96311	17.930	7.063	0.00000
CPE3	745	0.96476	17.005	6.931	0.00000
UAPT1	733	0.98567	6.694	4.644	0.00000
DC1	741	0.98458	7.406	4.897	0.00000
CVF1	725	0.98327	7.877	5.043	0.00000
CVF2	720	0.98329	7.819	5.023	0.00000
CVF3	719	0.98567	6.694	4.644	0.00000
CVF4	746	0.99388	2.955	2.651	0.00402
CVF5	756	0.87993	58.715	9.969	0.00000

CVF6	756	0.99327	3.292	2.917	0.00177
DNPS1	449	0.96476	17.005	6.931	0.00000
DDPS1	449	0.99962	0.117	-5.131	0.00000
DDPS2	745	0.99518	2.326	2.065	0.00948
DDPS3	750	0.99516	2.352	2.093	0.00819
SFPS1	750	0.99384	2.990	2.680	0.00368
DA1	747	0.99547	2.192	1.920	0.00742
ACT1	740	0.99433	2.718	2.445	0.00723
SC1	721	0.98854	5.369	4.105	0.00002
EDT1	739	0.98941	5.073	3.971	0.00004
EDT2	445	0.98874	3.410	2.933	0.00168
EDT3	442	0.99292	2.131	1.809	0.00523
EDT4	446	0.99255	2.260	1.950	0.02557
EDT5	750	0.98913	5.279	4.071	0.00002
LD1	747	0.99218	3.783	3.255	0.00057
LD2	746	0.97785	10.702	5.799	0.00000
LD3	749	0.96638	16.304	6.830	0.00000
LD4	748	0.98147	8.975	5.369	0.00000
LD5	745	0.98308	8.163	5.136	0.00000
LD6	753	0.96642	16.360	6.840	0.00000
LD7	740	0.98312	8.097	5.115	0.00000
LD8	736	0.93346	31.756	8.455	0.00000
LD9	480	0.98567	6.694	4.644	0.00000
PM1	487	0.99533	1.534	1.028	0.00198
PM2	487	0.99484	1.696	1.269	0.00230
PM3	487	0.98567	6.694	4.644	0.00000
PM4	487	0.98567	6.694	4.644	0.00000
PM5	746	0.99634	1.768	1.394	0.00171
KSE1	450	0.99490	1.562	1.066	0.00313
UD1	745	0.99312	3.318	2.934	0.00167
DDPMIa	744	0.99324	3.257	2.888	0.00194
E1	728	0.98820	5.576	4.200	0.00001
IDTO1	728	0.99250	3.542	3.091	0.00100
IDTO2	725	0.99351	3.054	2.728	0.00319
IDTO3	756	0.93221	33.152	8.570	0.00000
IDTO4	756	0.93041	34.028	8.634	0.00000
IDTO5	703	0.98839	5.317	4.077	0.00002
IDTO6	690	0.98936	4.788	3.818	0.00007
IDTO7	756	0.90835	44.817	9.308	0.00000
IDTO8	740	0.99181	3.930	3.347	0.00041
ITBA1	735	0.99173	3.944	3.355	0.00040

ITBA2	739	0.99499	2.401	2.142	0.00609
ITBA3	736	0.99251	3.574	3.114	0.00092
ITBA4	443	0.98567	6.694	4.644	0.00000
EA1	445	0.96649	10.090	5.526	0.00000
ESI1	446	0.98784	3.691	3.123	0.00090
ITI1	444	0.99237	2.306	1.998	0.00286
ITI2	438	0.98703	3.873	3.236	0.00061
ITI3	443	0.99007	2.995	2.623	0.00436
ITOP1	440	0.98477	4.567	3.630	0.00014
ITOP2	442	0.97945	6.187	4.356	0.00001
ITOP3	449	0.96798	9.778	5.454	0.00000
C1	449	0.97560	7.452	4.805	0.00000
C2	443	0.95955	12.203	5.981	0.00000
C3	447	0.96439	10.830	5.698	0.00000
C4	446	0.95931	12.351	6.011	0.00000
C5	442	0.96649	10.090	5.526	0.00000
C6	447	0.96367	11.050	5.746	0.00000
C7	444	0.97108	8.743	5.184	0.00000
C8	444	0.96631	10.184	5.549	0.00000
C9	442	0.94636	16.150	6.650	0.00000
C10	743	0.98567	6.694	4.644	0.00000
DIGVD1	446	0.99181	3.930	3.347	0.00041
FPI1	447	0.98567	6.694	4.644	0.00000
LBE1	448	0.99181	3.930	3.347	0.00041
LBE2	448	0.98784	3.691	3.123	0.00090
PBMU2	752	0.96649	10.090	5.526	0.00000

Source: Stata output using the survey dataset

APPENDIX (H): Correlation Analysis

Tables 1- 13 Constructs

Correlation matrix for the factor variable under the Vision and strategy construct

	LCT1	LCT2	ARTF1	OLEE1	OLEE2	OLEE3	OLEE4	OLEE5	CC1	CC2	CC3
LCT1	1.0000										
LCT2	0.3573 (0.0000)	1.0000									
ARTF1	0.2987 (0.0000)	0.3014 (0.0000)	1.0000								
OLEE1	0.4627 (0.0000)	0.3306 (0.0000)	0.3574 (0.0000)	1.0000							
OLEE2	0.4601 (0.0000)	0.3897 (0.0000)	0.4766 (0.0000)	0.6287 (0.0000)	1.0000						
OLEE3	0.5698 (0.0000)	0.3805 (0.0000)	0.3856 (0.0000)	0.6229 (0.0000)	0.6835 (0.0000)	1.0000					
OLEE4	0.4877 (0.0000)	0.3443 (0.0000)	0.4140 (0.0000)	0.5400 (0.0000)	0.6608 (0.0000)	0.6026 (0.0000)	1.0000				
OLEE5	0.3971 (0.0000)	0.3743 (0.0000)	0.3132 (0.0000)	0.4817 (0.0000)	0.5399 (0.0000)	0.5245 (0.0000)	0.4468 (0.0000)	1.0000			
CC1	0.4034 (0.0000)	0.3732 (0.0000)	0.3340 (0.0000)	0.4673 (0.0000)	0.5366 (0.0000)	0.5106 (0.0000)	0.4687 (0.0000)	0.7087 (0.0000)	1.0000		
CC2	0.4841 (0.0000)	0.3956 (0.0000)	0.2761 (0.0000)	0.4349 (0.0000)	0.5385 (0.0000)	0.5048 (0.0000)	0.5323 (0.0000)	0.5757 (0.0000)	0.6621 (0.0000)	1.0000	
CC3	0.4496 (0.0000)	0.3932 (0.0000)	0.4857 (0.0000)	0.5292 (0.0000)	0.6558 (0.0000)	0.5988 (0.0000)	0.6603 (0.0000)	0.4359 (0.0000)	0.4781 (0.0000)	0.5528 (0.0000)	1.0000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the Culture construct

	ARTF1	OLEE1	OLEE2	OLEE3	OLEE4	OLEE5	CC1	CC2	CC3
ARTF1	1.0000								
OLEE1	0.3574(0.0000)	1.0000							
OLEE2	0.4766(0.0000)	0.6287(0.0000)	1.0000						

OLEE3	0.3856(0.0000)	0.6229(0.0000)	0.6835(0.0000)	1.0000					
OLEE4	0.4140(0.0000)	0.5400(0.0000)	0.6608(0.0000)	0.6026(0.0000)	1.0000				
OLEE5	0.3132(0.0000)	0.4817(0.0000)	0.5399(0.0000)	0.5245(0.0000)	0.4468(0.0000)	1.0000			
CC1	0.3340(0.0000)	0.4673(0.0000)	0.5366(0.0000)	0.5106(0.0000)	0.4687(0.0000)	0.7087(0.0000)	1.0000		
CC2	0.2761(0.0000)	0.4349(0.0000)	0.5385(0.0000)	0.5048(0.0000)	0.5323(0.0000)	0.5757(0.0000)	0.6621 (0.0000)	1.0000	
CC3	0.4857(0.0000)	0.5292(0.0000)	0.6558(0.0000)	0.5988(0.0000)	0.6603(0.0000)	0.4359(0.0000)	0.4781 (0.0000)	0.5528(0.0000)	1.0000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the Organization and Governance construct

	CM1	DGS1	CSA1	RR1	DOS1	AEOS1	DDSS1	EE1	EE2	EE3	EE4	EE5	EE6	EE7
CM1	1.0000													
DGS1	0.8235 (0.0000)	1.0000												
CSA1	0.0842 (0.0000)	0.1277 (0.0005)	1.0000											
RR1	0.0462 (0.0060)	0.0829 (0.0231)	0.4194 (0.0000)	1.0000										
DOS1	0.0460 (0.2079)	0.0752 (0.0391)	0.4674 (0.0000)	0.5790 (0.0000)	1.0000									
AEOS1	0.0708 (0.0523)	0.0910 (0.0125)	0.3760 (0.0000)	0.3449 (0.0000)	0.3513 (0.0000)	1.0000								
DDSS1	0.0878 (0.0159)	0.1279 (0.0004)	0.5891 (0.0000)	0.5402 (0.0000)	0.5536 (0.0000)	0.5108 (0.0000)	1.0000							
EE1	0.0392 (0.2832)	0.0645 (0.0774)	0.5914 (0.0000)	0.4599 (0.0000)	0.4938 (0.0000)	0.4366 (0.0000)	0.6876 (0.0000)	1.0000						
EE2	0.0102 (0.7815	0.0517 (0.1579)	0.5852 (0.0000)	0.4735 (0.0000)	0.4508 (0.0000)	0.4198 (0.0000)	0.6630 (0.0000)	0.7248 (0.0000)	1.0000					
EE3	-0.0776 (0.0343)	-0.0549 (0.1342)	0.5223 (0.0000)	0.4666 (0.0000)	0.4984 (0.0000)	0.3680 (0.0000)	0.4934 (0.0000)	0.5204 (0.0000)	0.5122 (0.0000)	1.0000				
EE4	0.8166 (0.0000)	0.7748 (0.0000)	0.0346 (0.3439)	0.0326 (0.3725)	0.0317 (0.3853)	-0.0035 (0.9244)	0.0532 (0.1449)	-0.0112 (0.7603)	-0.0294 (0.4216)	-0.0932 (0.0109)	1.0000			
EE5	0.1580 (0.0000)	0.2223 (0.0000)	0.3955 (0.0000)	0.2599 (0.0000)	0.2641 (0.0000)	0.2790 (0.0000)	0.4235 (0.0000)	0.3505 (0.0000)	0.4312 (0.0000)	0.2677 (0.0000)	0.2268 (0.0000)	1.0000		
EE6	0.0775 (0.0348)	0.1237 (0.0000)	0.4243 (0.0000)	0.3268 (0.0000)	0.2966 (0.0000)	0.3258 (0.0000)	0.4440 (0.0000)	0.3993 (0.0000)	0.4816 (0.0000)	0.4099 (0.0000)	0.1235 (0.0000)	0.6011 (0.0000)	1.0000	

EE7	0.1381 (0.0002)	0.1633 (0.0000)	0.3842 (0.0000)	0.3425 (0.0000)	0.3087 (0.0000)	0.3061 (0.0000)	0.4432 (0.0000)	0.3970 (0.0000)	0.4350 (0.0000)	0.3789 (0.0000)	0.1676 (0.0000)	0.4555 (0.0000)	0.5648 (0.0000)	1.0000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the Innovation and Investment construct

	SAI1	SAI2	SAI3	SAI4	SAI5	SAI6	LOI1	LOI2	LAF1	LAF2	LAF3
SAI1	1.0000										
SAI2	0.8026 (0.0000)	1.0000									
SAI3	0.7000 (0.0000)	0.6982 (0.0000)	1.0000								
SAI4	0.4214 (0.0000)	0.4095 (0.0000)	0.4541 (0.0000)	1.0000							
SAI5	1.0000 (0.0000)	0.9199 (0.0000)	0.9117 (0.0000)	0.5292 (0.0000)	1.0000						
SAI6	0.5017 (0.0000)	0.4339 (0.0000)	0.5223 (0.0000)	0.3866 (0.0000)	0.3655 (0.0000)	1.0000					
LOI1	0.4820 (0.0000)	0.4427 (0.0000)	0.4889 (0.0000)	0.3851 (0.0000)	0.3868 (0.0000)	0.6479 (0.0000)	1.0000				
LOI2	0.2238 (0.0000)	0.2262 (0.0000)	0.2215 (0.0000)	0.2415 (0.0000)	0.9870 (0.0000)	0.2596 (0.0000)	0.3056 (0.0000)	1.0000			
LAF1	0.1472 (0.0019)	0.1423 (0.0028)	0.2096 (0.0000)	0.1692 (0.0003)	0.9978 (0.0000)	0.2311 (0.0000)	0.2449 (0.0000)	0.7000 (0.0000)	1.0000		
LAF2	0.5104 (0.0000)	0.4232 (0.0000)	0.4793 (0.0000)	0.3922 (0.0000)	0.9755 (0.0000)	0.4163 (0.0000)	0.4265 (0.0000)	0.3122 (0.0000)	0.3788 (0.0000)	1.0000	
LAF3	0.4664 (0.0000)	0.4139 (0.0000)	0.4679 (0.0000)	0.3445 (0.0000)	0.9887 (0.0000)	0.3926 (0.0000)	0.3884 (0.0000)	0.3656 (0.0000)	0.4083 (0.0000)	0.6346 (0.0000)	1.0000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the Innovation and Investment construct

	SAI1	SAI2	SAI3	SAI4	SAI5	SAI6	LOI1	LOI2	LAF1	LAF2	LAF3
SAI1	1.0000										
SAI2	0.8026 (0.0000)	1.0000									
SAI3	0.7000 (0.0000)	0.6982 (0.0000)	1.0000								
SAI4	0.4214 (0.0000)	0.4095 (0.0000)	0.4541 (0.0000)	1.0000							
SAI5	1.0000 (0.0000)	0.9199 (0.0000)	0.9117 (0.0000)	0.5292 (0.0000)	1.0000						

SAI6	0.5017 (0.0000)	0.4339 (0.0000)	0.5223 (0.0000)	0.3866 (0.0000)	0.3655 (0.0000)	1.0000					
LOI1	0.4820 (0.0000)	0.4427 (0.0000)	0.4889 (0.0000)	0.3851 (0.0000)	0.3868 (0.0000)	0.6479 (0.0000)	1.0000				
LOI2	0.2238 (0.0000)	0.2262 (0.0000)	0.2215 (0.0000)	0.2415 (0.0000)	0.9870 (0.0000)	0.2596 (0.0000)	0.3056 (0.0000)	1.0000			
LAF1	0.1472 (0.0019)	0.1423 (0.0028)	0.2096 (0.0000)	0.1692 (0.0003)	0.9978 (0.0000)	0.2311 (0.0000)	0.2449 (0.0000)	0.7000 (0.0000)	1.0000		
LAF2	0.5104 (0.0000)	0.4232 (0.0000)	0.4793 (0.0000)	0.3922 (0.0000)	0.9755 (0.0000)	0.4163 (0.0000)	0.4265 (0.0000)	0.3122 (0.0000)	0.3788 (0.0000)	1.0000	
LAF3	0.4664 (0.0000)	0.4139 (0.0000)	0.4679 (0.0000)	0.3445 (0.0000)	0.9887 (0.0000)	0.3926 (0.0000)	0.3884 (0.0000)	0.3656 (0.0000)	0.4083 (0.0000)	0.6346 (0.0000)	1.0000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the new value streams and business models construct.

	PBMU1	PBMU2	PBMU3	PBMU4
PBMU1	1.0000			
PBMU2	0.4026 (0.0000)	1.0000		
PBMU3	0.4351 (0.0000)	0.3998 (0.0000)	1.0000	
PBMU4	0.4549 (0.0000)	0.4889 (0.0000)	0.7808 (0.0000)	1.0000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the Digital Ethics construct

	TA1	TA2	TA3	TA4	TA5	TA6	TA7	IPBP 1	IPBP 2	IPBP 3	IPBP 4	PA1	PA2	PA 3	PA4	EPGS 1	EPGS 2	EPGS 3	EPGS 4	EPGS 5	EP G S6
TA 1	1.000 0																				
TA 2	0.398 0(0.0 000)	1.000 0																			
TA 3	0.465 7(0.0 000)	0.570 8(0.0 000)	1.000 0																		
TA 4	0.518 5(0.0 000)	0.549 1(0.0 000)	0.580 9(0.0 000)	1.000 0																	

TA5	0.2692(0.0000)	0.2284(0.0000)	0.2304(0.0000)	0.3156(0.0000)	1.0000																
TA6	0.3962(0.0000)	0.3602(0.0000)	0.3970(0.0000)	0.4830(0.0000)	0.5708(0.0000)	1.0000															
TA7	0.3235(0.0000)	0.3452(0.0000)	0.3706(0.0000)	0.4077(0.0000)	0.5401(0.0000)	0.6732(0.0000)	1.0000														
IPBP1	0.4237(0.0000)	0.3923(0.0000)	0.4190(0.0000)	0.4939(0.0000)	0.5195(0.0000)	0.6321(0.0000)	0.6503 (0.0000)	1.0000													
IPBP2	0.3883(0.0000)	0.3869(0.0000)	0.4040(0.0000)	0.4628(0.0000)	0.5205(0.0000)	0.6310(0.0000)	0.6480 (0.0000)	0.8024(0.0000)	1.0000												
IPBP3	0.3397(0.0000)	0.3750(0.0000)	0.4049(0.0000)	0.4722(0.0000)	0.4788(0.0000)	0.6205(0.0000)	0.6256 (0.0000)	0.7478(0.0000)	0.7277(0.0000)	1.0000											
IPBP4	0.4129(0.0000)	0.4243(0.0000)	0.4177(0.0000)	0.5290(0.0000)	0.5339(0.0000)	0.6238(0.0000)	0.6755 (0.0000)	0.7169(0.0000)	0.7155(0.0000)	0.6637(0.0000)	1.0000										
PA1	0.4123(0.0000)	0.4253(0.0000)	0.4418(0.0000)	0.4979(0.0000)	0.5266(0.0000)	0.6131(0.0000)	0.6326 (0.0000)	0.6904(0.0000)	0.7189(0.0000)	0.6600(0.0000)	0.8185(0.0000)	1.0000									
PA2	0.4075(0.0000)	0.4235(0.0000)	0.4201(0.0000)	0.5215(0.0000)	0.5336(0.0000)	0.6329(0.0000)	0.6369 (0.0000)	0.7011(0.0000)	0.7197(0.0000)	0.6688(0.0000)	0.8667(0.0000)	0.8600(0.0000)	1.0000								
PA3	0.4018(0.0000)	0.4202(0.0000)	0.4293(0.0000)	0.5033(0.0000)	0.5611(0.0000)	0.6129(0.0000)	0.6319 (0.0000)	0.6679(0.0000)	0.6919(0.0000)	0.7511(0.0000)	0.7800(0.0000)	0.7976(0.0000)	0.7893(0.0000)	1.0000							
PA4	0.3465(0.0000)	0.3559(0.0000)	0.3558(0.0000)	0.4105(0.0000)	0.5660(0.0000)	0.6053(0.0000)	0.6601 (0.0000)	0.6643(0.0000)	0.6709(0.0000)	0.6730(0.0000)	0.7482(0.0000)	0.7254(0.0000)	0.7432(0.0000)	0.7468 (0.0000)	1.0000						

EPG S1	0.3592(0.0000)	0.4011(0.0000)	0.3829(0.0000)	0.4684(0.0000)	0.5119(0.0000)	0.6068(0.0000)	0.6466 (0.0000)	0.6484(0.0000)	0.6811(0.0000)	0.6755(0.0000)	0.7171(0.0000)	0.7013(0.0000)	0.7106(0.0000)	0.7332 (0.0000)	0.7718(0.0000)	1.0000				
EPG S2	0.3993(0.0000)	0.3909(0.0000)	0.4054(0.0000)	0.4615(0.0000)	0.5366(0.0000)	0.6401(0.0000)	0.6711(0.0000)	0.6625(0.0000)	0.6937(0.0000)	0.6916(0.0000)	0.7472(0.0000)	0.7133(0.0000)	0.7479(0.0000)	0.7544 (0.0000)	0.7623(0.0000)	0.8419(0.0000)	1.0000			
EPG S3	0.3320(0.0000)	0.3551(0.0000)	0.3739(0.0000)	0.4494(0.0000)	0.4384(0.0000)	0.5674(0.0000)	0.5754 (0.0000)	0.6432(0.0000)	0.6332(0.0000)	0.6318(0.0000)	0.6281(0.0000)	0.6319(0.0000)	0.6661(0.0000)	0.6825 (0.0000)	0.6598(0.0000)	0.6793(0.0000)	0.6930(0.0000)	1.0000		
EPG S4	0.5367(0.0000)	0.4448(0.0000)	0.4544(0.0000)	0.5708(0.0000)	0.3389(0.0000)	0.5022(0.0000)	0.4019 (0.0000)	0.4226(0.0000)	0.4460(0.0000)	0.3803(0.0000)	0.4813(0.0000)	0.5087(0.0000)	0.4990(0.0000)	0.4738 (0.0000)	0.4235(0.0000)	0.4776(0.0000)	0.4471(0.0000)	0.4035(0.0000)	1.0000	
EPG S5	0.4100(0.0000)	0.3405(0.0000)	0.3353(0.0000)	0.4359(0.0000)	0.2420(0.0000)	0.3525(0.0000)	0.3422 (0.0000)	0.3614(0.0000)	0.3607(0.0000)	0.3761(0.0000)	0.3707(0.0000)	0.3663(0.0000)	0.3792(0.0000)	0.4135 (0.0000)	0.3378(0.0000)	0.3891(0.0000)	0.3892(0.0000)	0.3356(0.0000)	0.4534(0.0000)	1.0000
EPG S6	0.4429(0.0000)	0.3495(0.0000)	0.4192(0.0000)	0.4471(0.0000)	0.2476(0.0000)	0.3712(0.0000)	0.3199 (0.0000)	0.3820(0.0000)	0.4269(0.0000)	0.3923(0.0000)	0.4582(0.0000)	0.4352(0.0000)	0.4719(0.0000)	0.4194 (0.0000)	0.4229(0.0000)	0.4535(0.0000)	0.4358(0.0000)	0.4102(0.0000)	0.4401(0.0000)	0.3736(0.0000)	1.00000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the Customer orientation and engagement construct

	CPE1	CPE2	CPE3	UAPT1	DC1	CVF1	CVF2	CVF3	CVF4	CVF5	CVF6
CPE1	1.0000										
CPE2	0.6462 (0.0000)	1.0000									
CPE3	0.6180 (0.0000)	0.8034 (0.0000)	1.0000								
UAPT1	0.6717 (0.0000)	0.5801 (0.0000)	0.6167 (0.0000)	1.0000							
DC1	0.6904 (0.0000)	0.6704 (0.0000)	0.6965 (0.0000)	0.7507 (0.0000)	1.0000						
CVF1	0.6257 (0.0000)	0.5434 (0.0000)	0.5836 (0.0000)	0.6362 (0.0000)	0.6970 (0.0000)	1.0000					
CVF2	0.6312 (0.0000)	0.5476 (0.0000)	0.5951 (0.0000)	0.6672 (0.0000)	0.6976 (0.0000)	0.8646 (0.0000)	1.0000				
CVF3	0.6378(0.0000)	0.5221 (0.0000)	0.5702 (0.0000)	0.6643 (0.0000)	0.6849 (0.0000)	0.8596 (0.0000)	0.9048 (0.0000)	1.0000			
CVF4	0.3234 (0.0000)	0.3743 (0.0000)	0.3629 (0.0000)	0.3094 (0.0000)	0.3822 (0.0000)	0.3396 (0.0000)	0.2988 (0.0000)	0.3161 (0.0000)	1.0000		
CVF5	0.0695 (0.0000)	0.1186 (0.0000)	0.1192 (0.0000)	0.0611 (0.0000)	0.0671 (0.0000)	-0.0283 (0.0000)	-0.1002 (0.0000)	-0.0708 (0.0000)	0.0279 (0.0000)	1.0000	
CVF6	0.2718 (0.0000)	0.2410 (0.0000)	0.2345 (0.0000)	0.2886 (0.0000)	0.3432 (0.0000)	0.3720 (0.0000)	0.4056 (0.0000)	0.3967 (0.0000)	0.2354 (0.0000)	-0.4902 (0.0000)	1.0000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the Digital product innovation construct

	DNPS1	DDPS1	DDPS2	DDPS3	SFPS1	DA1	ACT1
DNPS1	1.0000						
DDPS1	0.6106 (0.0000)	1.0000					
DDPS2	0.3973 (0.0000)	0.3624 (0.0000)	1.0000				
DDPS3	0.2718 (0.0000)	0.2547 (0.0000)	0.3495 (0.0000)	1.0000			

SFPS1	0.4458 (0.0000)	0.3846 (0.0000)	0.4352 (0.0000)	0.3516 (0.0000)	1.0000		
DA1	0.3539 (0.0000)	0.3135 (0.0000)	0.4173 (0.0000)	0.3331 (0.0000)	0.4454 (0.0000)	1.0000	
ACT1	0.4112 (0.0000)	0.3984 (0.0000)	0.3468 (0.0000)	0.2993 (0.0000)	0.3399 (0.0000)	0.3856 (0.0000)	1.0000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the Workforce enablement, and performance construct

	SC1	PM1	PM2	PM3	PM4	PM5	KSE1
SC1	1.0000						
PM1	0.0086 (0.8533)	1.0000					
PM2	-0.0366 (0.4291)	0.8365 (0.0000)	1.0000				
PM3	-0.0472 (0.3073)	0.8529 (0.0000)	0.8195 (0.0000)	1.0000			
PM4	-0.1163 (0.0116)	0.6652 (0.0000)	0.6838 (0.0000)	0.6609 (0.0000)	1.0000		
PM5	0.3620 (0.0000)	-0.1066 (0.0196)	-0.0998 (0.0290)	-0.1154 (0.0115)	-0.1075 (0.0186	1.0000	
KSE1	0.3829 (0.0000)	0.0127 (0.7895)	0.0012 (0.9793)	-0.0281 (0.5554)	-0.0928 (0.0511)	0.4054 (0.0000)	1.0000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the Skills construct

	EDT1	EDT2	EDT3	EDT4	EDT5	LD1	LD2	LD3	LD4	LD5	LD6	LD7	LD8	LD9
EDT1	1.0000													
EDT2	0.7436 (0.0000)	1.0000												
EDT3	0.7610 (0.0000)	0.7653 (0.0000)	1.0000											
EDT4	0.4264 (0.0000)	0.4351 (0.0000)	0.4183 (0.0000)	1.0000										
EDT5	0.3731 (0.0000)	0.5008 (0.0000)	0.4280 (0.0000)	0.3629 (0.0000)	1.0000									
LD1	0.4239 (0.0000)	0.5312 (0.0000)	0.4991 (0.0000)	0.4251 (0.0000)	0.8279 (0.0000)	1.0000								

LD2	0.4855 (0.0000)	0.6238 (0.0000)	0.5424 (0.0000)	0.4215 (0.0000)	0.5953 (0.000)	0.6562 (0.0000)	1.0000							
LD3	0.4835 (0.0000)	0.5875 (0.0000)	0.5056 (0.0000)	0.4485 (0.0000)	0.5581 (0.0000)	0.6187 (0.0000)	0.8165 (0.0000)	1.0000						
LD4	0.4567 (0.0000)	0.5437 (0.0000)	0.4895 (0.0000)	0.4254 (0.0000)	0.5739 (0.0000)	0.6045 (0.0000)	0.6927 (0.0000)	0.7140 (0.0000)	1.0000					
LD5	0.4387 (0.0000)	0.5707 (0.0000)	0.4524 (0.0000)	0.3692 (0.0000)	0.5949 (0.0000)	0.6361 (0.0000)	0.7553 (0.0000)	0.7241 (0.0000)	0.6748 (0.0000)	1.0000				
LD6	0.0498 (0.1771)	-0.0304 (0.5224)	-0.0015 (0.9755)	-0.0133 (0.7795)	0.1251 (0.0000)	0.1442 (0.0000)	0.1720 (0.0000)	0.1726 (0.0000)	0.1560 (0.0000)	0.1564 (0.0000)	1.0000			
LD7	0.0505 (0.1739)	-0.0514 (0.2853)	-0.0847 (0.0787)	0.0050 (0.9165)	0.0896 (0.0151)	0.1331 (0.0000)	0.1568 (0.0000)	0.1687 (0.0000)	0.1161 (0.0000)	0.1771 (0.0000)	0.6515 (0.0000)	1.0000		
LD8	0.0755 (0.0425)	-0.0445 (0.3570)	-0.0768(0.1125)	-0.0351 (0.4675)	0.1254 (0.0000)	0.1549 (0.0000)	0.1560 (0.0000)	0.2085 (0.0000)	0.1281 (0.0000)	0.1123 (0.0000)	0.6308 (0.0000)	0.6967 (0.0000)	1.0000	
LD9	-0.0310 (0.5004)	-0.0673 (0.1634)	-0.0983 (0.0421)	-0.0578 (0.2319)	0.0065 (0.8869)	-0.0288 (0.5306)	-0.0148 (0.7472)	-0.0342 (0.4575)	-0.0185 (0.6883)	-0.0173 (0.7080)	0.4178 (0.0000)	0.5115 (0.0000)	0.4289 (0.0000)	1.0000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the Core processes and Digitalization construct

	UD1	DDPMIa	E1	IDTO1	IDTO2	IDTO3	IDTO4	IDTO5	IDTO6	IDTO7	IDTO8
UD1	1.0000										
DDPMIa	0.5099(0.0000)	1.0000									
E1	0.4354(0.0000)	0.4506(0.0000)	1.0000								
IDTO1	0.4364(0.0000)	0.4846(0.0000)	0.8258(0.0000)	1.0000							
IDTO2	0.4706(0.0000)	0.4736(0.0000)	0.8485(0.0000)	0.8017(0.0000)	1.0000						
IDTO3	0.3207(0.0000)	0.3075(0.0000)	0.4449(0.0000)	0.3907(0.0000)	0.4356(0.0000)	1.0000					
IDTO4	0.3516(0.0000)	0.3320(0.0000)	0.4347(0.0000)	0.3883(0.0000)	0.4439(0.0000)	0.8967(0.0000)	1.0000				
IDTO5	0.5232(0.0000)	0.4622(0.0000)	0.6547(0.0000)	0.6694(0.0000)	0.6884(0.0000)	0.3888(0.0000)	0.4236 (0.0000)	1.0000			
IDTO6	0.4446(0.0000)	0.4649(0.0000)	0.6108(0.0000)	0.6403(0.0000)	0.6779(0.0000)	0.3249(0.0000)	0.3508 (0.0000)	0.8051(0.0000)	1.0000		
IDTO7	0.4124(0.0000)	0.4143(0.0000)	0.4558(0.0000)	0.4206(0.0000)	0.4666(0.0000)	0.7830(0.0000)	0.7924 (0.0000)	0.5556(0.0000)	0.4990(0.0000)	1.0000	
IDTO8	0.3549(0.0000)	0.3714(0.0000)	0.5444(0.0000)	0.5565(0.0000)	0.5754(0.0000)	0.3688(0.0000)	0.3732(0.0000)	0.4408(0.0000)	0.4441(0.0000)	0.3864(0.0000)	1.0000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the IT/IS Excellence construct.

	ITBA1	ITBA2	ITBA3	ITBA4	EA1	ESI1	ITI1	ITI2	ITI3	ITOP1	ITOP2	ITOP3	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
ITBA1	1.0000																					
ITBA2	0.8790(0.0000)	1.0000																				
ITBA3	0.8891(0.0000)	0.9208(0.0000)	1.0000																			
ITBA4	0.5088(0.0000)	0.4920(0.0000)	0.5093(0.0000)	1.0000																		
EA1	0.5174(0.0000)	0.4947(0.0000)	0.5305(0.0000)	0.6514(0.0000)	1.0000																	
ESI1	0.5080(0.0000)	0.4956(0.0000)	0.4847(0.0000)	0.5460(0.0000)	0.4344(0.0000)	1.0000																
ITI1	0.6065(0.0000)	0.5944(0.0000)	0.5898(0.0000)	0.5961(0.0000)	0.5519(0.0000)	0.7661(0.0000)	1.0000															
ITI2	0.6350(0.0000)	0.6122(0.0000)	0.6067(0.0000)	0.5757(0.0000)	0.5415(0.0000)	0.7236(0.0000)	0.8536 (0.0000)	1.0000														
ITI3	0.6341(0.0000)	0.5920(0.0000)	0.5769(0.0000)	0.4904(0.0000)	0.4050(0.0000)	0.5684(0.0000)	0.6221 (0.0000)	0.6423(0.0000)	1.0000													
ITOP1	0.6963(0.0000)	0.6769(0.0000)	0.6439(0.0000)	0.5108(0.0000)	0.4178(0.0000)	0.5878(0.0000)	0.6542 (0.0000)	0.6565(0.0000)	0.8679(0.0000)	1.0000												

ITOP2	0.7000(0.000)	0.6597(0.000)	0.6288(0.000)	0.4758(0.000)	0.4269(0.000)	0.5482(0.000)	0.6385(0.0000)	0.6735(0.000)	0.8621(0.000)	0.8968(0.000)	1.0000											
ITOP3	0.5940(0.000)	0.5993(0.000)	0.5657(0.000)	0.4263(0.000)	0.4919(0.000)	0.5427(0.000)	0.5785(0.0000)	0.6188(0.000)	0.4500(0.000)	0.5235(0.000)	0.5286(0.000)	1.0000										
C1	0.5928(0.000)	0.5915(0.000)	0.5928(0.000)	0.4453(0.000)	0.4939(0.000)	0.5211(0.000)	0.5909(0.0000)	0.6064(0.000)	0.4651(0.000)	0.5433(0.000)	0.5306(0.000)	0.8437(0.000)	1.0000									
C2	0.5299(0.000)	0.5197(0.000)	0.5272(0.000)	0.3715(0.000)	0.4440(0.000)	0.4602(0.000)	0.5271(0.0000)	0.5415(0.000)	0.3966(0.000)	0.4192(0.000)	0.4668(0.000)	0.7661(0.000)	0.7943(0.000)	1.0000								
C3	0.5684(0.000)	0.5629(0.000)	0.5361(0.000)	0.3669(0.000)	0.4489(0.000)	0.4808(0.000)	0.5560(0.0000)	0.5852(0.000)	0.4317(0.000)	0.4688(0.000)	0.4936(0.000)	0.8576(0.000)	0.8023(0.000)	0.81755(0.0000)	1.0000							
C4	0.6066(0.000)	0.6035(0.000)	0.5663(0.000)	0.3758(0.000)	0.4747(0.000)	0.5336(0.000)	0.5674(0.0000)	0.5951(0.000)	0.4401(0.000)	0.4926(0.000)	0.4855(0.000)	0.8001(0.000)	0.7741(0.000)	0.75622(0.0000)	0.8577(0.000)	1.0000						
C5	0.5685(0.000)	0.5618(0.000)	0.5441(0.000)	0.3618(0.000)	0.4522(0.000)	0.5097(0.000)	0.5505(0.0000)	0.5571(0.000)	0.4150(0.000)	0.4370(0.000)	0.4508(0.000)	0.7621(0.000)	0.7141(0.000)	0.73233(0.0000)	0.8131(0.000)	0.8545(0.000)	1.0000					
C6	0.5924(0.000)	0.6008(0.000)	0.5618(0.000)	0.3776(0.000)	0.4342(0.000)	0.4852(0.000)	0.5669(0.0000)	0.5931(0.000)	0.4502(0.000)	0.4936(0.000)	0.5182(0.000)	0.7970(0.000)	0.7718(0.000)	0.78100(0.0000)	0.8737(0.000)	0.8391(0.000)	0.8122(0.000)	1.0000				
C7	0.6339(0.000)	0.6359(0.000)	0.6095(0.000)	0.4136(0.000)	0.4353(0.000)	0.4836(0.000)	0.5798(0.0000)	0.5799(0.000)	0.4472(0.000)	0.4909(0.000)	0.4906(0.000)	0.7545(0.000)	0.7366(0.000)	0.7283(0.	0.8024(0.000)	0.8013(0.000)	0.7953(0.000)	0.8448(0.000)	1.0000			

														0000)							
C8	0.5994(0.0000)	0.6047(0.0000)	0.5662(0.0000)	0.3652(0.0000)	0.4343(0.0000)	0.4860(0.0000)	0.5283(0.0000)	0.5631(0.0000)	0.4329(0.0000)	0.4740(0.0000)	0.5004(0.0000)	0.7636(0.0000)	0.7369(0.0000)	0.7287(0.0000)	0.8323(0.0000)	0.8445(0.0000)	0.8380(0.0000)	0.8314(0.0000)	0.8465(0.0000)	1.0000		
C9	0.6018(0.0000)	0.5912(0.0000)	0.5774(0.0000)	0.3644(0.0000)	0.4619(0.0000)	0.4552(0.0000)	0.4888(0.0000)	0.5145(0.0000)	0.4163(0.0000)	0.4588(0.0000)	0.4704(0.0000)	0.7690(0.0000)	0.7253(0.0000)	0.7018(0.0000)	0.8056(0.0000)	0.8366(0.0000)	0.8186(0.0000)	0.7986(0.0000)	0.8245(0.0000)	0.8842(0.0000)	1.0000	
C10	0.4253(0.0000)	0.4088(0.0000)	0.4181(0.0000)	0.4516(0.0000)	0.4140(0.0000)	0.4710(0.0000)	0.4902(0.0000)	0.4374(0.0000)	0.4314(0.0000)	0.4776(0.0000)	0.4368(0.0000)	0.3968(0.0000)	0.3848(0.0000)	0.3516(0.0000)	0.3647(0.0000)	0.4262(0.0000)	0.3662(0.0000)	0.3868(0.0000)	0.4183(0.0000)	0.4251(0.0000)	0.3997(0.0000)	1.00000

Source: Stata output using the survey dataset

Correlation matrix for the factor variable under the Business Results construct.

	DIGVD1	FPI1	LBE1	LBE2
DIGVD1	1.0000			
FPI1	0.6278(0.0000)	1.0000		
LBE1	0.5634(0.0000)	0.7569(0.0000)	1.0000	
LBE2	0.5373(0.0000)	0.6980(0.0000)	0.7710(0.0000)	1.0000

Source: Stata output using the survey data

APPENDIX (I): Constructs shortened names SEM.

Latent Variables	Shortened name
Leadership: Vision & Strategy	Leadership
Culture	Culture
Organization and Governance	Organisazition_governance
Investment and Innovation Architecture	investment_innovation
Digital ethics	Digital_Ethics
New value streams and business models	NVS_business_models
Skills	Skills
IT/IS Excellence	IT_IS_excellence
Customer Orientation and Engagement	Customer_orientation_e
Digital Product innovation	Digital_product_inn
Workforce Enablement and Performance	Workforce_e_p
Core Process Digitalization	Core_process_D
Business Results	Business_results

APPENDIX (J): Overall Fit model

Hypothesis	Model	Root mean squared error of approximation	Comparative fit index	Tucker-Lewis's index	p chi2p-value
1	Culture	0.016	0.913	0.8826	0.000
2	Leadership	0.002	0.925	0.8859	0.000
3	Digital_Ethics	0.000	0.889	0.8846	0.000
4	Organisazition_governance	0.005	0.845	0.8787	0.000
5	Digital_Ethics	0.0221	0.907	0.8779	0.000
6	Organisazition_governance	0.000	0.964	0.8955	0.000
7	Organisazition_governance	0.000	0.899	0.8816	0.000
8	Digital_Ethics	0.0148	0.854	0.9021	0.000
9	investment_innovation	0.020	0.813	0.8990	0.000
10	investment_innovation	0.000	0.895	0.9097	0.000
11	Organisazition_governance	0.000	0.891	0.9114	0.000
12	IT_IS_excellence	0.000	0.956	0.9100	0.000
13	skills	0.0093	0.813	0.9091	0.000
14	IT_IS_excellence	0.04496	0.9031	0.9050	0.000
15	IT_IS_excellence	0.03932	0.9093	0.9060	0.000
16	NVS_business_models	0.04857	0.9092	0.9051	0.000
17	NVS_business_models	0.05292	0.8989	0.9057	0.000
18	NVS_business_models	0.06558	0.8927	0.9279	0.000
19	Customer_orientation_e	0.05988	0.8943	0.9294	0.000
20	Customer_orientation_e	0.06603	0.8968	0.9203	0.000
21	Customer_orientation_e	0.04359	0.8996	0.9667	0.000
22	Digital_product_inn	0.04781	0.8987	0.9668	0.000
23	Digital_product_inn	0.05528	0.8988	0.9670	0.000
24	Digital_product_inn	0.05698	0.8972	0.9688	0.000
25	Digital_product_inn	0.03805	0.9082	0.9687	0.000
26	Workforce_e_p	0.3856	0.8722	0.9680	0.047
27	Workforce_e_p	0.6229	0.8699	0.9671	0.048
28	Workforce_e_p	0.6835	0.8537	0.9670	0.054
29	Core_process_D	0.04496	0.8583	0.9680	0.000
30	Core_process_D	0.03932	0.8580	0.9675	0.000
31	Core_process_D	0.04857	0.8618	0.9675	0.000
32	Core_process_D	0.05292	0.8489	0.9666	0.000
33	Workforce_e_p	0.6558	0.8525	0.9667	0.073
34	Digital_product_inn	0.05988	0.8522	0.9672	0.000
35	Customer_orientation_e	0.06603	0.8595	0.9666	0.000
36	NVS_business_models	0.04359	0.8734	0.9665	0.000
37	Business_results	0.04781	0.8586	0.9669	0.000
38	Business_results	0.05528	0.8567	0.9666	0.000
39	Business_results	0.4627	0.5576	0.4666	0.258
40	Business_results	0.03306	0.8685	0.9667	0.000
41	Business_results	0.03574	0.8972	0.9668	0.000
42	Business_results	0.03842	0.9082	0.9696	0.000

Source: Stata output using the survey dataset