The potential impact of digital transformation adoption on customer experience and customer value in the South African mobile telecommunications sector

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ABSTRACT

This research study investigated the impact of the adoption of digital transformation by customers of South African mobile network operators (MNOs) on their perceived customer experience and customer value. Prior studies qualitatively investigate the maturity of digital transformation in South African entities yet there is limited insight on the measurable impact of digital transformation, particularly from the consumer-facing perspective. The study adopted a quantitative, positivist, and deductive approach, using an online survey to collect data from 181 respondents who use mobile connectivity services from South African MNOs and MVNOs. The study adapted the *Diffusion of Innovations* theory as the theoretical framework and tested four hypotheses using regression analysis and confirmatory factor analysis. The results showed that the adoption of digital transformation, measured by the relative advantage characteristic from the theory, had a positive impact on both customer experience and customer value. The results also indicated that digital transformation had a positive impact on digital literacy, yet digital literacy did not have a mediating effect on the relationship between digital transformation adoption and customer experience, nor on digital transformation and customer value. The study contributed to the academic knowledge on digital transformation in South Africa, particularly in the consumer-focused telecommunications industry, and provided practical implications for telecommunications practitioners on how to leverage digital transformation initiatives to enhance customer experience and customer value in the South African market. Recommendations for future studies included studying a broader sample of the South African market, adopting a mixed-method approach to obtain rich customer sentiment insights and increasing focus on studying the effects of digital literacy.

KEYWORDS

Customer experience; Customer value; Customer lifetime value; Digital literacy; Digital transformation; Telecommunications

DECLARATION

I, Nadine Sigamoney, 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 Business Administration at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university. I further declare that I have obtained the necessary consent and authorisation to conduct this research.

Nadine Sigamoney

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Johannesburg

DEDICATION

Firstly, I would like to thank God for the spiritual strength and divine guidance imparted on me throughout this MBA journey.

This thesis is dedicated to my parents, Ms. R Singh and Mr. M Sigamoney, who instilled and encouraged a deep pursuit of knowledge and education in me from my childhood years, and to my sisters, Samantha and Shanelle, for their continuous motivation and encouragement. Finally, to my partner Bhupesh, for his unwavering support during the many highs and lows of this journey.

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LIST OF ACRONYMS AND ABBREVIATIONS

4IR	Fourth Industrial Revolution
5G	Fifth generation mobile technology
5IR	Fifth Industrial Revolution
AI	Artificial Intelligence
ANOVA	Analysis of variance
B2C	Business to customer
CEX	Customer experience
CLV	Customer lifetime value
CV	Customer value
DT	Digital transformation
Gb	Gigabyte
GSMA	Global System for Mobile Communications Association
ICT	Information and communications technology
ITU	International Telecommunications Union
IoT	Internet of things
ML	Machine learning
MNO	Mobile network operator
MVNO	Mobile virtual network operator
NPS	Net Promoter Score

R	South African Rand
SA	South Africa
SDG	Sustainable Development Goal
SIM	Subscriber Identity Module
SMS	Short Message Service
SPSS	Statistical Package for Social Sciences
Telco	Telecommunications

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

CHAPTER 1. INTRODUCTION

1.1 Purpose of the study

This study investigated the impact of the adoption of digital transformation (DT) by South African mobile network operator customers on the perceived customer experience (CEX) and customer value (CV) of South African telecommunications customers. Prior studies qualitatively investigated the maturity of digital transformation in South Africa (Moodley, 2019; Musaigwa & Mutula, 2022; Pretorius, 2016; Venkatesan, 2020; Stofile, 2022) yet there was limited insight on the measurable impact of digital transformation. This study intended to contribute to the academic knowledge on DT in South Africa, particulary in the consumer-focused telecommunications industry.

1.2 Background and context of the study

1.2.1 *Digital transformation and the Fourth Industrial Revolution*

The concept of DT is not new in the corporate world, tracing as far back as the 1970s when computer-aided design and manufacturing was initiated (Phung, 2022). In more recent times DT is a concept and term positioned in the lexicon of the Fourth Industrial Revolution (4IR) and the Fifth Industrial Revolution (5IR), associated with the journey of applying disruptive emerging technologies to optimise and create value (Zhang, Jin, & Li, 2023). While there are many accepted definitions of DT (Mergel et al., 2019), this study focuses on the definition proposed by Gong and Ribiere (2021):

> “A fundamental change process, enabled by the innovative use of digital technologies accompanied by the strategic leverage of key resources and capabilities, aiming to radically improve an entity and redefine its value proposition for its stakeholders.” (p12)

DT can be further explained as a holistic and continuous effort to revise core business processes, products, and services from analogue to digital which can drive a complete transformation of business model, driving new forms of service delivery, new products and services and increased customer satisfaction (Kampa, et al., 2023; Mergel, Edelmann, & Haug, 2019; Moodley, 2019; Pretorius, 2016).

The Fourth Industrial Revolution (4IR) has brought the onset of disruptive technologies such as artificial intelligence (AI), machine learning (ML), Internet of Things (IoT) and blockchain (Miguel, De-Pablos-Heredero, Montes, & García, 2022) which businesses across industries are compelled to incorporate to sustain competitive advantage (Yildiz, 2019). While the importance of digital technologies were emphasised during the COVID-19 pandemic, the focus has shifted to the long-term importance of these technologies in the Information and communications technology (ICT) sector with the ITU identifying ICT as a critical enabler to achieve the Sustainable Development Goals (SDGs) of 2030 (ITU, 2023). Considering that internet connectivity in ICT, in all its various modes and forms, is the base of emerging technologies and hence critical for DT, the telecommunications industry is a critical industry to drive DT (Yildiz, 2019).

1.2.2 *Digital transformation in the telecommunications industry*

The South African (SA) mobile telecommunications (telco) industry is facing increasing competition in an industry space where platform businesses such as Uber and Netflix are redefining customer expectations, OTTs (Over-the-Top) like Facebook and X (previously Twitter) are capitalising on telco customer relationships, customer spending is constrained and where connectivity infrastructure is subjected to vandalism and loadshedding (Kampa, et al., 2023; Morgan & Govender, 2017; Pretorius, 2016; Yildiz, 2019). There is also a decline in revenue and margins from traditional connectivity services (voice and data) as these increasingly become commoditised with the rise of higher generation technologies and network coverage (Kampa, et al., 2023; Maidment, 2016). Given these industry trends, telco operators are prompted to explore new ways of sustaining competitive advantage. McKinsey has identified customer experience (CEX) as the key differentiator, through which

incumbent telcos can rise to changing customer expectations in tough competitive conditions (Kampa, et al., 2023). Improving CEX is a common use of digital technologies and the application thereof through DT. Increasing the quality of customer engagement and interaction through personalisation over digital channels (social media, mobile applications, chat) can help telcos remain close with their customers, with the added benefit of increasing share of wallet and thus customer value (Venkatesan, 2020).

1.2.3 *The South African mobile telecommunications industry*

The SA mobile telco market is a unique and dynamic emerging market environment, with 118 million mobile connections where 47 million unique mobile subscribers have an average of 2.52 registered SIMs or connections each (GSMA Intelligence, 2023). The multi-sim environment is characterised with a dominance of prepaid subscribers (80% of the base) over postpaid subscribers (20%), and a moderate smartphone penetration (70%) versus basic feature phones without broadband-enabled capabilities (30%) (GSMA Intelligence, 2023). The subscriber base is forecasted to grow at a modest growth rate of 2% from 2023 to 55 million by 2030, with a signficant increase of 5G penetration from 4% to 43%, indicating that more customers will be making use of high internet speeds and capacity from the more advanced technology (GSMA Intelligence, 2023). The multi-sim nature of SA mobile customers can be an indication of low loyalty to a single MNO, where customers are registered with multiple MNOs to capitalise on deals and network coverage, especially during turbulent times of load-shedding. This presents a further challenge for telcos to drive customer experience and loyalty.

The Global System for Mobile Communications Association (GSMA), a global body representing the interests of MNOs across markets, has identified that poor digital literacy (DL) skills is a key barrier to internet adoption, particularly in emerging markets (GSMA, 2021). South Africa is no exception, with an infamous reputation for being one of the most unequal societies in the world (Mlaba, 2021), associated with a digital divide impacting telco customers partially due to a gap in digital literacy and skills

(Moleko, 2022). The COVID-19 pandemic also confirmed the prevalence of a digital divide in South Africa, when schools were forced to move to digital channels for continuance during lockdown, with a 16%-point gap between learners being able to access the digital content in private schools versus public schools (Hanekom, 2020). Outside of the education context, the digital literacy challenge and digital divide is exacerbated with the contrast in internet access penetration across the provinces of South Africa. The General Household from StatsSA indicated that household internet access penetration was the highest in Gauteng and Western Cape at 85.2% and 80.9% respectively, while Limpopo and the Eastern Cape were the lowest with 58.4% and 61.2% respectively (Statistics South Africa, 2020).

Across all provinces, the mobile telco subscriber base is primarily shared by four major mobile network operators in SA, which own and operate the infrastructure to service customers' mobile connectivity needs. The remaining market share is attributed to mobile virtual network operators (MVNOs), operators which do not own spectrum licences or network infrastructure but provide connectivity services under a white-label solution while renting capacity from a licenced MNO (Illidge, 2023). MVNOs in SA include the following: FNB Connect; Mr Price Mobile; PnP Mobile; Standard Bank Mobile; AfriHost Air Mobile (Illidge, 2023). The current market share split in terms of mobile connections is depicted in Figure 1-1.

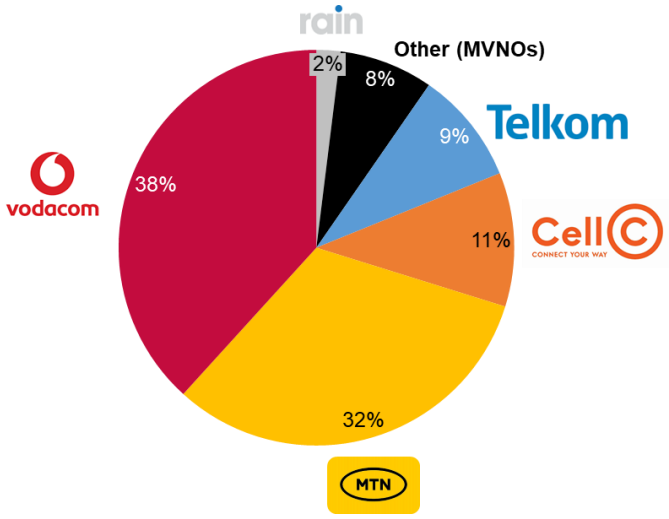

Figure 1-1: Market share of MNOs in SA (GSMA Intelligence, 2023)

1.3 Research problem

DT has become a popular topic for research across industries and geographies in recent years (Awadhi et al., 2021; Boston Consulting Group, 2021; Deloitte, 2022; Gong & Ribiere, 2021; Huseynli, 2022; ITU, 2023; Matarazzo, et al. (2021); Musaigwa & Mutula, 2022; Phung, 2022; Wiemker, 2015). For the telecommunications sector in particular, a sector synonymous with the application of technology and rich customer relationships supported by vast amounts of data, there is limited insight into the impact of DT. Studies from professional services firms including Deloitte and Boston Consulting Group offer insights, however these are almost exclusive to developed markets, where operating conditions and customer environments are different to the South African context. There have been further calls to study the impact of DT in the South African market by Moodley (2019) and Musaigwa and Mutula (2022), with qualitative case study research methods in the insurance sector offering a first insight into the topic. However, there is a need for more knowledge on the quantitative impact of DT in the South African context to accredit previous quantitative studies and help inform telecommunications practitioners on how to direct investment and business resources.

The way customers interact with organisations are evolving with the onset of emerging technologies and DT. Customers are becoming more empowered with the growth of DT and expect personalised and seamless customer experiences on their digital channel of choice (Shrivastava, 2017). Telecommunications providers have had to endure disruptions on their ability to serve customers from OTTs like Facebook, X and Netflix. Telco providers have since been forced to adapt their ability to serve consumers, often as a knee-jerk reaction. There is a need to link these reactions to business and customer impact to enable improved and informed decision-making for telco providers. For the B2C (business to customer) telco provider, the primary source of DT for consumer impact is contextualised across customer touchpoints, channels, and products. A key barrier to consumers adopting digital technologies, however, could be low digital literacy (Burzynska et al., 2023; GSMA, 2021; Kabakus, et al., 2023; Moleko, 2022).

The research problem is therefore that the impact of the adoption of digital transformation by South African MNO customers on customer experience and customer value, is mostly unknown. The impact of digital literacy on the relationship between DT and CEX, and CV is also unknown.

1.4 Research questions

Given the context and purpose of the study, the primary research question which guided this research was: ***What is the impact of digital transformation adoption on customer experience and customer value in the South African mobile telecommunications industry?***

The following secondary questions shall further guide this study:

I. What is the impact of DT adoption in the SA mobile telco industry on CEX?
II. What is the impact of DT adoption in the SA mobile telco industry on CV?
III. What is the effect of DL on the relationship between DT adoption in the SA mobile telco industry and CEX?
IV. What is the effect of DL on the relationship between DT adoption in the SA mobile telco industry and CV?

The research questions aimed to establish whether there is a causal relationship between DT, CEX and CV; and aimed to determine whether the relationship is positive or negative. The research questions also aimed to understand the indirect or direct influence of DL on the relationships between DT and CEX, and DT and CV.

1.5 Significance of the study

The research sought to inform telecommunications practitioners on the causal relationship between the adoption of DT and CEX and CV in the South African telco market, which are importantly linked to driving business value and competitive advantage in the telco industry. The research also aimed to increase insight on consumer behaviour and how

they adopt DT practices (channels, products, technology and services) from their service providers considering their DL levels, and how MNOs can potentially use these to improve the level of service.

1.6 Delimitations

This study covered the mobile telecommunications industry in South Africa by targeting customers who use connectivity services from South African MNOs and MVNOs. The scope of this study excluded fixed-line operators and networks, where the nature of customer relationship and services provided vary to that of mobile connectivity operators. This study excluded business or enterprise customers. This study excluded adjacent financial technology and insurance technology sectors which ride on telecommunications networks e.g., mobile money. This study excluded people in South Africa who have international SIM cards and who are roaming internationally.

1.7 Definition of terms for this study

Customer experience (CEX): “A customer’s perception of the entire quality of all encounters and connections with a business and its goods and services.” (Huseynli, 2022)

Customer Lifetime Value (CLV) or Customer value (CV): A prediction of the total customer value, often in terms of net profit, generated by a customer across the entire customer life cycle and tenure (Kampa, et al., 2023; Sterne, 2023).

Digital Literacy (DL): A base-level understanding and awareness of how to use, navigate and adopt digital and internet-based technologies via electronic devices to access information and reap the benefits of a connected life (GSMA, 2021).

Digital transformation (DT): A change process amongst consumers as they adopt digital channels, products, devices and behaviour enabled by digital technologies (Gong & Ribiere, 2021; Shrivastava, 2017).

Mobile network operator (MNO): Licensed connectivity operators which own and operate the infrastructure and equipment to service customers' mobile connectivity needs end-to-end (GSMA Intelligence, 2023).

Mobile virtual network operator (MVNO): Operators which do not own spectrum licences or network infrastructure but provide connectivity services under a white-label solution while renting capacity from a licenced MNO (Illidge, 2023).

1.8 Assumptions

It is assumed that:

- Respondents answered the survey questions honestly and to the best of their ability.
- Respondents have been subscribed to a South African MNO or MVNO for a period long enough to offer informed responses.

1.9 Chapter Outline

The remaining content of this research report is structured as follows. Chapter two includes a critical review of literature which provides the rationale behind the research gaps motivating the study, and presents the hypotheses linked to the applicable conceptual framework. The literature review also considered the delimitations of the study, ensuring the literature presented was relevant and focused to the research problem. Chapter 3 presents the research methodology and framework. Chapter 4 presents the results of the study, including the data analysis conducted and hypothesis testing. Chapter 5 is a discussion of the results, with Chapter 6 ending the report presenting conclusions and recommendations.

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

The literature review focused on a systematic review of previous academic and research work on DT and the impact of CEX and CV. The knowledge of the research topic in the South African telecommunications sector was found to be minimal and scarce from the materials reviewed. Numerous research covers the business impact of DT and select research touches on CEX however, the work has limitations from a geographical point of view, where only large organisations in the Global North are sampled, or the study focuses on determining contributing factors, attempting to answer the "how" and "why" questions behind DT while leaving a gap on the "what" behind the impact of DT (Awadhi et al., 2021; Boston Consulting Group, 2021; Deloitte, 2022; Matarazzo, et al. (2021; Musaigwa & Mutula, 2022; Wiemker, 2015). The literature review was structured first to clarify the definition of the research topic, explaining the relevant concepts, followed by an empirical review of related works in literature discussing each of the research questions posed, which ultimately attempted to answer the primary research question of: ***What is the impact of digital transformation on customer experience and customer value in the South African mobile telecommunications industry?***

The systematic literature review critically evaluated the application of existing theories and outlined the research gaps that motivated this study.

2.2 Definition of topic

2.2.1 *Digital transformation*

Digital transformation is a concept that can be lost in the hubris of corporate jargon if not used intentionally and supported with practical initiatives. Digitisation and

digitalisation are often used interchangeably with DT, yet it is important to note the nuances (Pretorius, 2016). Digitisation covers converting analogue data to binary form, digital information of zeroes and ones, to enable data processing by digital machines (computers). Digitalisation expands on digitisation, from the conversion of data to the process of converting data and other elements, from physical media to digital media and communication modes (Awadhi et al., 2021). These first two definitions contributed to the initial understanding of the DT concept in this study. These could be related to why DT was first understood as changing internal business elements to generate cost savings and process efficiencies (Matarazzo, Penco, Profumo, & Quaglia, 2021). As the onset of digital technologies, such as big data, artificial intelligence, machine learning, robotic process automation and blockchain, became more prevalent in industry, companies paid more attention to how digital transformation impacted value creation, their business models, and their relationship with their customers. After a rigorous scientific review of 134 published distinguishable definitions of DT, Gong and Ribiere (2021) proposed the following definition:

> A fundamental change process, enabled by the innovative use of digital technologies accompanied by the strategic leverage of key resources and capabilities, aiming to radically improve an entity and redefine its value proposition for its stakeholders.” (p12)

The above definition further defined an entity as an “organisation, business network, industry, or society.” This definition is understood as the understanding of DT for the purposes of this study focused on the consumer-facing elements on the demand-side, rather than the internal business supply-side, which would relate to the innovative use of digital technologies by consumers. In the telco context, this would refer to customers’ adoption of digital channels, products, devices, and behaviour enabled via digital technologies (Shrivastava, 2017). Musaigwa and Mutula (2022) distinguished DT strategy from digital and business strategy, not just as the overlap between the two, but also the change process required to achieve the overlap. Huseynli (2022) effectively links the concept of digital transformation to generating value and competitive advantage.

2.2.2 *Customer experience*

Like DT, the understanding of CEX has also evolved from the initial understanding and business capability of customer service (Awadhi et al., 2021). Where customer service generally refers to a company's ability to deliver customer value during a single point in time, or a single transaction, the definition of CEX is expanded to the holistic, longer-term relationship of a customer with the company, consisting of all touchpoints and interactions over time (McKinsey & Company, 2022). The definition of CEX expands includes the holistic business, where all employees have a responsibility and impact on deepening the connection with customers (Siggelkow & Terwiesch, 2023). Huseynli (2022) indicated that there is still an ongoing debate on the concept of CEX and proposed a widely accepted definition where CEX is a "customer's perception of the entire quality of all encounters and connections with a business and its goods and services."

2.2.3 *Customer value*

Understanding the impact of DT on customer value relates to understanding the impact on select measures: customer lifetime value; new revenue generated; costs saved (Sterne, 2023). This will encompass the perceived income generated from a customer over their tenure with a company i.e., customer lifetime value, and potentially cover new revenue generated from new products and services because of DT and the potential costs saved from improving on processes to serve a customer via DT. The Customer Lifetime Value (CLV) can hence be defined as a prediction of the total customer value, often in terms of net profit, generated by a customer across the entire customer life cycle (Kampa et al., 2023; Sterne, 2023). For this study, CLV is referred to going forward as customer value or CV.

2.3 Empirical literature review

This section reviewed existing literature to establish the current accepted understanding of the related terms of the research question and outline the research gaps. The findings from the literature review sought to shape the research methodology and approach to answer the primary research question: ***What is the impact of digital transformation on customer experience and customer value in the South African mobile telecommunications industry?***

2.3.1 *The extent of digital transformation in the SA mobile telco sector*

Before presenting the hypotheses of the study to answer the research questions, the extent of DT in the context of this study i.e., the South African telecommunications sector, is a key theme which was explored.

Musaigwa and Mutula's 2022 study of the impact of DT in the South African insurance sector utilised a single case study of an insurance entity in Gauteng, coupled with *resource-based view theory* to understand how DT affects strategy. The study concluded that the entity had initiated DT projects but was not doing enough in the context of South Africa's slow adoption of digital technologies (Musaigwa & Mutula, 2022). The application of *resource-based view theory* in the study was partially relevant to this study, where adopting digital technologies to serve the customer better was considered as a key capability to investigate. Another research venture by Moodley (2019) studied DT in South Africa's short-term insurance sector, interviewing eight respondents from four entities. The study concluded that there was a vast opportunity for players in the insurance sector to leverage "insurtech" as a digitally transformed offering, implying that current adoption is insufficient (Moodley, 2019). Both the above-mentioned studies were focused in terms of sector, with small sampling sizes inhibiting the generalisation of the findings. The studies were also qualitative, offering limited substantiation to the claims of the impact of DT. Moodley (2019) also pointedly mentioned the limited academic research available on the South African insurance sector and South Africa in general.

Other existing works on DT reviewed included research on the state of DT in telecommunications, yet the respondents in the study were exclusive of Africa and similar emerging market economies (BCG, 2021; Deloitte, 2020; Deloitte, 2022). Deloitte's Digital Disruption Index – South Africa (2020), which included responses from 85 senior South African business leaders provided insights on the maturity of DT in SA, but without the lens of industry and measures of DT impact. From the various works covered, the research gap on the extent of DT across consumer-facing elements was evident. In addition, the general extent of DT in South Africa was also a research gap identified, inferring the research gap of DT in the telecommunications sector and hence contributing to the justification for this study.

2.3.2 *Hypothesis 1: The adoption of DT has a positive impact on CEX*

The first hypothesis presented relates to the first secondary research question: ***What is the impact of DT adoption in the SA mobile telco industry on CEX?***

With rapid growth and digital disruption from various OTTs, customer behaviour has also evolved (Purdy, 2023). Customers in the telecommunications sector, growing accustomed to engaging with OTTs, also lean more towards an intensified service experience, which is personalised, seamless and pervasive (Purdy, 2023; Sahu et al., 2018). Multiple digital technologies enabled by 4IR have also triggered a change in customer behaviour and expectations, where humans expect real-time, interactive, and customised engagement over new digital channels which require relatively lower effort to interact with (Matarazzo, et. al., 2021). Ericsson's study of how DT is redefining CEX in communications services providers (Shrivastava, 2017) offers an effective categorisation of the impact of DT on CEX across the following four customer elements:

- **Digital technologies**:
    - There is a shift to using digital technologies such as machine learning and virtual/augmented reality to better serve customers enabling personalisation and improving an operator's ability to predict or influence customers' communication needs.

- **Digital devices:**
    - Transforming a customer's world to a digital world implies that customers need digital devices to gain access to this world. The number of digital devices in a customer's arsenal can grow without a limit from laptops, smartphones, wearables, to sensors across operating systems, with customers expecting a consistent experience regardless of operating system and physical location.
- **Digital channels:**
    - Digital disruptors like Netflix, Amazon and Uber, have empowered customers to transact and engage from the smartphone on their fingertips, with the ability to receive a real-time response from providers. Similarly, telco customers preferences shift from traditional channels, such as the voice-enabled call centre and retail stores, to multiple digital channels of their choice. DT prompts the customer expectation for personalised and uniform engagement from their telco provider across digital channels which include web, mobile app, social media channels and the use of chatbots. Customers have a need for self-service and have the growing expectation to transact and interact from whichever platform they choose, which prompts telco providers to interface with adjacent third-party apps like banking apps.
- **Digital customer behaviour:**
    - Customer behaviour is evolving at a rapid pace with the onset of digital disruptors, irrespective of a customer's digital maturity. Expectations of customers are continually increasing, thereby increasing the complexity of a telco service provider to serve effectively. Customers expect seamless, engaging, and easy interactions, and telco providers are forced to compete with increasingly crowded digital real estate for customer attention.

Shrivastava's industry specific study in 2017 further explores the potential positive impact of DT on CEX measures. Firstly, telco providers can improve their primary measure of customer satisfaction, the Net Promoter Score (NPS = percentage of

promoters minus percentage of detractors). In relation, customer loyalty can thus improve if a customer's experience is improved to align to the changing aspects of the four elements above (technologies, devices, channels, behaviour). An improved NPS can also improve customer retention through a more digitally engaged experience. While Shrivastava's conclusions are compelling, the study fails to provide evidence of such impact. Another research gap identified was that the study treated the telecommunications sector as homogenous, failing to account for the differing dynamics across developed markets and emerging economies, such as the case with South Africa which this study investigated.

Diverging from the telco industry, Matarazzo et al. (2021) investigated how four Italian SMEs used digital technologies to improve customer value experience with *dynamic capabilities theory*. The rationale behind using *dynamic capabilities theory* provided was that there exists a literature gap in how business capabilities affect the adoption of digital technologies, despite the theory being well-recognised as a mechanism to manage change in a rapidly changing environment, such as with DT (Matarazzo, et. al., 2021). From a proposed set of four dynamic capabilities, the study identified "sensing" and "learning" as the priority capabilities for Italian SMEs to digitally transform and improve customer value through which SMEs apply DT to strengthen their customer relationships through digital touchpoints and channels. While the findings support the second hypothesis of this study, the Italian SME study focuses on "how" entities re-organise themselves internally to respond to triggers of DT via *dynamic capabilities theory*. The aim of this study was to investigate the impact of DT and answer the "what" question to support the "how." The Italian SME study was a first step to understanding the topic, and more case studies were recommended by including SMEs accounting for the varying geographical regions of Italy. This literature offered a unique view on the specific *dynamic capabilities theory* however is not extensive enough to transfer to this study on South African telecommunications operators (non-SMEs).

A second related academic piece was reviewed which also applied the *dynamic capabilities theory* to investigating critical success factors of DT for improving CEX

(Sahu et al., 2018). The study resulted in developing a conceptual framework dubbed the “ABCD framework,” covering analytics, business, customers, and digital concepts. Again, the justification of this study on capabilities rather than impact was owed to the existence of studies on DT adoption and impact, and a gap on critical success factors. The factors identified in this study were derived from interviewing one entity in Australia, a highly developed market relative to South Africa.

A 2021 study by Awadhi et al. (2021) covered the impact of customer service digitisation on customer satisfaction, using evidence from the telco industry in the United Arab Emirates. The research applied a positivist philosophical approach and analysed quantitative responses from 130 telecoms clients who use digital solutions to serve their communications needs. The *Expectancy-Disconfirmation* and *Evaluation Congruity* theories were applied to describe how the relationship between the expectations of using a digital solution and the experience of using the solution influences customer satisfaction and dissatisfaction (Awadhi et al., 2021). This dual-theory study focused on articulating the gap between customer expectations and outcomes while using digital channels/solutions in the telco industry and concluded that there is a strong degree of correlation between customer expectations, customer outcomes and the level of satisfaction (Awadhi et al., 2021). Research learnings can be applied from Awadhi et al., (2021) in terms of how the customer surveys were articulated, however this research study aimed to confirm the effect on customer satisfaction and quality of experience when customers adopt digitally transformed elements in the South African telecommunications industry off a zero-assumed usage base on the customer. As opposed to the 2021 study which investigated the gap between expectation and outcome (Awadhi et al., 2021).

The studies reviewed mentioned the positive impact of DT on CEX and attempted to delve into organisational capabilities and customer philosophy. These elements can potentially be explored for future studies in the South African telecommunications context, however the gap of understanding the quantitative impact of DT on CEX still needed to be addressed. Boston Consulting Group’s 2021 Global Digital Transformation survey indicated that 98% of telcos cite CEX and journeys as their top

priority for DT, with the highest share of investment wallet allocated to digital customer engagement (Boston Consulting Group, 2021). Although the survey's 860 respondents failed to include African representation, the importance of CEX in in the DT agenda of telecommunications players was evident, adding to the justification of this study.

2.3.3 *Hypothesis 2: The adoption of digital transformation has a positive impact on customer value.*

The second hypothesis presented related to the second secondary research question: ***What is the impact of DT adoption in the SA mobile telco industry on CV?***

The invention of large-language models as a form of generative AI is one of the most recent disruptions in the DT sphere (Siggelkow & Terwiesch, 2023). Since the launch of ChatGPT by OpenAI in November 2022, technology giants Microsoft and Google have responded with the launch of their own large-language models Bing and Bard, respectively. Siggelkow and Terwiesch (2023), authors of the acclaimed *Connected Strategy*, propose key factors for consideration given the above-mentioned technological advancement. For instance, how do entities take advantage of this new technology? What are the implications from a competitive advantage standpoint? If all entities have access to the same technology, then is there a competitive advantage and additional business value created from simply implementing the technology, or does an entity need to couple implementation with a deep understanding of which unmet consumer need is being addressed? Siggelkow and Terwiesch (2023) recommend the latter. Acquiring bragging rights to introducing ChatGPT on a chatbot for example, or buying real estate in the metaverse is not sufficient to create sustainable competitive advantage and inherently customer value (Purdy, 2023).

Two potential elements of customer value are associated with DT: business value and customer value. The first, business value, is associated with the business benefits of applying DT. Additional revenue generated through cross-selling and upselling existing products or introducing new products can be enhanced by enhancing the digitised CEX through more engaged and digital touchpoints. The increased business value can be measured in the uplift of CLV, with a higher maturity of DT showing linkages to an

improved digital value realisation on this measure (Shrivastava, 2017). Reducing the response times and empowering the customer to self-serve can also have cost-saving benefits for the business (Awadhi et al., 2021; McKinsey & Company, 2022).

A Deloitte Insights study (2020b) on the relationship between digital maturity and financial performance aligned to Shrivastava's claims, with survey results indicating that 43% of companies with high digital maturity reported higher net profit margins than the industry average, versus 15% of the companies with low digital maturity. Furthermore, 45% of companies with high digital maturity reported higher net revenue growth than industry benchmarks, versus 15% of companies with low digital maturity. Deloitte's study however, interviewed US-based executives of companies with over $250 million revenue per year exclusively and was industry-agnostic. While the findings can inform the hypothesis that DT does positively contribute to CV in the form of business value, there is a research gap on understanding what the impact of DT is in an emerging market like SA, and whether the findings can be correlated to the low digital maturity entities in the Deloitte US study. This study sought to understand the impact of DT on CV in the South African telecommunications context.

Delivering more value to the customer through CEX can result in a higher perceived customer experience, with DT potentially enabling predictive needs analyses, hyper-personalisation, and additional customer value sources (Boston Consulting Group, 2021). More CV can result in greater customer loyalty and advocacy, strengthening the long-term customer relationship. The *Expectancy-Disconfirmation* and *Evaluation Congruity* theories from Awadhi et. al (2021) can potentially be applied to the second hypothesis to understand the impact of a high quality digital customer experience as a result of DT, on the perceived CV.

2.3.4 *Hypothesis 3: Digital literacy will have a mediating effect between digital transformation adoption and customer experience*

The third hypothesis presented relates to the third secondary research question: ***What is the effect of DL on the relationship between DT in the SA mobile telco industry and CEX?***

The definition of DL presented earlier in the study aligned to a collection of definitions presented in numerous academic papers (Burzynska et al., 2023; Deschenes, 2023; Kabakus et al., 2023; Moleko, 2022). Moleko (2022) further implied that having a level of digital literacy which enables a consumer's confidence to navigate various devices and the internet from an informed position, positions the consumer for a continuous learning journey with the ability to adapt to new innovations. This implication of DL was relevant for this study, where the adoption of DT is being studied. To adopt digital channels when engaging with an MNO, a customer needs to have the knowledge to do so, which means having the knowledge to navigate digital tools and platforms. If improved CEX is an effect of greater DT adoption, and higher DL effects technology adoption, it may be correct to infer that DL unlocks the reaping of the benefits from DT, leading to the formulation of the third hypothesis in this research study.

To understand the link between DL and DT, it is worth noting the 2023 cross-sectional study conducted by Deschenes, which evaluated the impact of DL on the use of digital collaborative technologies, contextualised to +5000 public service workers in Quebec in a hybrid work environment. Deschenes (2023) concluded that DL positively influences the use of collaborative technologies. Cetindamar et al. (2021) and Nikou et al. (2022) provided insights on how people in the workforce with higher levels of DL are more confident in the adoption of new technologies and demonstrated more positive attitudes towards the use of these techologies. On the other hand, Kohnke (2016) presented the conclusion that people with low digital literacy levels are more speculative adopting new technologies, and may experience difficulty in the use thereof. The link between DL, the adoption of digital technologies and the attitudes of people in the process is correlated to the link studied in this paper between DL, DT and CEX, contextualised for South African mobile telco customers. Shrivastava (2017) stated in contrast that customer behaviour in the digital context is evolving rapidly, regardless of a customer's digital maturity or literacy levels. This study aimed to understand if DL does play a role in how customers in SA adopted digital channels, devices and platforms, and what their attitudes and perceptions of experience of their MNO were.

While studies in literature (Nikou & Aavakare, 2021; Nikou et al., 2022), have proved a relationship between DL and a person's propensity to adopt new technologies or the ease of use of technologies as per the Technology Acceptance Model by Davis (1989), Kabakus et al., (2023) showed that DL did not impact how beneficial the technology was perceived to be by respondents. Kabakus et al. (2023) also concluded that DL had an indirect impact on the intention to use digital technology. The study by Deschanes (2023) also confirmed an indirect link between DL and adoption of technology. Venkatesan (2020) confirmed moderating or indirect effects of the digital maturity of organisations on the relationship between entrepreneurial agilty and organisation performance. The business-contextualised conclusions were translated into a customer view for the understanding of this study. Considering the literature, this study hypothesised an indirect impact of DL on the relationship between DT and the other variables (CEX, CV) of the study.

2.3.5 *Hypothesis 4: Digital literacy will have a mediating effect between digital transformation adoption and customer value*

The fourth hypothesis presented relates to the fourth secondary research question: ***What is the effect of DL on the relationship between DT in the SA mobile telco industry and CV?***

The literature review for hypothesis three in the previous sub-section provided insight on an indirect link between DL and DT, inferring a resultant indirect link between DL and the benefits of adopting DT, which in the scope of this study is also CV. The academic direction and analysis for this study presented for hypothesis three was also applied to hypothesis four, hypothesising an indirect effect of DL on the relationship between DT and CV.

Appendix C presents an overview of the academic literature reviewed from an empirical and theoretical point of view for this study. The theories applied in the academic works were reviewed in the context of the conclusions made and limitations identified. These insights were then considered in understanding the theoretical framework for this study, which enabled the development of the conceptual framework.

2.4 Analytical Framework

2.4.1 *Theoretical framework*

An extensive literature review was conducted to identify theories and frameworks which could contribute to answering the primary research question of: ***What is the impact of DT on CEX and CV in the South African mobile telecommunications sector?*** While many studies have been conducted on digital transformation, with a summary selection in Appendix C, most studies aimed to explore the supply-side factors and challenges of DT in organisations internally, with limitations on understanding how DT is received and perceived on the demand-side with customers, and the impact thereof, namely on CEX and CV for the purpose of this study.

Multiple studies reviewed applied *dynamic capabilities theory*, an evolution of *resource-based view theory*, and thus evaluated the internal capabilities of organisations in the context of DT (Matarazzo et al., 2021; Musaigwa & Mutula, 2022; Sahu et al., 2018; Venkatesan, 2020; Wiemker, 2015; Zhang et al., 2023). To understand how the adoption of DT on the demand-side makes an impact, the theory analysed in Baird & Raghu (2015) and Steiber et. al. (2021) was deemed a better fit to this study: ***the Diffusion of Innovations theory*** (Rogers, 1983). *Dynamic capabilities theory* would be suitable to understand the extent of DT on the supply-side within telecommunications players which would be an input to customers adopting digitally transformed elements from organisations, and hence impact CEX and, or CV. *Dynamic capabilities theory* was considered as out of scope for this study, as the DT maturity of telecommunications operators in SA was not being studied, but rather the extent of adoption of DT when customers interact with telecommunications operators.

The *Expectancy Disconfirmation theory* (Oliver, 1980), applied in Awadhi et al., (2021), could have been a theory relevant to this study however, the theory aims to understand the gap between a customer's perceived expectations and their post-purchase and post-adoption experience. For this study, the aim was to measure customer CEX, and CV as a potential function of DT adoption.

2.4.1.1. The Diffusion of Innovations theory

2.4.1.1.1. Overview of the theory

The popularised theory by Everett Rogers (1983) has incorporated the work of many scholars into the *Diffusion of Innovations* theory (Lundblad, 2003). With over a thousand citations of Rogers' book (2003), the theory is renowned for contributing to understanding how new ideas, processes, technologies, and products are adopted and spread across people and organisations. The *Diffusion of Innovations* theory can be termed as a change model that helps organisations navigate technological innovation across all levels of adoption of the innovation, without ignoring the impact of word-of-mouth and social influence on the spread of adoption (Kaminski, 2011).

2.4.1.1.2. Categories of adopters

Rogers emphasised that this process of adoption of innovation begins with the initial few who are receptive to a new concept and eager to try it. The use of this new concept is then spread to a "critical mass" of individuals as words spread and more are eager to try out the innovation (Rogers, 1983). The spread of innovation gradually increases until a peak or threshold of adoption is reached. There are five categories of adopters of innovation identified and sized by Rogers (2003) which are depicted in the bell curve Figure 2-1: innovators; early adopters; early majority; late majority; laggards.

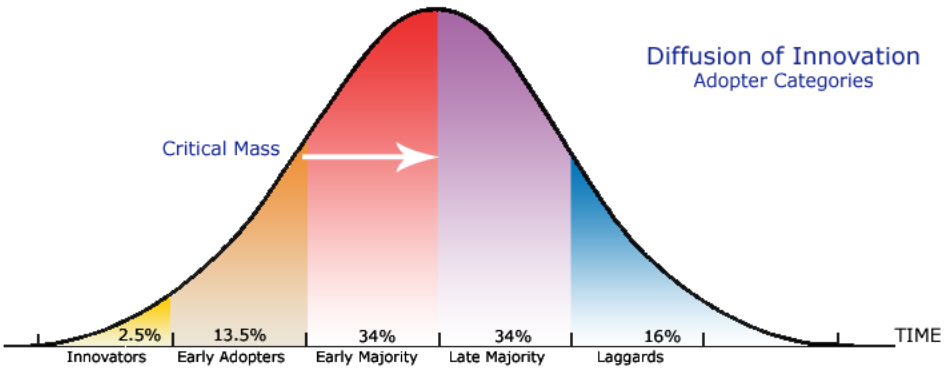

Figure 2-1: Categories of Diffusion of Innovation Adopters (Rogers, 2003)

In the context of this study, the adopters would refer to the customers of mobile telecommunications services in SA. The innovation being adopted would refer to the consumer-facing DT initiatives enabled by telco operators in SA. The degree of adoption of using digital channels, devices, products, and services in the telecommunication context i.e., consumer DT, is expected to differ across customers, with some customers with a higher affinity for DT than others.

2.4.1.1.3. Innovation characteristics

As part of the *Diffusion of Innovations theory*, Rogers (2003) also identified five characteristics of the innovation which determine the level of adoption and provide criteria for organisations to evaluate their innovations. These five characteristics are covered in Table 2-1.

Table 2-1: Characteristics of Innovation (Rogers, Diffusion of Innovations, 2003)

Innovation characteristic	Description
Relative advantage	The degree to which an innovation is perceived to be superior and add value to the current practice or status quo.
Compatibility	The degree to which the innovation is perceived to be aligned to customer needs in the current socio-cultural context.
Complexity	The degree to which an innovation is either difficult or easy to use and understand.
Trialability	The degree to which an innovation can be tested in a constrained context to gauge impact before scaling use.
Observability	The degree to which an innovation and the impact of using the innovation is visible to adopters across all categories.

It was hypothesised that the rate of adoption of the innovation, in this context consumer-facing DT, increases as the degree of the innovation characteristics increase, except for complexity where the inverse is true (Kaminski, 2011). The innovation characteristics from the *Diffusion of Innovations* theory were used as the theoretical basis for the variable measures of DT adoption amongst telecommunications customers, addressing the first part of the primary research question.

2.4.2 *Conceptual framework*

2.4.2.1 Proposed conceptual framework

To emphasise the research problem at hand, the extent of the impact on CEX and CV by the adoption of consumer DT, was unknown in most contexts, more so in the SA telecommunications industry. The proposed conceptual framework for this study was adapted from the *Diffusion of Innovations* theory, illustrated in Figure 2-3.

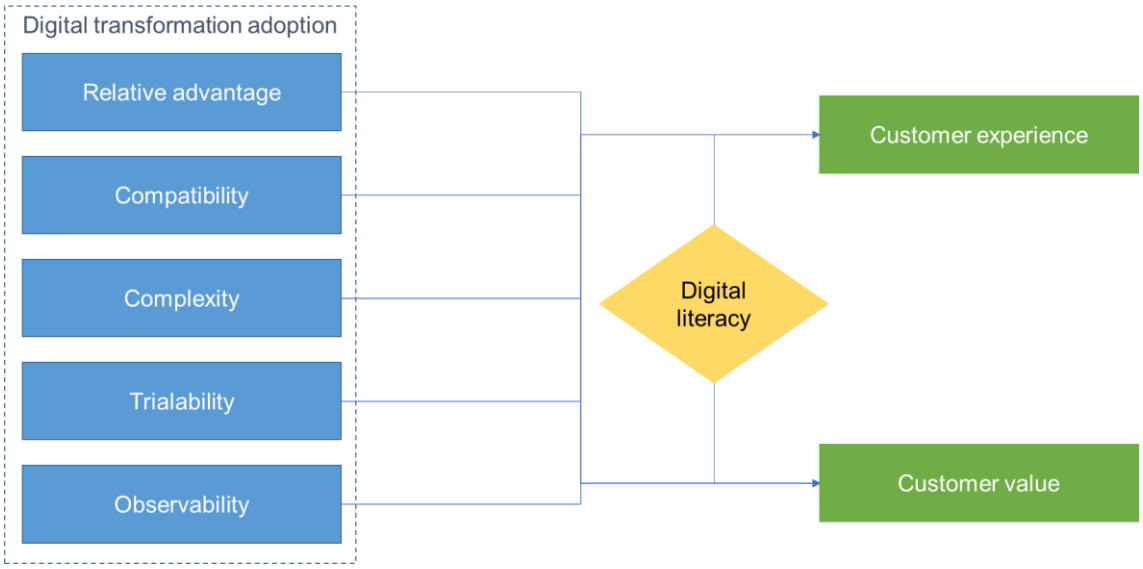

Figure 2-2: Proposed conceptual framework (Source: Researcher)

2.4.2.2 Independent variables

The independent variables of the framework aligned to the innovation characteristics proposed by the *Diffusion of Innovations* theory (Rogers, 2003). These variables were

used to measure the adoption of DT by mobile telecommunications customers in SA. The perceived degree of the innovation characteristics was related to the adoption rate of the innovation (Rogers, 2003). The adoption of DT as an independent variable was tested by the five independent sub-variables: relative advantage, compatibility, complexity, trialability, observability.

2.4.2.3 Dependent variables

The dependent variables of the study were CEX and CV. The change in the degree of CEX and CV were measured as a function of DT adoption, which was in turn measured by the innovation characteristics of the *Diffusion of Innovations* theory. CEX was broken down into elements for measure including NPS, where respondents were asked how likely they were to recommend their MNO service to friends and family (McKinsey & Company, 2022). CEX was also operationalised by requesting responses to statements testing a customers' level of satisfaction when engaging with their operator. Similarly, CV or CLV was operationalised by requesting responses to statements testing if customers spend and engage more on digital channels versus traditional channels, and whether customers were interested in purchasing new digital services or intending to change their operator.

2.4.2.4 Mediating variable

The DL of customers was hypothesised to mediate the relationship between DT adoption and CEX and DT adoption and CV. DL refers to how digitally literate a customer is, i.e., the level of education a customer has on navigating, using, and adopting digital technologies (GSMA, 2021). If a customer's DL is low or non-existent, they are unlikely to have the know-how to adopt DT in their telecommunications activities, hence their adoption would be low and hence the impact on CEX and CV would be low (GSMA, 2021; Burzynska et al., 2023; Moleko, 2022; Deschenes, 2023). The opposite can be true if their DL is comprehensive. Thus, DL is a condition which needs to exist for DT adoption to have an impact on CEX and CV. DL was operationalised in the study via statements testing a customer's level of comfort and awareness using digital channels when engaging with their MNO or MVNO.

2.5 Conclusion of Literature Review

The empirical literature review systematically covered academic research on the concepts of the primary research question namely: digital transformation, customer experience; customer value.

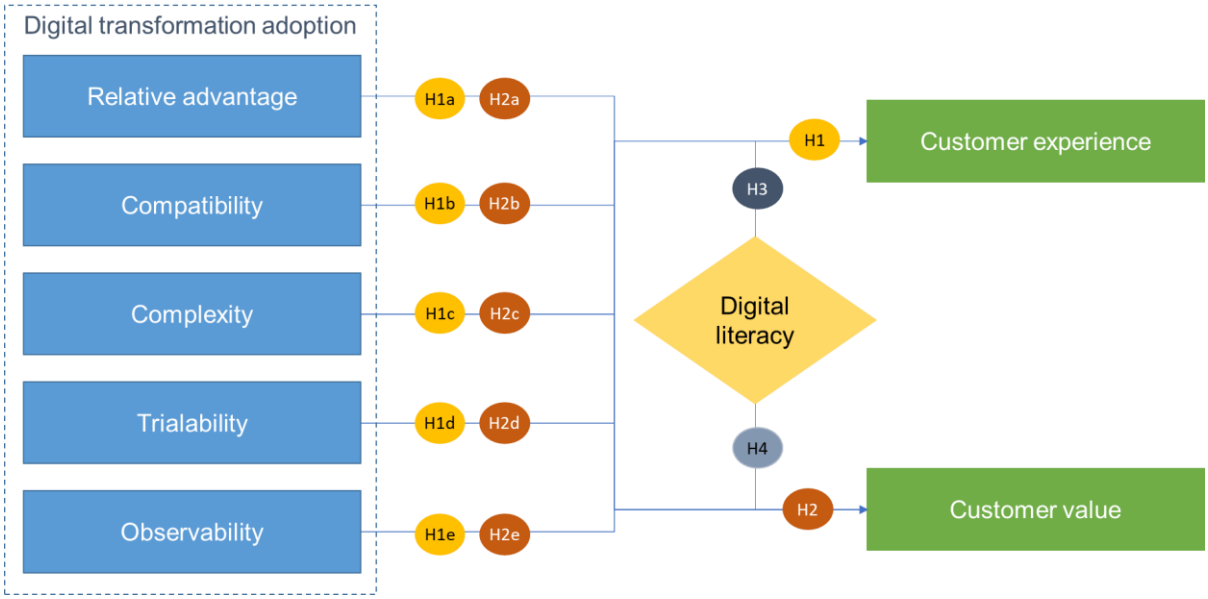

Figure 2-3: Proposed conceptual framework with hypotheses (Source: Researcher)

The analytical framework literature review revealed the relevance of Diffusion of Innovations theory to this study and hence the following hypotheses from the proposed conceptual framework were derived as per Figure 2-3.

- **H1:** DT adoption measured by the following diffusion of innovation characteristics will have a positive effect on CEX:
    a) Relative advantage
    b) Compatibility
    c) Complexity
    d) Trialability
    e) Observability

- **H2:** DT adoption measured by the following diffusion of innovation characteristics will have a positive effect on CV:

a) Relative advantage
b) Compatibility
c) Complexity
d) Trialability
e) Observability

- **H3:** DL will have a mediating effect between DT adoption and CEX

- **H4:** DL will have a mediating effect between DT adoption and CV

CHAPTER 3. RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research methodology followed and the process followed for analysing the research results from the study.

3.2 Research approach

The purpose of this study was to identify the impact of DT adoption by South African telecommunications operators on CEX and CV. The study aimed to measure the extent of the impact of one set of variables on another set of variables, as depicted in the proposed conceptual framework in Figure 2-2, grounded in the *Diffusion of Innovations* theory. Testing the proposed set of hypotheses and thus answering the research questions was conducted via a deductive quantitative approach, where regression was used to measure the causal effects of variables (Venkatesan, 2020) and test the hypotheses derived from the theory reviewed (Saunders, Lewis, & Thornhill, 2023). A quantitative approach required the numerical measurement of the concepts in the study; thus, the concepts were operationalised and converted to a measurable variable in the final research instrument. This was necessary to identify the causal relationships between the adoption of DT on CEX and CV, similar to the research approaches followed by Venkatesan (2022), Stofile (2022), Baird and Raghu (2015),) and Awadhi et al. (2021). Various academic literature reviewed and synthesised in Chapter 2 did not follow quantitative approaches, with low replicability and generalisability on single case study methods, creating a research gap on quantitative findings on the impact of DT. This study is rooted in the SA telecommunications context and aimed to maximise replicability and generalisability using a deductive, quantitative approach. The results of the research were thereafter statistically analysed by with the aid of IBM software tool, SPSS.

3.3 Research paradigm

The study adopted the positivist research paradigm. According to Sekaran and Bougie (2016) positivist researchers primarily believe that “the goal of research is to only describe phenomena that one can directly observe and objectively measure.” Positivism closely aligns with the deductive and quantitative research approach of this study which aimed to measure the causal relationships directly and objectively between the research variables (Saunders, Lewis, & Thornhill, 2023). Like Venkatesan (2022), the positivist research paradigm was also aligned to the personal research philosophy of the researcher of this study. Rooted in the researcher’s engineering background and analytical problem-solving experience in management consulting, this study sought to measure the impact of DT in SA telcos objectively and quantifiably.

3.4 Research design

The research design adopted for this study was a survey with the following characteristics: self-administered; online; minimal researcher interference; cross-sectional; individuals as the unit of analysis. The research approach (deductive and quantitative) and research paradigm (positivist) informed this research design.

A survey was selected over alternative research designs including ethnography and action research, given the ability to collect many responses automatically which saved time and money (Sekaran & Bougie, 2016). The paperless, electronic and online medium of the survey would grant respondents the convenience of providing data at their choice of time and place, would allow for more geographical coverage of respondents in a shorter time period relative to mailed or in-person surveys (Saunders, Lewis, & Thornhill, 2023), and would reduce environmental impact. The survey was constructed on the online University of the Witwatersrand *Qualtrics* tool, which allowed the data to be automatically collected and analysed.

The survey also allowed for self-administration, limiting bias or influence that may occur with other research designs like ethnography (Sekaran & Bougie, 2016) with a

trade-off on granting respondents the ability to ask clarifying questions to the researcher (Venkatesan, 2020).

The survey allowed for a structured approach, where different sections were created for each research question in addition to an upfront section on collecting relevant demographics from respondents. A survey did pose the risk of higher non-response rates, which was mitigated with selective follow-up reminders from the researcher. Unlike ethnographic research, the survey did not allow for deeper analysis of responses.

The cross-sectional survey collected data at a point in time. Recommendations for future research include longitudinal studies which investigate the impact of DT adoption on CEX and CV over time, enabling a trend analysis.

The unit of analysis for this study were individual respondents to the survey, who were customers of mobile network operators in South Africa. The online medium of the survey required a base level of digital literacy to answer the survey.

3.5 Data collection methods

As indicated in the previous section 3.4, an online survey was used as the method of data collection in this study. The survey link was shared electronically via WhatsApp, as well as published on the researcher's social media platforms, considering the target population. This was done post a pilot survey conducted by a handful of expert individuals. Respondents' answers to the survey were collected and thereafter tested for goodness using IBM's SPSS tool.

The first section of the section aimed to qualify the respondent as someone who makes use of telecommunication services from a mobile network operator based in South Africa and who owns a smartphone to enable web-based digital experiences. This qualification eliminated collecting outlier data, for example, data from respondents who could have been roaming internationally on a South African mobile network operator for a temporary period, similar to the qualification mechanism applied by Venkatesan

(2022). The next section of the survey requested demographic information from respondents, to allow for potential data linkages and correlations across points like provincial location and age. The survey sections that followed were structured based on the research questions of the study, enabling the data to be collected per research question as recommended by Sekaran and Bougie (2016).

The online medium of the survey allowed for large amounts of data to be collected with minimal interference from the researcher, while self-administration allowed for the respondents' convenience and privacy. A cover letter was also included in the body of the communication inviting the respondents' participation, stating the purpose of the study, and aiming to build trust by ensuring data privacy and identity anonymity. Live tracking of the response rate gave the researcher the opportunity to intervene with follow-up communication to increase the response rate and mitigate a low response rate.

Unlike an interview, the online survey limited the potential bias if the researcher were to engage one-on-one with each respondent and answer clarifying questions. This characteristic was important given the objective and quantitative approach of the study, anchored in positivism.

Data was collected from the survey in the form of answers selected by respondents from a set of given options, enabling the data to be quantified and analysed across the units of analysis.

3.6 Population and sample

3.6.1 *Population*

The target population for this study was customers of South African MNOs over 18 years of age (adults). The scope of the study was consumer-facing DT and understanding the impact thereof on the experience by customers, and the value of the customers as perceived by the customers themselves. The population thus included people who use telecommunications services from MNOs specifically i.e.,

people who have at least one registered SIM card from a South African operator and were thus mobile telecommunications customers.

3.6.2 *Sample and sampling method*

Collecting data from the population of this study was not possible given the resource constraints. The first constraint was time available, and the second constraint was the availability of sophisticated analysis tools to address the significantly higher amount of data of the population, given that the South African telecommunication customer base, or mobile subscriber base, is 47 million as at December 2023 (GSMA Intelligence, 2023). Data was collected from a subset of the population i.e. a sample.

A convenience, non-probability sampling design was used as the sampling method. The survey sought to collect data from South African telecommunications customers, where there was no probability of a particular customer being selected as a sample subject given that the survey was published online and open to eligible respondents who were available and willing to participate at their convenience.

There were 30 core data collection questions in total related to the concepts (excluding demographic and qualifying questions). The minimum number of sample size chosen was 120. To reduce the impact of any survey errors or incompleteness, a sample size of approximately 200 was targeted, similar to the sampling size technique followed by the digital transformation MBA research study by Venkatesan (2020) and Miguel, De-Pablos-Heredero, Montes, and García (2022). A total of 181 responses were received for the survey, exceeding the minimum sample size.

3.7 The research instrument

The research instrument was a self-administered online survey conducted on the Wits University Qualtrics platform. The survey consisted of sections of simple questions in English directed to the South African telecommunications customer. Data was collected in a quantitative manner, where respondents were asked to select answers from a range of pre-defined options or respond to questions via a 5-point Likert scale

(Sekaran & Bougie, 2016). This was important to enable the statistical analysis of responses (Stofile, 2022). The survey was structured into separate sections; one section per variable to be tested, and additional upfront sections on qualifying questions for the survey, demographics, and telecommunications profile.

A consent form and cover letter were included with the survey, assuring respondents of their anonymity and data security. A pilot study of the survey was also conducted to ensure that the survey is understandable and simple enough to encourage full completion.

3.8 Procedure for data collection

The research instrument was sent via WhatsApp and LinkedIn to potential eligible respondents and the link was published on the researcher's social media pages. Given that the target population was customers with at least one registered SIM with a South African MNO or MVNO, publishing the survey on online platforms was suitable given the high likelihood that a respondent will open the link using the connectivity enabled by their MNO or MVNO. Potential respondents who received the link were also encouraged and requested to share the link with other eligible candidates in their personal networks to drive response rates causing a snowball sampling effect.

3.9 Data analysis strategies and interpretation

The respondent data was analysed using IBM's Statistical Package for Social Sciences (SPSS) tool via multiple regression analysis. There were 5 independent sub-variables in the study being used to operationalise the adoption of DT, and the impact of the independent variables was being measured across multiple dependent variables: CEX and CV. The relative importance of the independent variables on the dependent variables were indicated with the resulting regression coefficients (Sekaran & Bougie, 2016). Data cleansing was conducted to remove invalid responses and outlying data, similar to the analyses conducted by Stofile (2022) and Venkatesan (2020).

3.10 Possible limitations and challenges of the study

- Sample may not have been fully representative of and generalisable to population given the non-probability convenience sampling technique.
- Study excluded respondents with extremely low digital maturity given the online research design and medium.
- Study was limited to respondents who utilise mobile telecommunications services from MNOs and MVNOs in South Africa.

3.11 Quality Assurance

3.11.1 *External validity*

Using the non-probability convenience sampling technique lowered the generalisability of the study. However, the survey was distributed online, encouraging snowball sampling, to increase the representation of South African telecommunications consumers. The study findings may be applied to emerging markets similar to South Africa with customers of similar digital maturity levels.

3.11.2 *Internal validity*

Before releasing the survey, expert reviews were requested. Thereafter post addressing the feedback from the reviews, a pilot study was run to maximise validity.

3.11.3 *Reliability*

Simple, complete questions were used in the survey. The survey was also tested for length and ease of understanding in the review and pilot process to minimise survey errors. Thereafter in the analysis stage, Cronbach's alpha was used to measure the reliability of the data.

3.12 Ethical considerations

The cover letter or consent form presented in Appendix A, included assurances to the respondent that their identity was anonymous and that their responses would only be used for the purposes of this study. There was also a question in the survey to ensure that there is informed consent from the potential respondent before participation. The ethics clearance certificate issued by Wits Business School is included in Appendix E, confirming that the ethics clearance process was followed satisfactorily. The ethics protocol number as indicated on the cover page and certificate is WBS/BA371836/162.

CHAPTER 4. RESULTS

4.1 Introduction

This chapter presents results of the study conducted via the method described in the previous chapter. The steps followed for data preparation and coding, descriptive statistics resulting from the analysis and inferential statistics are included. The transformations and optimisations applied to the data results to allow for greater statistical integrity are also included. This chapter also includes the results of the reliability and validity tests on the data from the confirmation factor analysis (CFA) conducted, where the fit of the conceptual model presented in chapter two to the results from the study is tested (Figure 2-2). The chapter concludes with a summary of the hypothesis tests from the regression analysis conducted.

4.2 Description of sample

The online questionnaire administered via survey software Qualtrics XM produced results from a total of 181 respondents who participated in the data collection process. The characteristics of the 181 respondents were analysed by the researcher to determine the persona of the average respondent via a descriptive demographic analysis.

4.2.1 *Demographic profile of respondents*

The 181 respondents were spread across all age groups from 18 to 50 years old and above, with most representation and median age in the 31-to-35-year age group, as can be viewed in Table 4-1.

Table 4-1: Age group of respondents

Age group	N	% of total
18 to 25 years old	10	5.5%
26 to 30 years old	26	14.4%
31 - 35 years old	60	33.1%
36 to 40 years old	27	14.9%
41 - 50 years old	37	20.4%
Above 50 years old	21	11.6%

Most survey respondents at 63% of the total indicated Gauteng as their provincial location of primary residence followed by 26.5% of respondents residing in KwaZulu-Natal, as per Table 4-2. There were no respondents residing in Mpumalanga or the Northern Cape.

Table 4-2: Primary residence location of respondents

Province	N	% of total
Eastern Cape	1	0.6%
Free State	1	0.6%
Gauteng	114	63.0%
KwaZulu-Natal	48	26.5%
Limpopo	9	5.0%
North-West	2	1.1%
Western Cape	6	3.3%

4.2.2 *Mobile usage characteristics*

Survey questions concerning the customer behaviour of the respondents when connected to their opted mobile network were tested. Querying the choice of mobile network operator, volume data usage, data spend, and customer profile (postpaid or prepaid) helped understand the respondents' persona as an MNO customer in SA.

Figure 4-1 and Table 4-3 provide a view of the results received when asking respondents to indicate the MNOs they have a registered SIM card with. The three top MNOs in the total South African market (MTN, Vodacom, Telkom Mobile) according to GSMA Intelligence (2023) also proved to be the most popular in the results from the study. The 181 respondents in the sample revealed a total registered SIM base of 239 due to multi-summing, resulting in an average total of 1.32 SIMs per unique respondent, which was lower than the South African national average of 2.61 (GSMA Intelligence, 2023). The results revealed that 133 respondents or 73% of the total, have a single-SIM registered with an MNO. MTN was indicated as the most popular respondent for those with single-SIM profiles. The number of dual-SIM respondents was logged at 39 or 22% of the total, followed by triple-SIMs and quadruple-SIM respondents at 8 (4%) and 1 (1%) respectively.

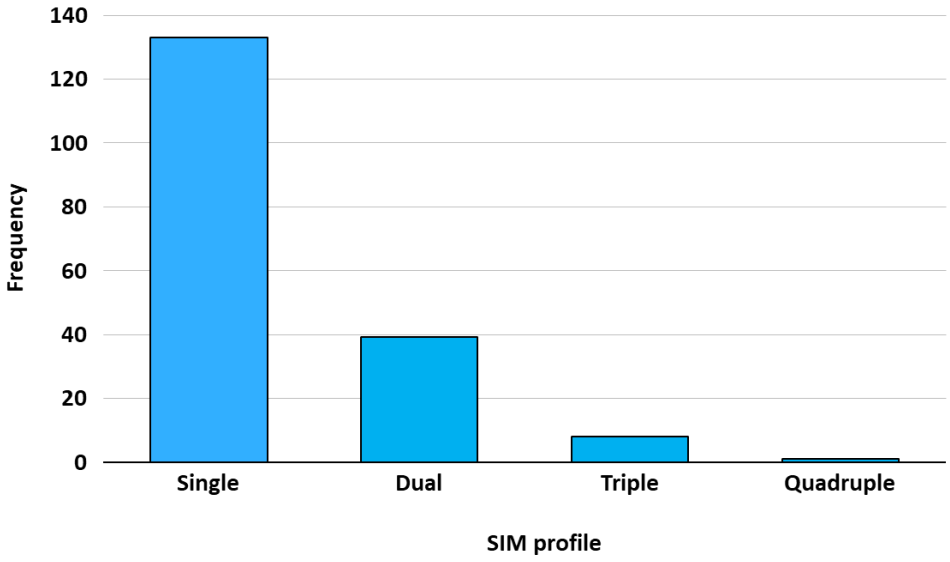

Figure 4-1: Split of SIM profile of respondents

Table 4-3: Overall SIMs across MNOs of respondents

MNO(s)	N	% of total	SIM profile	Number of SIMs
MTN	64	35%	Single	64
Vodacom	40	22%	Single	40
Telkom Mobile	21	12%	Single	21
Telkom Mobile, Vodacom	10	6%	Dual	20
MTN, Vodacom	9	5%	Dual	18
Telkom Mobile, MTN	9	5%	Dual	18
Cell C	6	3%	Single	6
Telkom Mobile, MTN, Vodacom	4	2%	Triple	12
Vodacom, Cell C	4	2%	Dual	8
FNB Connect	2	1%	Single	2
MTN, Cell C	2	1%	Dual	4
Telkom Mobile, Cell C	2	1%	Dual	4
Rain, FNB Connect	1	1%	Dual	2
MTN, Vodacom, FNB Connect	1	1%	Triple	3
MTN, Vodacom, Standard Bank Mobile	1	1%	Triple	3
Vodacom, FNB Connect	1	1%	Dual	2
Vodacom, Rain	1	1%	Dual	2
Telkom Mobile, MTN, Cell C	1	1%	Triple	3
Telkom Mobile, Vodacom, FNB Connect	1	1%	Triple	3
Telkom Mobile, MTN, Vodacom, Rain	1	1%	Quadruple	4
Total	**181**	**100%**		**239**

While respondents owned multiple SIMs with multiple MNOs, the study also requested respondents to indicate which of those MNO SIMs were used predominantly. From Figure 4-2, it was evident that the most popular primary mobile network operator amongst the respondents was MTN, with 76 responses constituting 42% of the total. Vodacom proved to be the next highest primary MNO with 33%, followed by Telkom Mobile with 17%. Cell C, FNB Connect and Rain did not prove to be prominent in the survey sample, with a collective response contribution of ~8%.

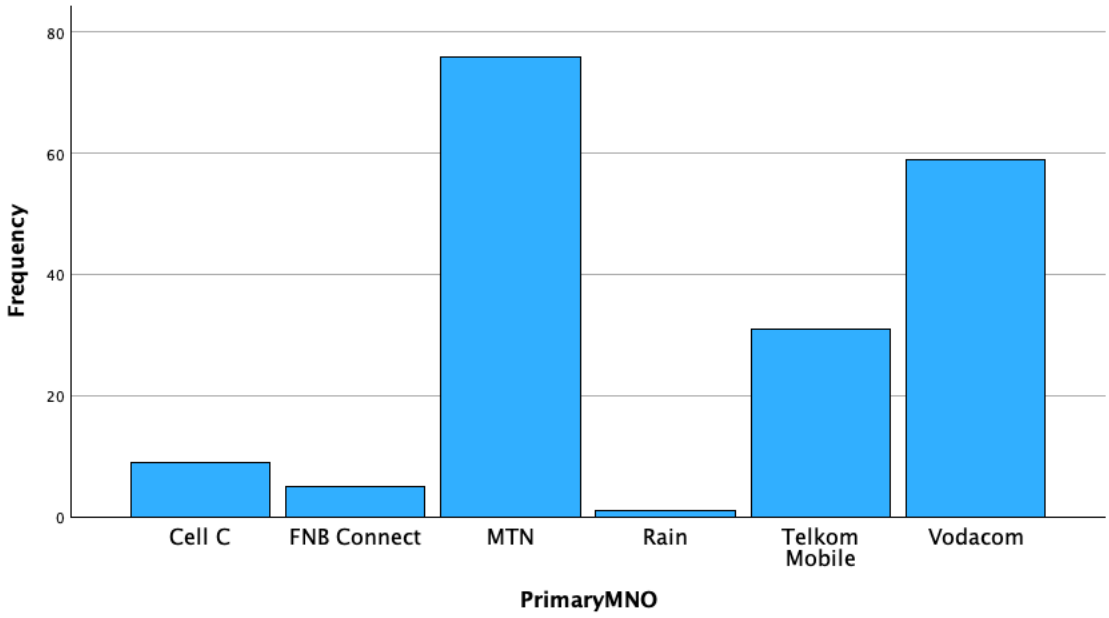

Figure 4-2: Primary MNO of respondents

Understanding the type of mobile customer was gauged by identifying which respondents are postpaid customers versus prepaid customers. As per Table 4-4, almost 60% of respondents were postpaid customers, or formal mobile customers, considering the credit checks and recurring debit order payments that are required for mobile contracts with MNOs.

Table 4-4: Mobile customer profile of respondents

Profile	N	% of total
Postpaid - I have a contract with a mobile network operator and I make monthly payments	104	57.5%
Prepaid - I buy mobile data and airtime as and when I need it	77	42.5%

The monthly spend on mobile services of the respondents, including airtime, voice minutes, SMSs and mobile data but excluding the spend on the smartphone or handset, is depicted in Figure 4-3. According to the GSMA, the average revenue per user or mobile connection in 2023 was $4.88, converted to approximately R94. The first option on the questionnaire for monthly spend was less than R100 a month resulting in no responses, indicating that all the 181 respondents in this study spent higher than the national average on mobile data. A fifth of the respondents spent more than R700 a month purchasing mobile services.

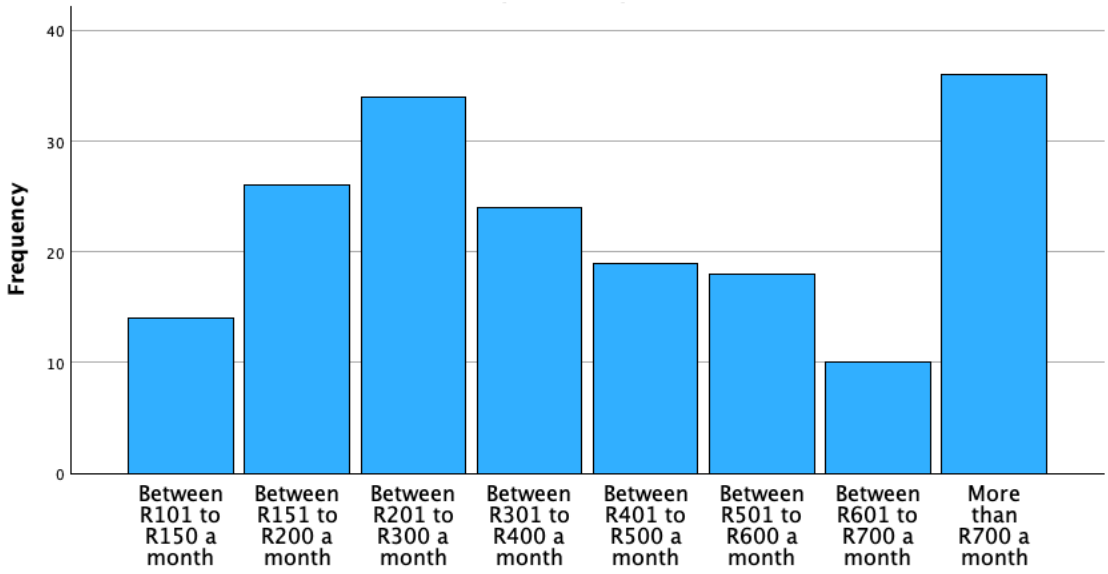

Figure 4-3: Monthly spend on mobile data of respondents

Figure 4-4 depicts the monthly mobile data usage amount of the respondents, excluding Wi-Fi usage when connected to a fixed connection. According to the GSMA, the average mobile data usage per connection in 2023 for South Africans was 3 Gb per month (GSMA Intelligence, 2023). While the sample was present in all mobile data usage ranges, around 60% of the respondents indicated monthly data usage higher than 3 Gb, skewing the sample to be characterised as higher than average mobile data users. 28% of respondents (51) fell in the high data usage segment, using 10 Gb or more a month.

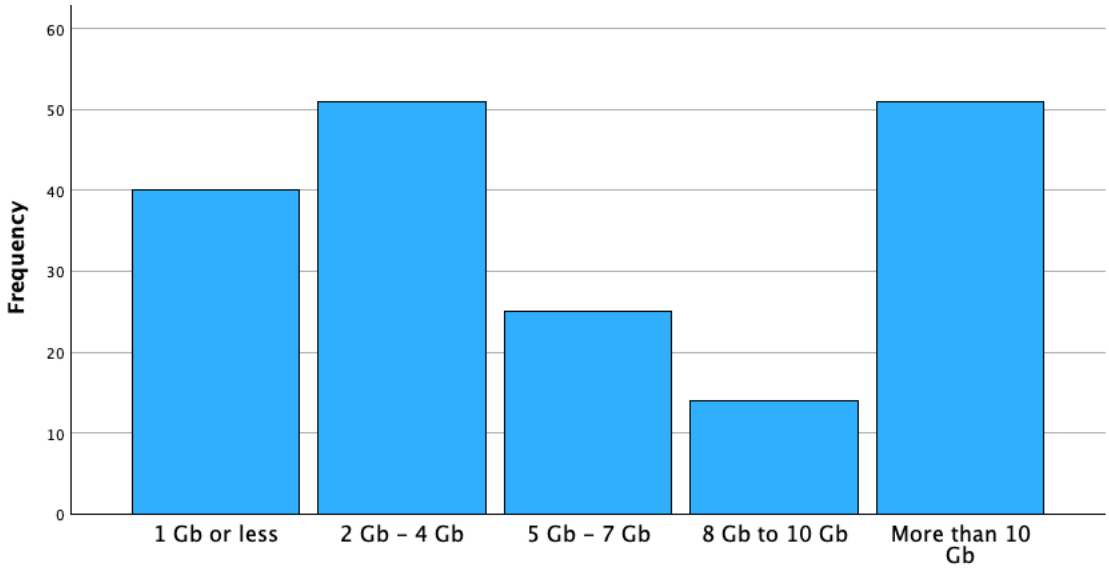

Figure 4-4: Monthly data usage of respondents

Respondents were asked how long they spend using their smartphone for internet-based services per day. Internet-based services are generally mobile data intensive and would include watching videos, browsing social media, and streaming content. The most prevalent option selected as per Figure 4-5 was 2 to 3 hours per day, with 67 respondents or 37% of the total. 55% of the sample spent more than 3 hours per day using their phone for internet-based services, with only 8% of respondents spending less than 1 hour per day.

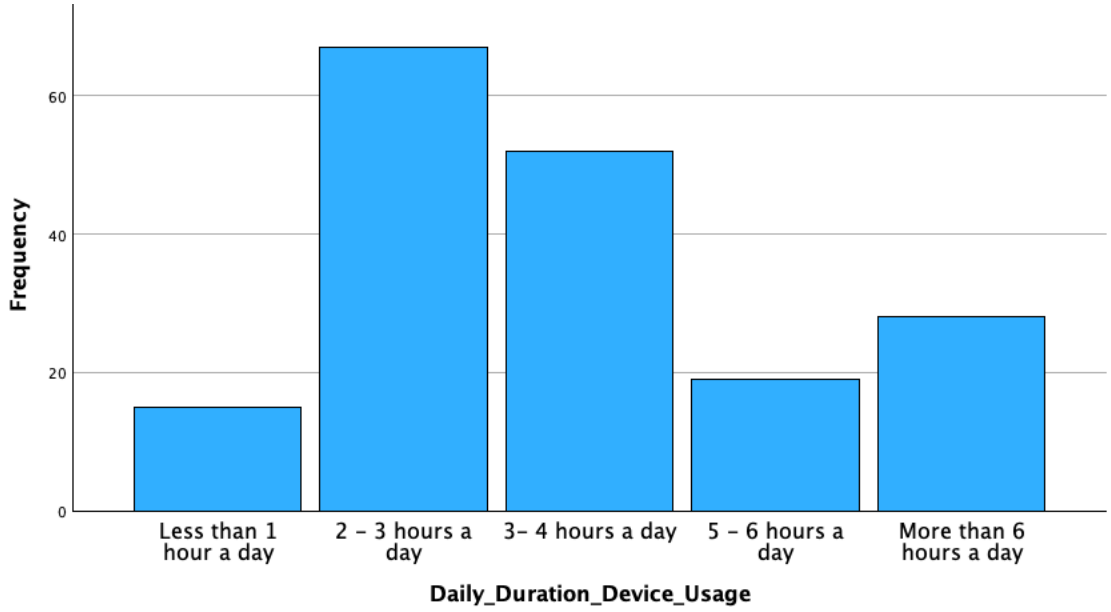

Figure 4-5: Daily device duration on internet services of respondents

4.2.3 *Cross-tabulation of demographic and mobile usage characteristics*

The study allowed for the opportunity to test mobile usage characteristics against the demographic factors collected, which were age and province. Considering that most of the respondents (63%) reside in Gauteng, the customer behaviour, or mobile usage, was rather viewed against age only as the provincial data would be skewed to a single province.

In Figure 4-6 the monthly mobile services spend can be viewed against the age groups. The results revealed that the older the respondents, the higher the spend on mobile services. The age groups ranging from 36 to 40 years and 41 to 50 years old had the highest concentration of the biggest spenders, with more than R700 monthly spend. In the youngest age group, most respondents claimed to be spending the lowest amount – between R101 and R150 a month. As mentioned previously, no respondents claimed to spend less than R100 a month on mobile services.

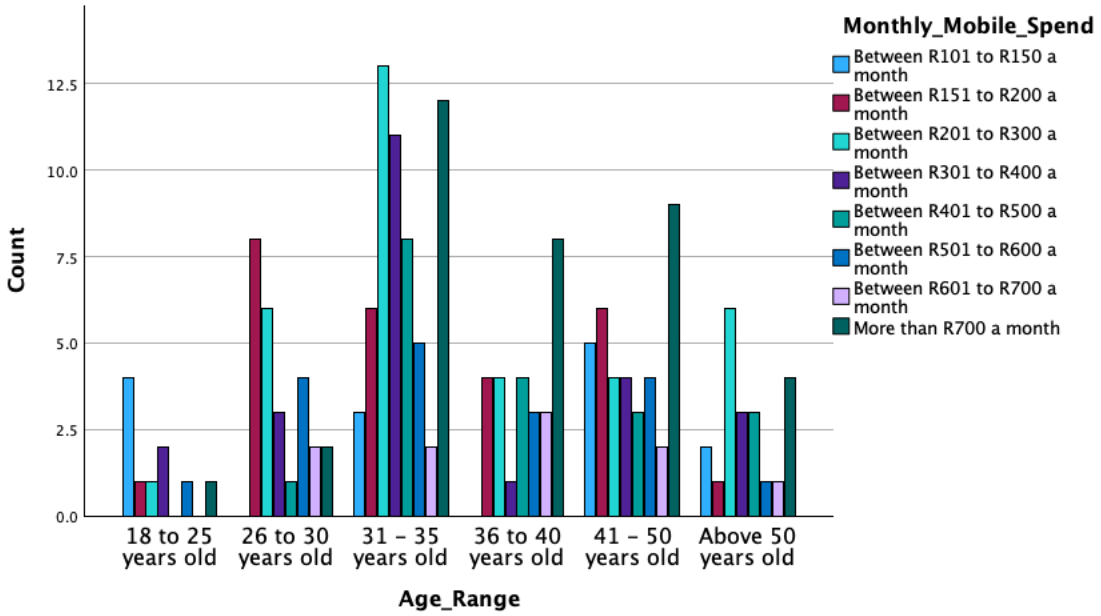

Figure 4-6: Monthly mobile services spend per age group of respondents

In Figure 4-7 the monthly mobile data usage is presented against age groups. The results revealed that respondents within the 18-to-25-year age group and the 31-to-35-year age group had a higher concentration of high data users with more than 10 Gb usage per month. The respondents aged 50 and above proved to be low data users with most respondents indicating a monthly data usage of 1 Gb or less. The remainder of the age groups had a prevalence of 2 to 4 Gb usage however, the respondents with high data usage were significant. Interestingly, the spend across age groups and mobile data usage across age groups were not closely correlated. For example, most of the respondents in the youngest age group spent the least on mobile services, while the older respondents cited a higher spend but lower mobile data usage. This observation could be attributed to older respondents spending more, but on services other than mobile data.

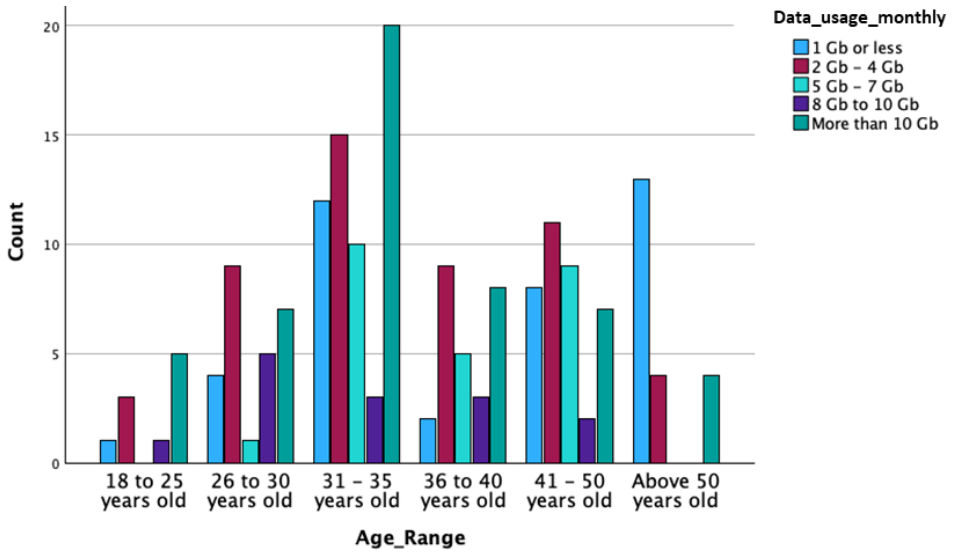

Figure 4-7: Monthly data usage per age group of respondents

Similarly, the daily duration of respondents using their device on internet-based services can be observed as per Figure 4-8. The highest option of internet-based device usage, more than 6 hours a day, was most prevalent in the youngest age group of 18- to 25-year-old respondents. For the remaining age groups, most respondents selected options between 2 to 3 hours a day and 3 to 4 hours a day.

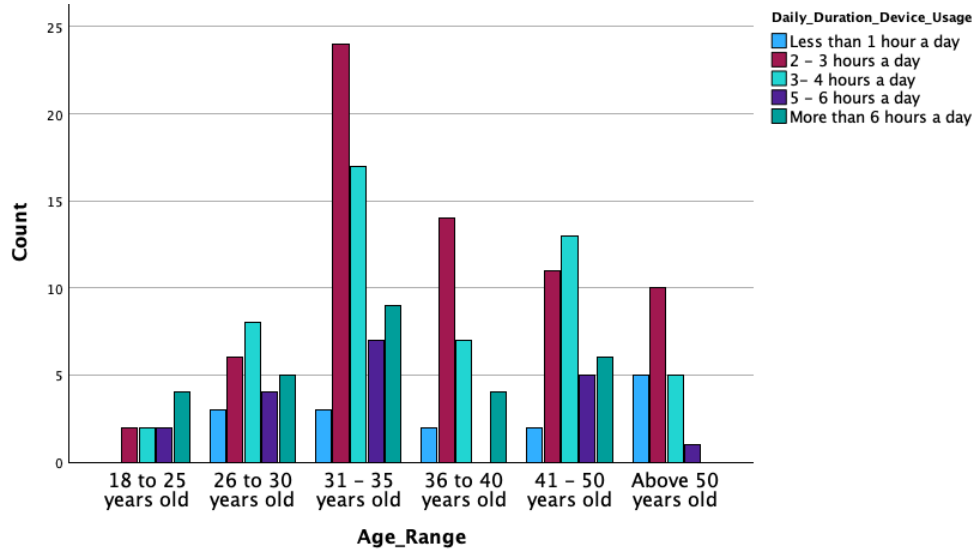

Figure 4-8: Daily device duration on internet services per age group of respondents

4.2.4 *Persona of the average respondent*

The results of the study presented earlier in this chapter allow for the persona of the average respondent of the questionnaire to be inferred. The persona is inferred to possess the following traits:

- Aged between 31 to 35 years
- Resides in Gauteng
- Postpaid customer exclusively to MTN (single-SIM)
- Spends more on mobile services than the national average
- Spends between 2 to 4 hours per day using a mobile device for internet-based services

4.3 Data preparation and coding

The Qualtrics XM survey completion rate from the 181 respondents was 100% due to the researcher setting all questions in the survey as mandatory. Two upfront qualifying questions determined the eligibility of the respondent for the scope of the survey, with 100% eligibility achieved, defined by a respondent owning a smartphone and at least one mobile SIM card registered with a South African mobile network operator.

The researcher exported a .sav file post the data collection on Qualtrics XM, which was then imported into SPSS version 29 for data cleaning, coding, and analysis.

The researcher undertook the following steps to clean the data and prepare for results analysis:

- Confirmed consent and eligibility for respondents to check if any exclusions were required, no exclusions were required as all respondents provided consent and all respondents met the eligibility criteria.
- Performed a missing value analysis utilising the *Analyse Patterns* functionality on SPSS to ascertain the completion rate of the survey, which was 100%.

- Eradicated unnecessary identifiers and variables that were auto generated by Qualtrics XM during the data collection process.
- Confirmed that the data types amongst variables were represented correctly as numerical or categorical data.

The researcher thereafter coded the data with the following steps:

- The Likert scale responses in the survey were coded to numerical values as per Table 4-5 to enable the proceeding confirmatory factor analysis.
- The variables or constructs in the conceptual framework (Figure 2-2) were coded to decipherable acronyms for ease of use (Table 4-6)
- New columns with processed or calculated data were added.

Table 4-5: Coding of Likert Scale responses

Response	Code
Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly agree	5

Table 4-6: Coding of variables

Variable or construct	Code
Digital Transformation	DT
Digital Transformation: Relative Advantage	DTRA
Digital Transformation: Compatibility	DTC
Digital Transformation: Complexity	DTCX
Digital Transformation: Trialability	DTT
Digital Transformation: Observability	DTO
Digital Literacy	DL
Customer Experience	CEX
Customer Value	CV

4.4 Evaluation of the measurement model

4.4.1 *Internal consistency or reliability*

All the items measuring the constructs in the survey were measured for internal consistency using the interim consistency reliability method, the most popular test for internal consistency (Sekaran & Bougie, 2016). This test evaluated whether all the survey items measuring a certain construct can measure the construct independently yet also correlate with another as a subset (Sekaran & Bougie, 2016). Cronbach's alpha measured the extent to which multiple attempts to measure a single construct were correlated, key to ensuring the repeatability of a study independent of the researcher. The acceptability of the value of Cronbach's alpha is included in Table 4-7.

Table 4-7: Internal consistency or Cronbach's alpha acceptability (Field, 2009)

Value of Cronbach's alpha	Acceptability
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 < \alpha$	Unacceptable

The summary of the reliability tests on the individual constructs or variables are presented in Table 4-8. From the five DT adoption characteristics, one characteristic, relative advantage, had a Cronbach Alpha above 0.7, deeming the construct as sufficiently internally consistent. DL and CEX also proved to be sufficiently internally consistent. While CV was unacceptable due to the Cronbach's alpha being less than 0,5m the construct was not discarded at that point and rather optimised in the next step of the data processing.

Table 4-8: Cronbach Alpha results of constructs

Variable or construct	Code	No. of items in survey	Cronbach's alpha	Reliability conclusion
Digital Transformation:	DT			
Relative Advantage	DTRA	6	0.728	Acceptable
Compatibility	DTC	3	0.363	Unacceptable
Complexity	DTCX	3	0.350	Unacceptable
Trialability	DTT	2	0.448	Unacceptable
Observability	DTO	3	0.646	Questionable
Digital Literacy	DL	3	0.835	Acceptable
Customer Experience	CEX	4	0.872	Acceptable
Customer Value	CV	4	0.440	Unacceptable

4.4.2 *Data optimisation*

In the process of conducting a Confirmatory Factor Analysis (CFA) using the *Lavaan* package in *R*, the researcher adopted a systematic approach to optimise the measurement model for enhanced clarity and interpretability of results. The initial model encompassed a comprehensive set of eight variables, each intended to measure underlying latent constructs. To refine the model and focus on the most significant predictors, the researcher scrutinised the R-square values of all eight variables, which indicate the proportion of variance in the observed variables that can be explained by the latent variables they are intended to measure. A threshold of 3% (0.03) was set as the minimum acceptable level of explained variance for optimisation (Zikmund, 2000).

Survey items with R-square values falling below the threshold of 0.03 were considered weakly associated with their corresponding latent constructs or variables and were systematically removed from the model. This step involved careful consideration of both statistical criteria and theoretical justification for the removal of items. The rationale behind setting the threshold was to ensure that the remaining items of variables contributed meaningfully to the understanding of the latent constructs, thereby enhancing the overall model fit and interpretability. This optimisation process resulted in a more streamlined model, which not only performed better in terms of fit indices as presented further in this chapter, but also aligned more closely with theoretical expectations, facilitating clearer insights into the relationships among constructs of interest and enabling hypothesis testing.

The results of the data optimisation are presented in Table 4-9, indicating the removal of four out of five DT adoption characteristics, with relative advantage remaining as the sole measurement characteristic. DT as a variable was then wholly linked to the relative advantage characteristic. Two items of the CV construct were removed to optimise the data for the analysis that followed (refer to optimised model evaluated using confirmatory factor analysis in the next section).

Table 4-9: Data optimisation results

Variable or construct	Code	Cronbach's alpha	Status of variable
Digital Transformation:	DT		
Relative Advantage	DTRA	0.728	Retained
Compatibility	DTC	0.363	Removed
Complexity	DTCX	0.350	Removed
Trialability	DTT	0.448	Removed
Observability	DTO	0.646	Removed
Digital Literacy	DL	0.835	Retained
Customer Experience	CEX	0.872	Retained
Customer Value	CV	0.440	Retained

4.4.3 *Confirmatory factor analysis*

A confirmatory factor analysis (CFA) was performed to evaluate the overall fit of the measurement model and to assess the reliability and validity of the remaining constructs. To effectively assess the validity of the measurement model, the discriminant and convergent validity were evaluated via the composite reliability and average variance (AVE) methods. The model was analysed using Structural Equation Modelling (SEM) of which CFA is a subset of. Factor analysis was applied to indicate which items of the constructs are most applicable for each variable and hence establishing construct validity (Sekaran & Bougie, 2016). The following section presents the validity and reliability test results, measured by CFA and composite reliability. The resultant, optimised measurement model as a result of optimisation on R software, tested for validity and reliability is included in Appendix D.

Figure 4-9 presents a graphical representation of the measurement model with the optimised constructs post optimisation and cleaning, including the factor loading per variable.

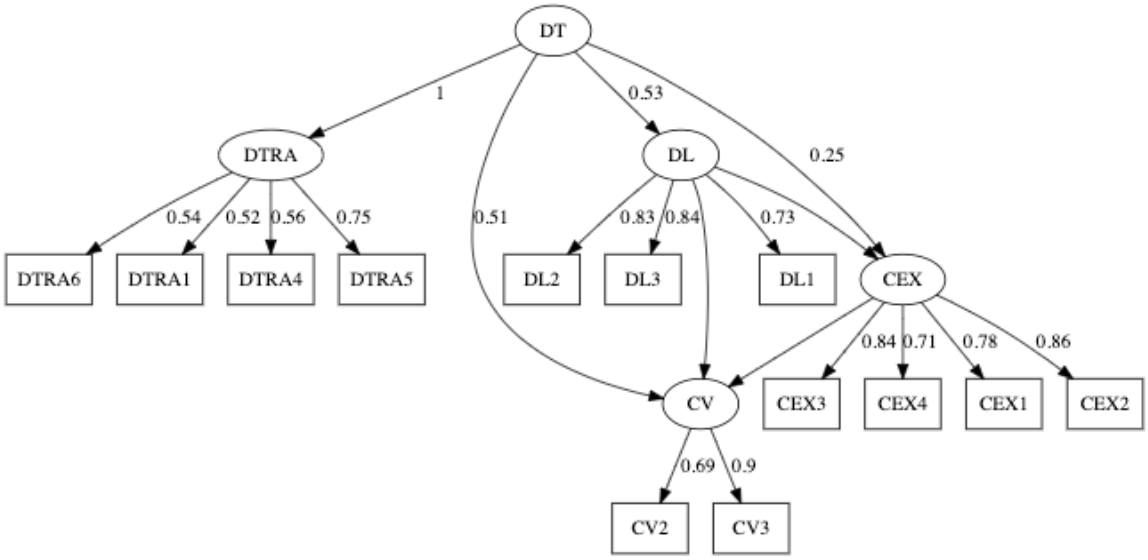

Figure 4-9: Visual representation of the measurement model with factor loadings

4.4.3.1 Composite reliability (CR)

Composite reliability is a measure of internal consistency in scale items, much like Cronbach's alpha (Sekaran & Bougie, 2016). However, where Cronbach's alpha assumes that all items are equally related to a construct, composite reliability accounts for the factor loadings, as a result of the confirmatory factor analysis (Hair et al., 1998). The results are presented in Table 4-10 and all optimised constructs were deemed acceptable.

Table 4-10: Composite reliability of constructs

Variable or construct	Code	Composite reliability (CR)	Status of variable
Digital Transformation:	DT		
Relative Advantage	DTRA	0.772	Acceptable
Digital Literacy	DL	0.835	Acceptable
Customer Experience	CEX	0.872	Acceptable
Customer Value	CV	0.765	Acceptable

4.4.3.2 Average Variance Extracted (AVE)

The average variance extracted of a generic latent variable estimates the extent of the variation of its indicators to the assumed latent variable. As a result, the share of unexplained or error variations can be calculated as 1 – AVE (Fornell & Larcker, 1981). The Variance Extracted measure shows the total amount of variance in the indicators that can be accounted for by the latent construct (Hair et al., 2010). Only first-order factors were considered for the AVE results presented in Table 4-11.

Table 4-11: AVE results of constructs

Variable or construct	Code	AVE
Digital Transformation: Relative Advantage	DTRA	0.4449761
Digital Literacy	DL	0.6461646
Customer Experience	CEX	0.6357973
Customer Value	CV	0.6147755

4.4.3.3 Discriminant Validity

Discriminant validity was tested by determining whether the square root of the AVE per construct was greater than the inter-factor correlations of the construct with the remaining constructs (Fornell & Larcker, 1981). The bivariate correlations between the latent factors, or inter-factor correlations, are indicated in Table 4-12, which were all below the threshold of 0.85, removed the risk of multicollinearity (Field, 2009).

Table 4-12: Inter-factor correlations per construct

Factor	DTRA	DL	CEX	CV
DTRA	1.000			
DL	0.529	1.000		
CEX	0.350	0.321	1.000	
CV	0.593	0.375	0.332	1.000

Table 4-13 indicates the square roots of the AVE per latent variable. It can be deduced that all the square roots are greater than each construct's correlation with the remaining constructs i.e. the inter-factor correlations. Hence, all factors passed the discriminatory validity test.

Table 4-13: Square root of AVE per factor

Factor	Square root of AVE
DTRA	0.6671
DL	0.8038
CEX	0.7972
CV	0.7841

4.4.3.4 Fit Indices

A successful statistical analysis where a model with 1199 degrees of freedom was conducted using the *Lavaan* package in R, and the iterative process of fitting the model to the data from the study was completed without error in 39 iterations. The fit indices aim to quantify how well the conceptual model for the study fits the data obtained, the results of which are presented in Appendix D.

4.4.3.5 Goodness of fit

The tests for goodness of the model fit were conducted to establish how accurate the model is in terms of predicting data. The results of this test are presented in Table 4-14, indicating that all tests for goodness of fit were passed.

Table 4-14: Results of Goodness of fit tests

Test for fit	Result	Threshold	Verdict
CFI	0.932	> 0.90	Pass
GFI	0.988	> 0.90	Pass
NFI	0.967	> 0.90	Pass
RMSEA	0.078	< 0.08 or less for goodness of fit	Pass
SRMR	0.049	< 0.08	Pass
NNFI	0.910	> 0.95	Pass
TLI	0.910	> 0.95	Pass
AGFI	0.979	> 0.95	Pass
RFI	0.927	close to 1 indicates a good fit	Pass
PNFI	0.892	> 0.50	Pass
IFI	0.933	> 0.90	Pass
Chi-squared	0.000	Must be as close to zero as possible (Hu & Bentley, 1999)	Pass

4.4.3.6 Regressions

The factor loadings, mediated paths and results of the multiple regression analysis resulting from the CFA are included in Appendix D.

4.5 Hypothesis testing

Prior to regression analysis, the researcher first confirmed that the data satisfied the assumptions of regression, which were as follows:

- **Assumption 1:** The dependent variable is measured on a continuous scale.

- **Assumption 2:** There is one independent variable, which is continuous and one mediator variable that is dichotomous.
- **Assumption 3**: Observations must be independent.
- **Assumption 4:** There is a linear relationship between the dependent variable and the independent variable for each group of the dichotomous mediator variable.
- **Assumption 5**: The data shows homoscedasticity.
- **Assumption 6:** The data does not show multicollinearity.
- **Assumption 7:** There are no significant outliers, high leverage points or highly influential points.
- **Assumption 8:** The residuals (errors) are approximately normally distributed.

Thereafter the regression analysis results are presented according to the hypotheses of the study.

4.5.1 *Hypothesis 1: Digital transformation and Customer experience*

4.5.1.1 Regression analysis

Null Hypothesis: The adoption of DT does not have a positive effect on CEX.

Alternative Hypothesis: The adoption of DT does have a positive effect CEX.

Table 4-15 presents descriptive statistics for the two variables, CEX and DT. DT is the equivalent of DTRA, as four sub-items on the DT construct were eliminated during the optimisation process, with relative advantage as the remaining DT adoption characteristic. For CEX, the mean is 3.3757 with a standard deviation of 0.85822, based on a sample size of 181. Similarly, for the DT variable, the mean is 3.9655, the standard deviation is 0.81683.

Table 4-15: Descriptive statistics for CEX and DT

Variable	Mean	Std. Deviation	N
CEX	3.3757	0.85822	181
DT	3.9655	0.81683	181

The model summary in Table 4-16 presents statistical metrics for a regression analysis with the dependent variable CEX and DT as the predictor. The R Square value, indicating the proportion of variance in the dependent variable explained by the predictor, is 0.069, suggesting a relatively low explanatory power. The Durbin-Watson statistic, measuring the presence of autocorrelation in residuals, is 1.895, indicating the absence of strong autocorrelation (King, 1992). The constant term is included as a predictor in the model.

Table 4-16: CEX/DT Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.263[b]	0.069	0.064	0.83025	1.895

a. Dependent Variable: CEX b. Predictors: (Constant), DT

The analysis of variance (ANOVA) table provides information about the sources of variation in the CEX-DT regression model. Table 4-17 includes three main components: Regression, Residual, and Total. The Regression component's sum of squares is 9.191, with 1 degree of freedom, resulting in a mean square of 9.191. The associated F-statistic is 13.333, and the p-value is less than 0.001, suggesting that the regression model is statistically significant.

Table 4-17: CEX/DT ANOVA[a]

Model		Sum of Squares	Degrees of Freedom	Mean Square	F	Sig.
1	Regression	9.191	1	9.191	13.333	<.001[b]
	Residual	123.387	179	0.689		
	Total	132.578	180			

a. Dependent Variable: CEX b. Predictors: (Constant), DT

Table 4-18 includes the results of the regression analysis with CEX as the dependent variable and DT as the predictor. The t-statistic for DT is 3.651, with its p-value also statistically significant (<0.001). These coefficients provide information about the intercept and the impact of the predictor DT on the dependent variable CEX, suggesting that there is a positive relationship between DT and CEX.

Table 4-18: CEX/DT Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.279	0.307		7.430	<0.001
	DT	0.277	0.076	0.263	3.651	<0.001

a. Dependent Variable: CEX

The regression equation based on the coefficients presented in Table 4-18 is as follows:

$$CEX = 2.279 + 0.263*DT$$

In the above regression equation, CEX is the dependent variable and DT is the predictor or independent variable. The constant 2.279 is the estimated y-axis intercept when DT is equal to zero, and the 0.263 coefficient for DT represents the rate of change of CEX for each unit change in DT i.e. the quantifying the impact of DT on CEX. The distribution residuals included in Appendix D confirms the regression assumption that the residuals were normally distributed.

4.5.1.2 Conclusion for hypothesis 1

The hypothesis testing results provide substantial evidence at a 95% confidence level to reject the null hypothesis, suggesting that DT does indeed have a significant effect on CEX. The regression analysis yielded a statistically significant relationship between DT and CEX, as evidenced by the low p-value (<0.001) associated with the predictor or independent variable DT. The positive coefficients indicate a positive impact of DT on CEX, supporting the alternative hypothesis. Therefore, based on the analysis, there is sufficient statistical reason to conclude that there is a meaningful and positive impact of the adoption of DT, through observing relative advantage, on CEX.

4.5.2 *Hypothesis 2: Digital transformation and Customer value*

4.5.2.1 Regression analysis

Null Hypothesis: The adoption of DT does not have a positive effect on CV.

Alternative Hypothesis: The adoption of DT does have a positive effect CV.

Table 4-19

Table 4-15 presents descriptive statistics for CV and DT (the equivalent of DTRA). For CV, the mean is 3.3122 with a standard deviation of 1.02906, based on a sample size of 181. Similarly, for DT, the mean is 3.9655, the standard deviation is 0.81683.

Table 4-19: Descriptive statistics for CV and DT

Variable	Mean	Std. Deviation	N
CV	3.3122	1.02906	181
DT	3.9655	0.81683	181

The model summary in Table 4-28Table 4-20Table 4-16 presents statistical metrics for a regression analysis with the dependent variable CV and DT as the independent variable. The R Square value, is 0.184 suggesting that approximately 18.4% of the variance in CV is accounted for by DT, suggesting a relatively low explanatory power. The Durbin-Watson statistic has a value of 2.096, indicating the absence of strong autocorrelation (King, 1992). The constant term is included as a predictor in the model.

Table 4-20: CV/DT Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.428[b]	0.184	0.179	0.93241	2.096

a. Dependent Variable: CV b. Predictors: (Constant), DT

The ANOVA data in Table 4-21 assesses the significance of the regression model with CV as the dependent variable and DT as the predictor, indicating a highly significant overall fit. The F-statistic, measuring the ratio of explained variance to unexplained variance, is 40.249, and the associated p-value is less than 0.001, suggesting a statistically significant relationship between CV and DT.

Table 4-21: CV/DT ANOVA[a]

Model		Sum of Squares	Degrees of Freedom	Mean Square	F	Sig.
1	Regression	34.992	1	34.992	40.249	<.001[b]
	Residual	155.621	179	0.869		
	Total	190.613	180			

a. Dependent Variable: CV b. Predictors: (Constant), DT

Table 4-22 includes the results of the regression analysis with CV as the dependent variable and DT as the predictor. The t-statistic for DT is 6.344, with its p-value also statistically significant (<0.001), suggesting that the coefficient is statistically significant.

Table 4-22: CV/DT Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.172	0.344		3.402	<.001
	DT	0.540	0.085	0.428	6.344	<.001

a. Dependent Variable: CV

The regression equation based on the coefficients presented in Table 4-22 is as follows:

$$CV = 1.172 + 0.428*DT$$

In the above regression equation, CV is the dependent variable and DT is the predictor or independent variable. The constant 1.172 is the estimated y-axis intercept when DT is equal to zero, and the 0.428 coefficient for DT represents the rate of change of CV given a change in DT i.e. quantifying the impact of DT on CV. The distribution residuals included in Appendix D confirms the regression assumption that the residuals were normally distributed.

4.5.2.2 Conclusion for hypothesis 2

The hypothesis testing results provide substantial evidence at a 95% confidence level to reject the null hypothesis and support the alternative hypothesis. The regression analysis indicates DT does have a significant impact on CV The coefficient for DT is statistically significant ($p < 0.001$), with a positive value, suggesting that changes in DT are associated with changes in CV. Therefore, based on the analysis, there is sufficient statistical reason to conclude that there is a positive impact of the adoption of DT, through observing relative advantage, on CV.

4.5.3 *Digital transformation and digital literacy*

4.5.3.1 Regression analysis

This section applies to testing hypotheses 3 and 4, testing whether DL influences the relationship between DT and CEX, and DT and CV. First, it is necessary to test if DT has a relationship with DL.

Null Hypothesis: The adoption of DT does not have an influence on DL.

Alternative Hypothesis: The adoption of DT has an influence on DL.

Table 4-23 presents descriptive statistics for, DL and DT (the equivalent of DTRA).

Table 4-23: Descriptive statistics for DL and DT

Variable	Mean	Std. Deviation	N
DL	4.2634	0.76418	181
DT	3.9655	0.81683	181

The model summary in Table 4-24Table 4-20Table 4-16 presents statistical metrics for a regression analysis with the dependent variable DL and DT as the independent variable. The R Square value, is 0.182 suggesting that approximately 18.2% of the variance in DL is accounted for by DT. The standard error of the estimate is 0.69319, providing a measure of the dispersion of actual values around the regression line. The Durbin-Watson statistic, with a value of 2.162, suggests a moderate level of autocorrelation in the residuals (King, 1992).

Table 4-24: DL/DT Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.426[b]	0.182	0.177	0.69319	2.162

a. Dependent Variable: DL b. Predictors: (Constant), DT

The ANOVA results in Table 4-25 for the regression model with DL as the dependent variable and DT as the predictor indicates significant overall model fit. The regression model accounts for a substantial portion of the variance, as evidenced by the significant F-statistic ($F = 39.752$, $p < 0.001$). These findings suggest that the model, with DT as a predictor, significantly contributes to explaining the variance in the dependent variable DL.

Table 4-25: DL/DT ANOVA[a]

Model		Sum of Squares	Degrees of Freedom	Mean Square	F	Sig.
1	Regression	19.101	1	19.101	39.752	<0.001[b]
	Residual	86.012	179	0.481		
	Total	105.114	180			

a. Dependent Variable: DL b. Predictors: (Constant), DT

Table 4-26 includes the results of the regression analysis with DL as the dependent variable and DT as the predictor. The coefficient for DT is 0.399, with a standard error of 0.063 and a beta (standardized coefficient) of 0.426. The beta suggests that this relationship is significant ($t = 6.305$, $p < 0.001$). Both the constant and DT coefficients demonstrate statistical significance, providing valuable insights into the strength and direction of the relationship between the predictor and the dependent variable.

Table 4-26: DL/DT Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.682	0.256		10.473	<0.001
	DT	0.399	0.063	0.426	6.305	<0.001

a. Dependent Variable: DL

The regression equation based on the coefficients presented in Table 4-26 is as follows:

$$DL = 2.682 + 0.426*DT$$

In the above regression equation, DL is the dependent variable and DT is the predictor or independent variable. The constant 2.682 is the estimated y-axis intercept when DT is equal to zero, and the 0.426 coefficient for DT represents the rate of change of DL given a change in DT i.e. confirming and quantifying the impact of DL on DT, thereby establishing a relationship between the two variables. The distribution residuals included in Appendix D confirms the regression assumption that the residuals were normally distributed.

4.5.3.2 Conclusion for hypothesis

The hypothesis testing results provide substantial evidence at a 95% confidence level to reject the null hypothesis and support the alternative hypothesis. The regression analysis indicates DT does have a significant impact on DL, as indicated by the low p-values associated with the regression coefficients. The positive standardised coefficient (beta) for DT further supports the alternative hypothesis, indicating that an increase in the adoption of digital transformation by consumers is associated with a positive and significant impact on DL. Therefore, based on the statistical findings, we have sufficient evidence to conclude that there is a meaningful influence of the adoption of DT on DL, supporting the alternative hypothesis and highlighting the importance of considering DT as a significant factor in understanding and enhancing DL.

4.5.4 *Hypothesis 3: Digital literacy and customer experience*

4.5.4.1 Regression analysis

Null Hypothesis: DL does not have an influence on CEX.

Alternative Hypothesis: DL has an influence on CEX.

Table 4-27 presents descriptive statistics for the two variables, CEX and DL.

Table 4-27: Descriptive statistics for CEX and DL

Variable	Mean	Std. Deviation	N
CEX	3.3757	.85822	181
DL	4.2634	.76418	181

The model summary in Table 4-28 presents statistical metrics for a regression analysis with the dependent variable CEX and DL as the independent variable. The R Square value is 0.079 suggesting that approximately 7.9% of the variance in CEX is accounted for by DL. The correlation coefficient (R) is 0.282, indicating a weak positive correlation between the predictors and the dependent variable. The Durbin-Watson statistic is 1.934, which falls below 2, suggesting the possible presence of autocorrelation in the residuals (King, 1992). The model includes a constant term and one predictor, DL, in predicting the dependent variable CEX.

Table 4-28: CEX/DL Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.282[b]	0.079	0.074	0.82575	1.934

a. Dependent Variable: CEX b. Predictors: (Constant), DL

The ANOVA results in Table 4-29Table 4-25 reveals significant results. The regression model, with predictors including a constant and DL, accounts for a total sum of squares of 10.523. The F-statistic is 15.433, and the associated p-value is less than 0.001, indicating that the model is statistically significant in explaining the variance in the dependent variable CEX. These findings suggest that the predictors, specifically DL, contribute significantly to explaining the variability in CEX.

Table 4-29: CEX/DL ANOVA[a]

Model		Sum of Squares	Degrees of Freedom	Mean Square	F	Sig.
1	Regression	10.523	1	10.523	15.433	<0.001[b]
	Residual	122.055	179	0.682		
	Total	132.578	180			

a. Dependent Variable: CEX b. Predictors: (Constant), DL

Table 4-30 includes the results of the regression analysis with CEX as the dependent variable and DL as the predictor. The constant term has an unstandardised coefficient of 2.027, with a standard error of 0.349 and a t-value of 5.810, indicating a significant contribution to the model. The t-value for DL is 3.928, and the associated p-value of 0.554 is more than 0.05, indicating that DL does not significantly contribute to predicting CEX and hence does not have an effect on the relationship between DT and CEX. The distribution residuals included in Appendix D confirms the regression assumption that the residuals were normally distributed.

Table 4-30: CEX/DL Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.027	0.349		5.810	<0.001
	DL	0.316	0.081	0.282	3.928	<0.0554

a. Dependent Variable: CEX

4.5.4.2 Conclusion for hypothesis 3

The results of the hypothesis testing do not provide compelling evidence at a 95% confidence level to reject the null hypothesis that DL does not have an influence on CEX. The regression analysis revealed a non-statistically significant relationship between DL and CEX, as evidenced by the high p-value associated with the predictor variable DL. Therefore, the alternative hypothesis, asserting that DL has an influence on CEX, is not supported by the data. In conclusion, there is no empirical support from this study for the notion that DL plays a significant role in shaping CEX in the presence of DT.

4.5.5 *Hypothesis 4: Digital literacy, customer experience and customer value*

4.5.5.1 Regression analysis

Null Hypothesis: DL and CEX do not have an influence on CV.

Alternative Hypothesis: DL and CEX have an influence on CV.

Table 4-31 presents descriptive statistics for three variables, CV, DL and CEX.

Table 4-31: Descriptive statistics for CV, DL and CEX

Variable	Mean	Std. Deviation	N
CV	3.3122	1.02906	181
DL	4.2634	0.76418	181
CEX	3.3757	0.85822	181

The model summary in Table 4-32 indicates that the coefficient of determination (R Square) is 0.128, indicating that approximately 12.8% of the variance in the dependent variable CV is explained by the predictors (constant, CEX, and DL). The Durbin-Watson statistic is 2.035, which is close to 2, suggesting that there may be minimal autocorrelation in the model residuals (King, 1992). The predictors include a constant, CEX, and DL, and the dependent variable is CV.

Table 4-32: CV/CEX/DL Model Summary[a]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.358[b]	0.128	0.118	0.96638	2.035

a. Dependent Variable: CV b. Predictors: (Constant), CEX, DL

The ANOVA data in Table 4-33 assesses the overall significance of the regression. The regression model, with predictors (constant, CEX, and DL) for the dependent variable CV, is statistically significant as indicated by a significant F-statistic (F = 13.053) with a corresponding p-value of less than 0.001. This suggests that the model explains a significant proportion of the variance in the dependent variable. These

results support the conclusion that the predictors collectively contribute significantly to explaining the variability in the dependent variable CV.

Table 4-33: CV/CEX/DL ANOVA[a]

Model		Sum of Squares	Degrees of Freedom	Mean Square	F	Sig.
1	Regression	24.380	2	12.190	13.053	<0.001[b]
	Residual	166.233	178	0.934		
	Total	190.613	180			

a. Dependent Variable: CV b. Predictors: (Constant), CEX, DL

Table 4-34 presents the regression coefficients where the dependent variable is CV and the predictors are DL and CEX, along with the constant term. The constant term is 1.119, with a standard error of 0.445 and a t-statistic of 2.513, yielding a significant p-value of 0.013. For the predictor DL, the unstandardised coefficient is 0.306, the standard error is 0.098, and the t-statistic is 3.120, with a significant p-value of 0.062. Similarly, for the predictor CEX, the unstandardised coefficient is 0.263, the standard error is 0.087, and the t-statistic is 3.003, with a significant p-value of 0.070. These results indicate that both DL and CEX do not have statistically significant effects on the dependent variable CV. The distribution residuals included in Appendix D confirms the regression assumption that the residuals were normally distributed.

Table 4-34: CV/CEX/DL Coefficients[a]

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.119	0.445		2.513	0.013
	DL	0.306	0.098	0.228	3.120	0.062
	CEX	0.263	0.087	0.219	3.003	0.070

a. Dependent Variable: CV

4.5.5.2 Conclusion for hypothesis 4

The results of the hypothesis testing do not provide sufficient evidence to reject the null hypothesis at a 95% confidence level that DL and CEX does not have an influence on CV. The regression analysis revealed non-statistically significant coefficients for both DL and CEX in the regression equation, with p-values of 0.062 and 0.070, respectively. This indicates that changes in DL and CEX are not associated with changes in CV. Therefore, the null hypothesis that DL and CEX do not have an influence on CV is not rejected, indicating that DL does not have an influence on CV, and CEX also does not have an influence on CV (as an additional insight not initially hypothesised in the conceptual model).

4.5.6 *Summary of hypothesis testing results*

Hypothesis	Description	Result
H1	**The adoption of digital transformation will have a positive impact on CEX.**	Support
H1a	The relative advantage characteristic of DT adoption will have a positive impact on CEX.	Support
H1b	The compatibility characteristic of DT adoption will have a positive impact on CEX.	Reject
H1c	The complexity characteristic of DT adoption will have a positive impact on CEX.	Reject
H1d	The trialability characteristic of DT adoption will have a positive impact on CEX.	Reject
H1e	The observability characteristic of DT adoption will have a positive impact on CEX.	Reject
H2	**The adoption of digital transformation will have a positive impact on CV.**	Support
H2a	The relative advantage characteristic of DT adoption will have a positive impact on CV.	Support
H2b	The compatibility characteristic of DT adoption will have a positive impact on CV.	Reject
H2c	The complexity characteristic of DT adoption will have a positive impact on CV.	Reject
H2d	The trialability characteristic of DT adoption will have a positive impact on CV.	Reject
H2e	The observability characteristic of DT adoption will have a positive impact on CV.	Reject
H3	DL will have a mediating effect on the relationship between DT adoption and CEX.	Reject
H4	DL will have a mediating effect on the relationship between DT adoption and CV.	Reject
Bonus result from H3 and H4 test	DT has an influence DL.	Accept
Bonus result from H4 test	CEX has an effect on CV.	Reject

CHAPTER 5. DISCUSSION OF RESULTS

5.1 Introduction

The purpose of this research study was to determine the potential impact of DT on CEX and CV. The research questions presented in Chapter 1 and hypotheses formulated in Chapter 2 aimed to examine whether there was a causal relationship between the variables, and whether the relationship is positive or negative. This chapter discusses the results of the study, highlighting the extent to which the findings confirm or contradict the literature presented in Chapter 2, and whether the results fit the conceptual framework adapted from the Diffusion of Innovation theory (Rogers, Diffusion of Innovations, 1983).

5.2 Hypothesis 1: The adoption of digital transformation has a positive impact on customer experience.

The results of the study revealed that the adoption of DT has a positive and significant relationship on CEX, in the context of South African MNO customers adopting digital channels, devices and experiences. The coefficient of DT in the regression analysis was +0.263. The positive value indicates a positive correlation and influence of DT on CEX or, that for each unit increase of DT, there is a 0.263 unit increase in CEX, which supports the hypothesis that DT has a positive effect on CEX. It is important to note that the adoption of DT was defined according to the five characteristics from the *Diffusion of Innovations* theory by Rogers (1983) which are: relative advantage; compatibility; complexity; trialability; observability. However, the data optimisation process revealed that four out of the five characteristics were not statistically significant in this study and were removed from the confirmatory factor analysis. This may suggest that South African consumers do not place importance on the eliminated characteristics or that the sample consisted mostly of early adopters according to the categories of *Diffusion of Innovation* adopters (Rogers, 2003). The spread or diffusion of DT may not be widespread in the South African context and the peak of adoption

may not be reached yet. The partial application of the theory attributes in this study was similar to the results from the Italian SME study by Matarazzo et al., (2021) where two out of four dynamic capabilities were deemed significant. In this study, the adoption of DT was exclusively measured by the relative advantage characteristic, the degree to which adopting DT is perceived to be superior to the current practices observed by respondents. The study then suggests that adopting digital channels, devices and experiences will have a positive impact on CEX when customers can observe that these DT initiatives have a greater advantage in their lives than their current practices. For the sample which consisted mostly of 31–35-year-old MTN customers in Gauteng who were moderate to high data users, communicating the relative benefit to using a chatbot, mobile application or website to reach their MNO versus calling a call centre is imperative to drive DT adoption and hence CEX. This finding is beneficial to the customer care teams of MNOs, which may prevent or avoid negative customer sentiment by driving digital customer care channels and offers as a first point.

The literature reviewed focused on the adoption of DT within organisations (supply-side) and linked this to an improvement in CEX for specific instances in mostly developed markets (Matarazzo et al., 2021; Sahu et al., 2018; Shrivastava, 2017). The results from this study are useful in understanding the positive relationship between the adoption of DT amongst consumers (demand-side) and thir CEX, for the telco market in a developing country. This study also confirmed the findings from Awadhi et al. (2021) which revealed a positve relationship between DT and closing the gap between customer expecations and CEX in a Middle-Eastern context.

5.3 Hypothesis 2: The adoption of digital transformation has a positive impact on customer value.

The study results revealed that the adoption of DT has a positive and significant relationship on CV. The coefficient of DT in the regression analysis with CV was +0.428. The positive value indicates a positive correlation and influence of DT on CV or, that for each unit increase of DT, there is a 0.428 unit increase in CV, which

supports the hypothesis that DT, with relative advantage as the sole adoption characteristic, has a positive effect on CV. The beta regression coefficient of DT-CV was higher than DT-CEX, indicating that the adoption of DT not only has a positive effect on CV, but also has a greater influence on CV than CEX. This is especially critical to note in a constrained South African context where MNOs are redirecting investment and “pumping billions” to battle loadshedding (Labuschagne, 2023), which may negatively affect strategic digital investments into initiatives like a chatbot powered by generative AI, and the enhancement of a mobile self-service application. This study implies that DT initiatives are not just enticing add-ons to improve CEX but could also be significant levers for increasing CV and loyalty. Considering that the respondents all indicated a monthly spend higher than the national average, an indication of customers willing to spend more on their MNO services when they interact with the MNO digitally is a significant business implication and opportunity for product design and marketing teams across operators.

While this study affirms the finding from Boston Consulting Group that the top priority for DT amongst telco operators is CEX, this study also indicates that increasing CV is a greater benefit than the improvement on CEX when driving adoption of DT from consumers. The literature review identified a research gap on the relationship between the adoption of DT by consumers and CV, as the research offered insights on the positive relationship between an organisation’s internal digital maturity and organisational performance. While organisation performance can be linked to customer value (Shrivastava, 2017), internal digital maturity is skewed towards the supply-side rather than understanding the demand-side of DT, which this research study offered insight on supported by the *Diffusion on Innovation* theory.

5.4 Hypothesis 3: Digital literacy will have a mediating effect between digital transformation adoption and customer experience

This study did not find a relationship between DL and CEX. There was a positive and significant relationship found between DL and DT, where an increase in the adoption of DT would cause an increase in DL, but there was insufficient statistical evidence to then draw a relationship between DL and CEX during the DL-CEX CFA analysis. Therefore, DL in this study did not prove to have a mediating effect on the relationship between DT and CEX in this study.

The positive DL-DT relationship confirmed findings from the literature of Deschenes (2023) and Moleko (2022) where respondents with higher levels of DL were found to have more confidence and adaptability in adopting new technologies. The lack of positive relationship found between DL and CEX in this study however, contradicts the findings of Cetindamar et al. (2021), Kohnke (2016), Nikou et al. (2022), where respondents displayed positive attitudes and sentiments, adjacent to CEX when using new digital technologies, when they possessed a higher level of DL. The study results were more aligned to Shrivastava (2017) and Kabakus et al., (2023), where customer's adoption of digital technologies and perception of service i.e. CEX, evolved regardless of DL level. In other words, CEX and DT showed a positive relationship regardless of DL. The observation in this study could be attributed to the nature of the sample, where respondents indicated data usage and spend above the national average which could imply that respondents' DL were skewed to the high-end. Once customers have a base-level of DL and are comfortably able to navigate a smartphone, their customer sentiments may be indifferent even if their DL were to increase to a more advanced level. Another explanation behind this finding is that DL can be a broad concept with varying definitions (Burzynska et al., 2023; Kabakus et al., 2023) and in the context of this study, a base level of DL was tested, where for example, respondents were asked to indicate their level of comfort when buying airtime on their phone (as per Appendix B). Respondents without a smartphone and the ability to use one, were excluded from this study.

5.5 Hypothesis 4: Digital literacy will have a mediating effect between digital transformation adoption and customer value

While a positive relationship was proved between DL and DT, there was no significant relationship found between DL and CV. Therefore, DL this study did not prove to have a mediating effect on the relationship between DT and CV, a beneficial impact of DT. The positive and significant relationship proved via hypothesis 2 testing is unaffected by the presence of DL in this study.

This finding could also be attributed to the reasons provided in the section above, describing that the sample of the study had a base-level of DL that was sufficient to enable the adoption of DT but not affect the benefits derived.

5.6 Additional hypotheses: Customer experience and customer value

The hypothesis testing of hypothesis 4 also provided an insight on the relationship between CEX and CV, that was not part of the initial research objectives. There was no significant relationship found between CEX and CV in this study, contradictory to findings from Boston Consulting Group (2021) which determined via a global executive survey that enabling a superior CEX through digital technologies can provide additional and incremental growth on CV. This also contradicts other literature which indicate that an improvement in CEX should influence the customer to spend more or remain with a provider for longer, inherently increasing CV (Huseynli, 2022; Kampa, et al., 2023; McKinsey & Company, 2022; Sterne, 2023). It is recommended for future research to assess this relationship more systematically and with a higher number of items per construct.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The final chapter of this report provides a summary of the principal conclusions from the results of the study related to the research questions which prompted the research. There were 181 respondents to the study, most of whom resided in Gauteng and were registered with MTN as their primary MNO. The sample was also characteristic of high data users who spent a moderate amount of time on their smartphones using internet-based services. The contributions to theory are then provided followed by recommendations or implications for business. The chapter concludes with a view of the limitations of this research study and suggestions for future research.

6.2 Principal conclusions

The purpose of this study was to investigate the impact of the adoption of DT by South African MNO customers on their CEX and CV. A literature review of studies on the topic were almost extensively on the supply-side of DT in the internal business context or myopic to a specific developed market context or was qualitative (refer to Appendix C for a full summary of the research gaps identified on literature). This study sought to address the identified research gap by contributing to the academic knowledge on DT in South Africa, in the consumer-focused telecommunications industry. Rogers' (1983) *Diffusion of Innovation*s theory was adopted and adapted to investigate the relationship between the constructs in the study and answer the research questions.

The primary research question was: ***What is the impact of digital transformation (DT) adoption on customer experience (CEX) and customer value (CV) in the South African mobile telecommunications sector?*** This study found that DT has a significant and positive relationship with both CEX and CV, although a stronger relationship was observed with CV, thereby answering the primary research question. The findings to the secondary research questions are unpacked below. Data optimisation revealed that four out of five characteristics adapted from the *Diffusion of*

Innovations theory were statistically insignificant in this study and were hence removed from the confirmatory factor analysis. The most significant factor from the theory for the adoption of DT proved to be relative advantage, which was progressed to the confirmatory factor analysis. The elimination of four innovation characteristics potentially indicated that the diffusion of DT may not be widespread in South African context and the peak of DT adoption has not been reached yet.

6.2.1 *Research question 1: What is the impact of DT adoption in the SA mobile telco industry on CEX?*

The hypothesis derived from the first research question (H1) was supported by the results of the study, with the adoption of DT indicating a positive and significant relationship with CEX. The regression analysis coefficients helped quantify the impact of DT, with +0.263-unit change in CEX for a unit change in DT. As stated above, one out of the five theory characteristics proved to be significant, therefore H1a was supported but H1b, H1c, H1d, and H1e were rejected.

6.2.2 *Research question 2: What is the impact of DT adoption in the SA mobile telco industry on CV?*

The hypothesis derived from the second research question (H2) was supported by the results of the study, with the adoption of DT indicating a positive and significant relationship with CV. The regression analysis coefficients helped quantify the impact of DT, with +0.428-unit change in CV for a unit change in DT. The coefficients for both H1 and H2 indicated that DT has a stronger influence on CV than CEX. One out of the five theory characteristics proved to be significant, therefore H2a was supported but H2b, H2c, H2d, and H2e were rejected.

6.2.3 *Research question 3: What is the effect of DL on the relationship between DT adoption in the SA mobile telco industry and CEX?*

This study did not find a significant or indirect mediator effect of DL on the relationship between DT and CEX, hence H3 was rejected. While a positive and significant relationship was found between DT and DL, where a +0.426-regression coefficient was determined, there was no significant relationship found between DL and CEX.

6.2.4 *Research question 4: What is the effect of DL on the relationship between DT adoption in the SA mobile telco industry and CV?*

This study did not find a significant or indirect mediator effect of DL on the relationship between DT and CV, hence H4 was rejected. While a positive and significant relationship was found between DT and DL, where a +0.426-regression coefficient was determined, there was no significant relationship found between DL and CV.

6.3 Contribution to theory

The results from the study confirmed literature on the positive impact of the adoption of DT on CEX and CV and contributed to the research gap identified on the demand-side of the adoption of DT, and in the context of the telecommunications industry in South Africa.

The results from the study on the mediating effect of DL on the relationships between DT-CEX and DT-CV mostly contradicted the academic literature reviewed however, this was explained by the nature of the sample base and structure of survey. The *Diffusion of Innovations* theory proved to be a useful theoretical route of the study, more applicable to understanding the demand-side impact rather than the supply-side studies from previous literature which employed *Dynamic Capabilities* theory. Not all the innovation characteristics from Rogers' (1983) proved to be significant for this study, however a clear conclusion was that relative advantage is the most important attribute to consider when driving digital technologies, products, channels, and experiences for South African consumers with traits similar to the sample.

The quantitative research approach and online sampling questionnaire method for data collection proved to be beneficial in determining causal relationships amongst the variables from the theory. Operationalising the concepts of the theory into measurable variables allowed the study to conclude a higher quantifiable impact of DT on customer value relative to customer experience. The research approach and methodology also allow for this study to be replicable with high generalisability to multiple organisations, as opposed to the single case study approaches observed in previous studies (Baird & Raghu, 2015). The convenience, non-probability sampling design used as the sampling method to collect data from South African telecommunications customers also contributed to understanding the demand-side perspective of the *Diffusion of Innovations Theory*, supplementing a previous supply-side study conducted by Steiber et. al. (2021).

In the context of the South African mobile telecommunications industry, the study contributes to the understanding of how customers receive digitally transformed elements when interacting with their MNO and can assist practitioners in the industry to make decisions on how to better serve customers digitally based on the elements they value, as explored in the study through the innovation attributes.

6.4 Recommendations for management

The positive quantitative impact revealed between the adoption of DT on CEX and CV can inform telecommunications practitioners on where to direct investment and business resources.

The study found that DT had a stronger positive impact on CV than CEX, which is important for telcos in the South African context as immense capital is redirected to battle loadshedding and away from digital transformation investment. The results show that investing in DT and driving the adoption of DT amongst consumers should not be a secondary business priority for enticement and luxury but considered as a significant lever to increase CV and loyalty. Despite the mature telco profile of the respondents, the higher impact on CV indicates that there is still an opportunity for MNOs to capture

more value from these customers via driving digital initiatives. The positive relationship between DT and CEX reaffirmed that driving digital initiatives is important for customer sentiment and satisfaction, and practitioner resource investment is recommended to align accordingly.

Relative advantage was revealed as the most significant DT adoption characteristic indicating that South African MNO customers place high value on utilising new services and technologies if these prove to be more beneficial than their current practices. It is recommended for telco practitioners to lean on this insight in their go-to-market strategies for new digital initiatives. For example, it would be impactful to market a chatbot to consumers by communicating that there would be no waiting on a phone call to speak to a call centre agent and information is available 24x7 on a chatbot. Customer care teams of MNOs may prevent or avoid negative customer sentiment by driving digital customer care channels and offers as a first point over directing customers to non-digital channels.

While the analysis of DL as a mediator variable on DT-CEX and DT-CV was proved to be insignificant, it is worthwhile for telco practitioners to note the positive and significant relationship observed between DT and DL. Increasing the adoption of DT amongst consumers is beneficial to their DL levels which then can increase the addressable base for future digital initiatives, as customers become more accustomed and knowledgeable in navigating digital technologies.

6.5 Research limitations and suggestions for future research

The respondents of the study were skewed to one province in South Africa and one MNO, Gauteng and MTN respectively, and fit the profile of relatively mature customers with all respondents spending higher than the national average with their MNO, and 60% using more data than the monthly national average. Although all ages were fairly represented, the sample is not a true reflection of all MNO customers in South Africa and it is suggested that future studies strive for a broader representation across region,

spend, data usage and customer profile (postpaid versus prepaid) for higher generalisability.

The design of the research questionnaire was also a source for suggestions. The cross-sectional design did not allow for a time analysis of the causality-based relationships between DT-CEX and DT-CV but analysed responses at a point in time. For future research, a longitudinal study may be beneficial to understand how the relationships between the variables evolve over time. The quantitative method may not have allowed for nuances and deeper sentiment to be identified from respondents, which would be critical in a study concerning CEX. Although self-completion removed interview bias, a mixed-method study in the future with ethnographic interviews is suggested for richer customer insights. Respondents completed the survey online by themselves which did not allow for clarifying questions posed to the researcher. The researcher did provide term definitions and examples in the questionnaire however future studies with ethnographic interviews may allow for respondents to ask questions. This would be helpful with a complex subject such as DT.

Four out of the five innovation attributes from the *Diffusion of Innovations* theory were deemed insignificant in this study. This can be partially attributed to the preferences and maturity of the sample however, the characteristic that did prove significant, relative advantage, had more items in the survey to support the DT construct relative to the other variables. It is recommended that all innovation attributes are tested to an equal extent in terms of the number of items for future studies.

The study also did not significantly prove a mediating effect of DL. This was explained by literature and the context of South African consumers however more focus on this construct is recommended for future studies considering that there was a positive relationship proved with DL-DT.

Lastly, the positivist research paradigm adopted in the study while closely aligned to the deductive quantitative research method, arguably may have introduced reductionism, where customers' experiences as a social reality may have been oversimplified to measurable variables, and universalism, where the conclusions

derived from the study attempted to articulate common behaviour across South African mobile customers, regardless of individual context (UPSC Factory, 2024).

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APPENDIX A: Consent form

The potential impact of digital transformation adoption on customer experience and customer value in the South African mobile telecommunications sector

Dear Sir/Madam,

I am a student at Wits Business School (University of Witwatersrand) currently completing my applied research project in partial fulfilment of my Master in Business Administration (MBA) degree.

My research aims to determine the potential impact of digital transformation adoption on customer experience and customer value in the South African mobile telecommunications sector. I am investigating the relationship between the extent of digital adoption by customers on digital channels, digital devices, digital products, and services offered from their network operators, and the level of customer satisfaction or experience and value (the amount a customer is prepared to spend over time with their operator).

Please can I ask for a maximum of 10 minutes of your time to participate in a short online survey on the secure Wits university platform, Qualtrics. Your participation will enable me to collect data to inform my research and is voluntary and anonymous (it will not be possible to trace your survey answers to your individual identity). All survey answers will be kept confidential and only published at an aggregated level (no individual answers). Please indicate your consent to participating in this survey in the next question.

Thank you in advance for your time.

If you have any questions or concerns, please contact me or my supervisor via the details provided below:

Researcher: Nadine Sigamoney

Email: 371836@students.wits.ac.za

Phone: +27 83 200 3402

Supervisor: Ms. Ayanda Magida

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APPENDIX B: Research Instrument

START

	Section 1	Upfront qualifying question
1.1	Question	Do you have at least one mobile SIM card registered with a South African mobile network operator (e.g. Telkom, Vodacom, MTN, Cell C, Rain)
	Answer options	*Yes* *No*

	Section 2	Demographics
2.1	Question	Please select your age range
	Answer options	*18 to 25 years old* *25 to 30 years old* *30 - 35 years old* *35 to 40 years old* *40 - 50 years old* *Above 50 years old*
2.2	Question	Please select your primary location of residence
	Answer options	*Gauteng* *KwaZulu-Natal* *Western Cape* *Eastern Cape* *Northern Cape* *North-West*

		Limpopo *Mpumalanga* *Free State*
	Section 3	**Mobile telecommunications profile**
3.1	Question	Which mobile network operators do you have SIM cards with that you use on a daily basis to make calls or use mobile data?
	Answer options Multiple selections possible	Telkom Mobile MTN Vodacom Cell C Rain Mr Price Mobile FNB Connect Virgin Mobile PnP Mobile Standard Bank Mobile
3.2	Question	Please select your customer profile
	Answer options	*Postpaid - I have a contract with a mobile network operator with monthly payments via a debit order* *Prepaid - I buy data and airtime as and when I need it*
3.3	Question	Please select your approximate monthly spend on airtime, voice minutes, mobile data and SMSs for your mobile phone
	Answer options	Less than R100 a month Between R101 to R150 a month Between R151 to R200 a month

		Between R201 to R250 a month More than R250 a month
3.4	Question	How long do you spend using internet-based services on your device per day? e.g. watching videos, social media, streaming music
	Answer options	Less than 1 hour a day 2 - 3 hours a day 3- 4 hours a day 5 - 6 hours a day More than 6 hours a day
3.5	Question	How much mobile data (excluding Wi-Fi) do you buy in a month to use on your phone?
	Answer options	1 Gb 2 Gb - 4 Gb 5 Gb - 7 Gb 8 Gb to 10 Gb More than 10 Gb
3.6	Question	What kind of mobile phone do you have?
	Answer options	Smartphone - large touch screen, able to connect to the internet and upload/watch videos and pictures; use social media; play online games Basic phone - small screen without touch capability, buttons on the phone, no access to internet, only able to make calls and send SMSs

The statements in the following sections will be assessed using a 5-point Likert scale (1 - strongly disagree; 2 - Disagree; 3- Neutral; 4- Agree; 5 - Strongly Agree)

	Section 4	Digital transformation adoption	
	Digital channels in this section refer to internet-based channels available on your phone where you can conduct transactions or make queries to your operator without engaging with a sales or service agent. Examples include: your mobile network operator app, the operator website, messaging service (WhatsApp, Facebook Messenger) or social media (Facebook, Instagram, X (previously Twitter)). Digital channels do not include USSD (*number# codes)		
	Variable	**Statement**	**Variable code**
4.1	Relative advantage	I prefer to contact my mobile network operator using digital channels on my phone when I need to make a purchase of airtime or data versus phoning the call centre to speak to an agent or going to the store	DTRA
4.2	Relative advantage	I prefer to contact my mobile network operator using digital channels on my phone when I have a query or complaint on my service versus phoning the call centre to speak to an agent or going to the store	DTRA
4.3		I prefer for my operator contact me on digital channels to engage with me on their services versus an agent calling me on the phone	DTRA
4.4	Relative advantage	I get better deals (more value for money) on digital channels when I need to purchase something from my operator versus calling an agent or going to the store	DTRA
4.5	Relative advantage	I become aware of more deals from my operator when browsing digital channels versus calling an agent or going to the store for a brochure	DTRA
4.6	Relative advantage	It is quicker to get something done with my operator using digital channels on my phone versus calling an agent or going to the store	DTRA
4.7	Compatibility	I get better deals personalised to my needs and anticipating my future needs on digital channels versus calling an agent or going to the store to purchase a service from my operator	DTC1
4.8	Compatibility	I need to always speak to a live person or agent when I need something from my operator versus using digital channels on my phone	DTC1

4.9	Compatibility	I trust that when I purchase a service from my operator using a digital channel, my money is going to the right place for the right service that I need	DTC1
4.10	Complexity	I do not like using the mobile app from my operator because it takes too much effort	DTC2
4.11	Complexity	I would find it easier to engage with my operator on a chatbot on a digital channel	DTC2
4.12	Complexity	Buying a service online from my operator on digital channels is too much effort or too confusing and I would rather phone the call centre to speak to an agent or visit the store	DTC2
4.13	Trialability	When using a digital channel for the first time, I test it first by purchasing a small amount of airtime or data to see if the channel works	DTT
4.14	Trialability	I need a free trial period of a new digital service from my operator to test it first before subscribing to a paid service e.g. music streaming packages, smart home offers, video streaming, online gaming	DTT
4.15	Observability	I can see the benefits experienced from my friends and family when they use digital channels from their operators	DTO
4.16	Observability	My friends and family have started to bundle subscription services to Netflix or Showmax with their normal purchases from their operators	DTO
4.17	Observability	It is easy to share data or send data to my friends and family using digital channels like the app or website	DTO

	Section 5	**Digital literacy**	
	Variable	**Statement**	**Variable code**
5.1	Digital literacy	I am comfortable using the internet to buy products and services on my phone	DL
5.2	Digital literacy	I know how to use the digital channels on my phone to check my airtime/data balance or to check how much I owe my operator	DL
5.3	Digital literacy	I know how to look for deals and offers from my operator using the internet on my phone	DL

	Section 6	**Customer experience**	
	Variable	**Statement**	**Variable code**

6.1	Customer experience	I would recommend my operator to my friends and family based on my experience with them overall	CEX
6.2	Customer experience	I have a positive experience when engaging with my operator	CEX
6.3	Customer experience	My operator exceeds my expectations	CEX
6.4	Customer experience	If I have a complaint or query, my operator is able to solve my problem efficiently (quick and easy)	CEX
6.5	Customer experience	I would pay more for mobile services (minutes, airtime & data) if I knew I would receive a great customer service.	

	Section 7	**Customer value**	
	Variable	**Statement**	**Variable code**
7.1	Customer value	I buy more airtime and data when using digital channels versus when calling an agent or visiting a store	CV
7.2	Customer value	I would be interested in purchasing new digital products and services from my operator outside of airtime and data e.g. music streaming packages, smart home offers, video streaming, online gaming	CV
7.3	Customer value	Now that I have access to digital channels, I engage more with the current offers from my operator, and I am curious to learn more about new offers	CV
7.4	Customer value	I have plans to change my operator in the near future	CV

END

APPENDIX C: Summary of empirical review findings

Table C 0-1: Summary of empirical review findings

Author(s)	Title	Method	Theory	Research gaps
(Awadhi, Obeidat, & Alshurideh, 2021)	The impact of customer service digitalization on customer satisfaction: Evidence from the elecommunications industry	Positivist philosophical perspective with quantitative data analysis survey of 130 customers of digital solutions in the telecommunications sector in the United Arab Emirates	Expectancy-Disconfirmation and Evaluation Congruity Theories	• Measures gap between perceived and actual outcomes for customers before and after using a digital solution, not the absolute experience and engagement of digital solution. • Suggestion to segregate response across telco providers and not treat all results as homogeneous
(Baird & Raghu, 2015)	Associating consumer perceived value with business models for digital services	Electronic survey emailed to 2948 recent medical patients in the western United States	Diffusion of innovation theory	• Focuses on hypothetical usage of digital services on a specific digital use case in the healthcare sector, not actual usage of a service. • Assesses the impact of supply-side business models, not demand-side. • Limited by small sample size in constrained location which limits generalisability
(Boston Consulting Group, 2021)	BCG Global Digital Transformation Survey	30 digital transformation case studies and survey of 860 senior executives across Asia Pacific, Americas, and Europe	N/A	• No insights on African or South African telecommunications sector

Author(s)	Title	Method	Theory	Research gaps
(Burzynska et al., 2023)	Dr Google: Physicians—TheWeb—Patients Triangle: Digital Skills and Attitudes towards e-Health Solutions among Physicians in South Eastern Poland—A Cross-Sectional Study in a Pre-COVID-19 Era	Cross-sectional descriptive study among 307 Polish health physicians	N/A	• Study was conducted in the pre-COVID era, digital related behaviour was shown to significantly accelerate at the onset of the pandemic • Limited to one region of Poland
(Deloitte, 2020a)	Digital Disruption Index – South Africa	Online survey of 85 senior leaders responsible for DT	N/A	• Study was industry agnostic • No measures of impact of DT, only maturity of DT
(Deloitte, 2022)	Digital Maturity Index Survey	Global online survey with 400 participants in the manufacturing industry weighted heavier on Germany	N/A	• Manufacturing industry specific • No measures of impact of DT, only maturity of DT
(Deloitte, 2020b)	Understanding the connection between digital maturity and financial performance	Online survey of US-based executives across 1200 organisations with at least $250 million in revenue	N/A	• Study specific to US market – developed market, no insights on developing or emerging markets
(Deschenes, 2023)	Digital literacy, the use of collaborative technologies, and perceived social proximity in a hybrid work	Online survey with 5141 participants	N/A	• Cross-sectional study did not allow for evaluation of the evolution of causal relationships • Respondents were highly educated, indicating low generalisability of the sample

Author(s)	Title	Method	Theory	Research gaps
	environment: Technology as a social binder			
(Huseynli, 2022)	Digital Transformation for Improving Customer Experience	Case study	N/A	• Suggestion to research CEX within scope of customer payment technologies and digital currencies in future studies • Gap on international research on concept of CEX and the potential cultural effects on customer perception
(Kabakus et al.,, 2023)	The effect of digital literacy on technology acceptance: An evaluation on administrative staff in higher education	Online survey targeted to administrative staff working in higher education with 183 responses	Unified theory of acceptance and use of technology (UTAUT) framework	• Research was contextually specific to administrative staff in higher education at two institutions in Turkey • Theory did not account for external barriers to technology acceptance
(Matarazzo, Penco, Profumo, & Quaglia, 2021)	Digital transformation and customer value creation in Made in Italy SMEs: A dynamic capabilities perspective	Qualitative case study of four SMEs with open coding practice	Dynamic capability theory (sensing, learning, integrating, coordinating)	• Need to extend to additional case studies – can be considered as pilot study for further studies. • Very focused on Italian market with strong operational characteristics
(Moodley, 2019)	Digital Transformation in South Africa's Short-Term Insurance Sector: Traditional Insurers' Responses to the	Qualitative semi-structured, interviews with 8 senior executives in SA insurance sector from 4 entities	N/A	• No quantitative findings • Very specific to one use case in DT: IoT • Does not expand on customer experience impact

Author(s)	Title	Method	Theory	Research gaps
	Internet of Things (IoT) and InsurTech			
(Musaigwa & Mutula, 2022)	Impact of digital transformation on strategy in the insurance sector	Case study of single insurance firm in SA with purposive sampling	Resource-based view of dynamic capability theory	• Only focuses on impact of DT on strategy and not on other business areas i.e. customer experience • Very specific to insurance industry – only one entity studied • Acknowledges limited literature on DT in SA in general across industries
(Pretorius, 2016)	Factors that affect digital transformation in the Telecommunication industry	Exploratory case study of single telecommunications operator in SA via semi-structured interviews	N/A	• Results are applicable to one organisation, cannot be generalised
(Purdy, 2023)	Building a Great Customer Experience in the Metaverse	Thought leadership report from Harvard Business Review	N/A	• No quantitative insights on impact of CEX and metaverse
(Sahu, Deng, & Mollah, 2018)	Investigating The Critical Success Factors of Digital Transformation for Improving Customer Experience	Case study of single firm in Australia – exploratory, qualitative	Dynamic capability theory	• No link to industry/sector • Only explores from internal organisation perspective, not the customer (supply side and not demand side)
(Shrivastava, 2017)	Digital Disruption is Redefining the Customer Experience: The Digital	Industry report from Ericsson	N/A	• No quantitative insights on impact of DT

Author(s)	Title	Method	Theory	Research gaps
	Transformation Approach of the Communications Service Providers			• Considers telecommunications market as homogenous and contiguous
(Siggelkow & Terwiesch, 2023)	Create Winning Customer Experiences with Generative AI	Thought leadership report from Harvard Business Review	N/A	• No quantitative insights on impact
(Steiber, Alange, Ghosh, & Goncalves, 2021)	Digital transformation of industrial firms: an innovation diffusion perspective	Case study of two industrial firms	Diffusion of innovation theory	• Identifies supply-side factors on innovation diffusion analytical framework for digital transformation • No demand-side insights
(Venkatesan, 2020)	The effect of digital maturity and entrepreneurial agility on firm performance in digital transformation of traditional organisations	Online quantitative survey with 60 respondents	Resource-based view of dynamic capability theory	• Small sample size at risk of snowballing effect • Individual responses were used for organisational insights – at risk of individual bias •
(Werner, Puta, Chilalika, & Walker Hyde, 2023)	How digital transformation can accelerate data use in health systems	Analysis of 72 documents and 33 interviews across five countries (Burkina Faso, Ethiopia, Malawi, SA, Tanzania)	WHO-ITU eHealth strategy building blocks (concept)	• Country-level insights not available and findings can be weighted heavier on countries with higher digital maturity • Possibility of bias from interview responses
(Wiemker, 2015)	The digital transformation of the telecommunication industry: A qualitative	Case study interviews of eight European operators	Dynamics capabilities theory	• Findings skewed toward companies which already have the ordinary and dynamic capabilities to

Author(s)	Title	Method	Theory	Research gaps
	benchmark study in the telecommunication industry to identify success factors for a new business model approach which best leverages digital technologies to improve customer interaction			leverage digital technologies, and may not be transferrable to companies in emerging markets • Study identifies factors to improve customer satisfaction but does not articulate the impact on customer satisfaction
(Zhang, Ma, Pang, Xing, & Wang, 2023)	The impact of digital transformation of manufacturing on corporate performance — The mediating effect of business model innovation and the moderating effect of innovation capability	Empirical study on 255 Chinese manufacturing enterprises	Resource-based view theory	• Research should be extended outside of China • More elements of DT need to be explored (2 are included in the study) • More research is required on business model innovation in the context of digital transformation

APPENDIX D: Supporting results data

The resultant, optimised measurement model as a result of optimisation on R software, tested for validity and reliability was as follows:

```
model = '
# measurement model

DTRA =~ DTRA1+DTRA4+DTRA5+DTRA6
DL =~ DL1+DL2+DL3
CEX =~ CEX1+CEX2+CEX3+CEX4
CV =~ CV2+CV3
DT =~ DTRA

# direct effect
          CV ~ a*DT
          CEX ~ b*DT
          CV ~ f*CEX
        # mediator
          CV ~ d*DL
          CEX ~ e*DL
          DL ~ c*DT

        # indirect effect (a*b)
          cd := c*d
          ce := c*e
        # total effect
          total := a + b + f + (c*d) + (c*e)
```

Norm Quintiles Plot

The norm quintile plot of the study is below, a plot of the residuals across quintiles and assessing against a normal distribution of data, while trying to identify potential skewness and outliers. As indicated by the plot, there are no severe deviations from normality and the residuals exist within the 95% confidence level. The distribution is sufficiently normal for analysis.

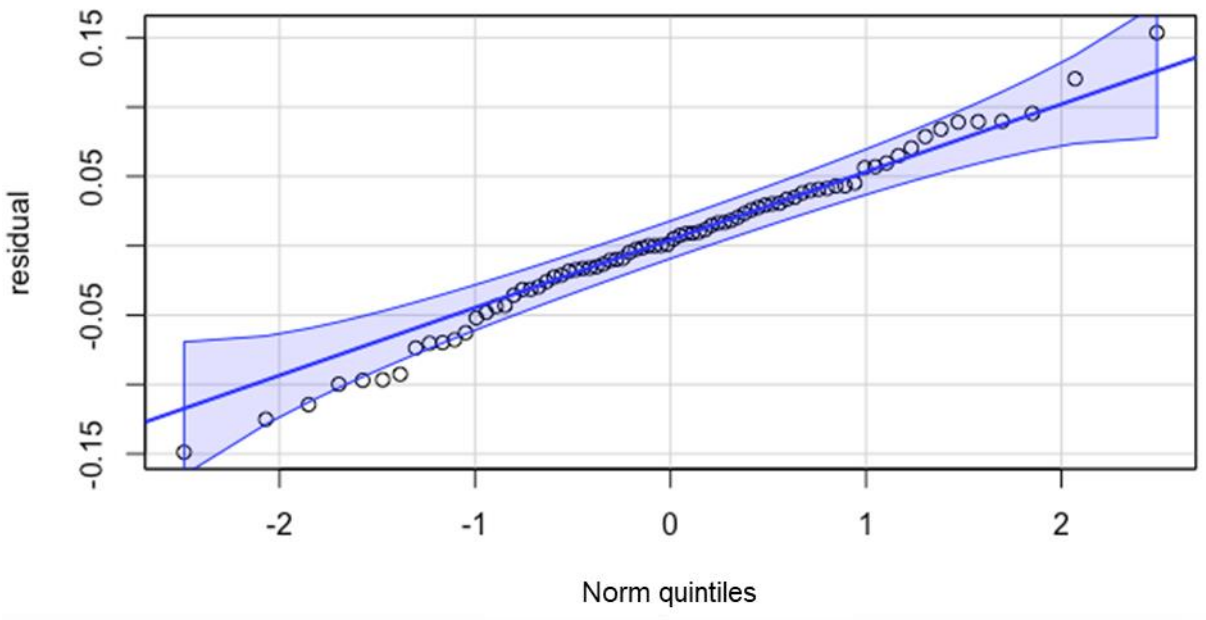

Figure D 0-1: Norm-quintile plot

Fit Indices

Table D 0-1: Fit indices

Estimator	ML
Optimisation method	NLMINB
Number of model parameters	45
Number of observations	181
Model Test User Model:	
Test statistic	123.236
Degrees of freedom	59
P-value (Chi-square)	0.000
Model Test Baseline Model:	

Test statistic	1022.457
Degrees of freedom	78
P-value (Chi-square)	0.000
User Model versus Baseline Model	
Comparative Fit Index (CFI)	0.932
Tucker-Lewis Index (TLI)	0.910
Loglikelihood and Information Criteria:	
Loglikelihood user model (H0)	-2957.136
Loglikelihood unrestricted model (H1)	-2895.517
Akaike (AIC)	6004.271
Bayesian (BIC)	6148.204
Sample-size adjusted Bayesian (SABIC)	6005.686
Root Mean Square Error of Approximation (RMSEA):	
RMSEA	0.078
90 Percent confidence interval - lower	0.058
90 Percent confidence interval - upper	0.097
P-value H_0: RMSEA <= 0.050	0.011
P-value H_0: RMSEA >= 0.080	0.435
Standardised Root Mean Square Residual:	
SRMR	0.049
Parameter Estimates:	
Standard errors	Standard
Information	Expected

Information saturated (h1) model	Structured

Factor Loadings

The factor loadings resulting from the CFA are as follows:

Latent Variables:

		Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
DTRA	=~						
	DTRA1	1.000				0.685	0.519
	DTRA4	0.888	0.175	5.090	0.000	0.609	0.555
	DTRA5	1.140	0.197	5.783	0.000	0.781	0.750
	DTRA6	0.883	0.176	5.027	0.000	0.605	0.544
DL	=~						
	DL1	1.000				0.604	0.728
	DL2	1.121	0.113	9.909	0.000	0.677	0.826
	DL3	1.359	0.136	9.969	0.000	0.821	0.840
CEX	=~						
	CEX1	1.000				0.775	0.782
	CEX2	1.090	0.090	12.105	0.000	0.845	0.865
	CEX3	1.068	0.091	11.789	0.000	0.828	0.840
	CEX4	0.980	0.101	9.742	0.000	0.759	0.710
CV	=~						
	CV2	1.000				0.867	0.695
	CV3	1.066	0.166	6.432	0.000	0.924	0.900
DT	=~						
	DTRA	1.000				1.000	1.000

Mediated paths

The mediated paths resulting from the CFA are as follows:

Defined Parameters:

	Estimate	Std.Err	z-value	P(>|z|)	Std.lv	Std.all
cd	0.040	0.068	0.597	0.550	0.032	0.032
ce	0.113	0.066	1.724	0.085	0.100	0.100
total	1.235	0.240	5.145	0.000	1.029	1.029

Regressions

The results of the multivariate regression analysis resulting from the CFA are as follows:

```
Regressions:
                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  Std.all
  CV ~
    DT         (a)    0.650    0.188    3.462    0.001    0.514    0.514
  CEX ~
    DT         (b)    0.282    0.134    2.109    0.035    0.249    0.249
  CV ~
    CEX        (f)    0.149    0.097    1.536    0.125    0.133    0.133
    DL         (d)    0.087    0.147    0.590    0.555    0.060    0.060
  CEX ~
    DL         (e)    0.243    0.136    1.793    0.073    0.190    0.190
  DL ~
    DT         (c)    0.466    0.106    4.385    0.000    0.529    0.529
```

Variables entered and removed

Hypothesis 1:

The table indicates that in the model for hypothesis 1, the variable DT (a predictor variable) was entered, while no variables were removed. The method employed for variable selection was the "Enter" method, suggesting that all requested variables, in this case, DT, were included in the model.

Table 0-2: Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	DT[b]	0	Enter

a. Dependent Variable: CEX b. All requested variables entered.

Hypothesis 2:

The table indicates that in the model for the hypothesis, the variable DT (a predictor variable) was entered, while no variables were removed. The method employed for variable selection was the "Enter" method, suggesting that all requested variables, in this case, DT, were included in the model.

Table 0-3: Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	DT[b]	0	Enter

a. Dependent Variable: CV b. All requested variables entered.

Digital transformation and digital literacy:

The table below indicates that in the model for the hypothesis, the variable DT (a predictor variable) was entered, while no variables were removed. The method employed for variable selection was the "Enter" method, suggesting that all requested variables, in this case, DT, were included in the model.

Table 0-4: Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	DT[b]	0	Enter

a. Dependent Variable: DL b. All requested variables entered.

Hypothesis 3:

The table below includes the model summary where a single model (Model 1) is presented with the dependent variable CEX. The only variable entered in the model is DL, and no variables were removed. The method used for variable inclusion is the "Enter" method. This indicates that DL is the sole predictor considered in this analysis for explaining variations in the dependent variable CEX.

Table 0-5: Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	DL[b]	0	Enter

a. Dependent Variable: CEX b. All requested variables entered.

Hypothesis 4:

The table below includes the model summary where the dependent variable is CV, and the variables entered into the model are CEX and DL. No variables were removed during the process, and the method employed was the "Enter" method.

Table 0-6: Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	DL[b], CEX[b]	0	Enter

a. Dependent Variable: CV b. All requested variables entered.

Distribution of residuals

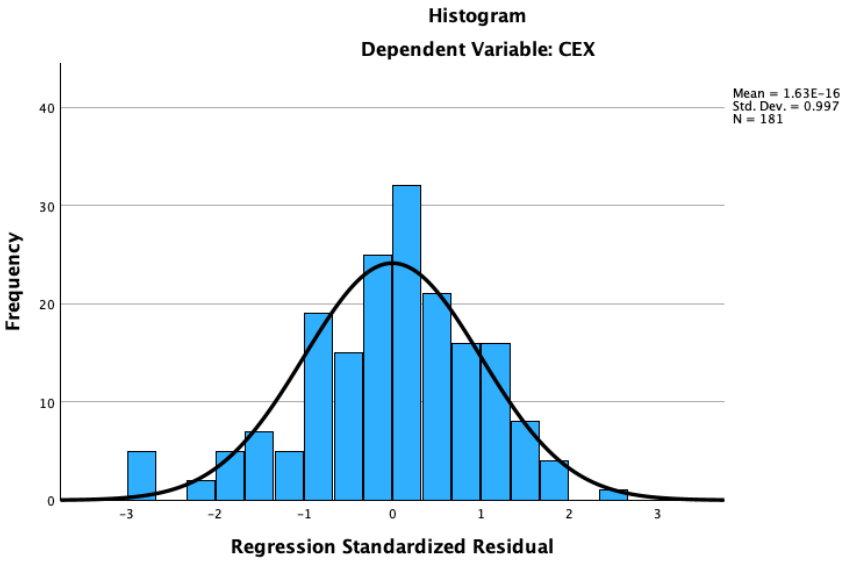

Figure D 0-2: CEX/DT distribution of residuals

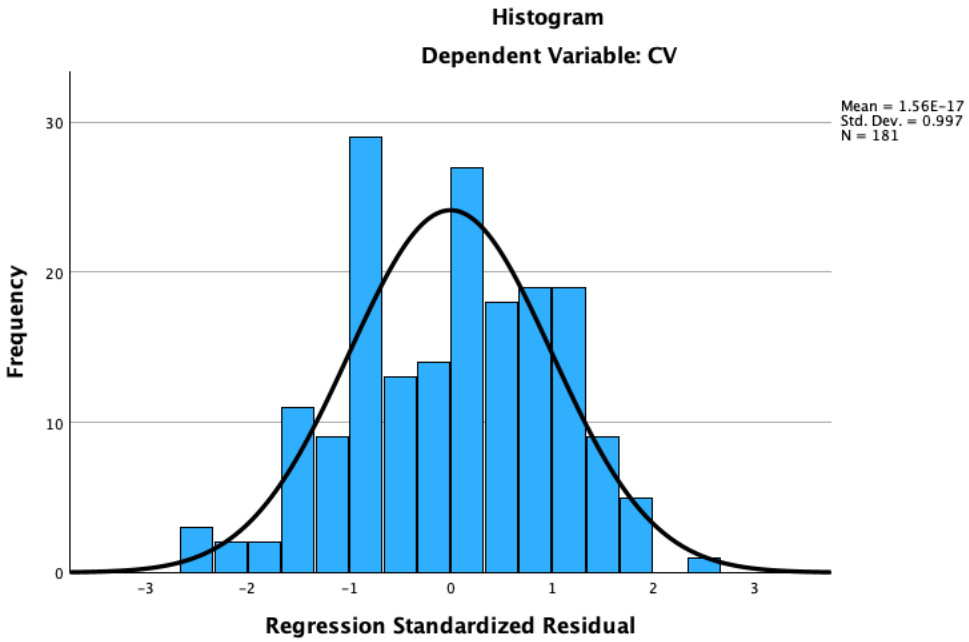

Figure D 0-3: CV/DT distribution of residuals

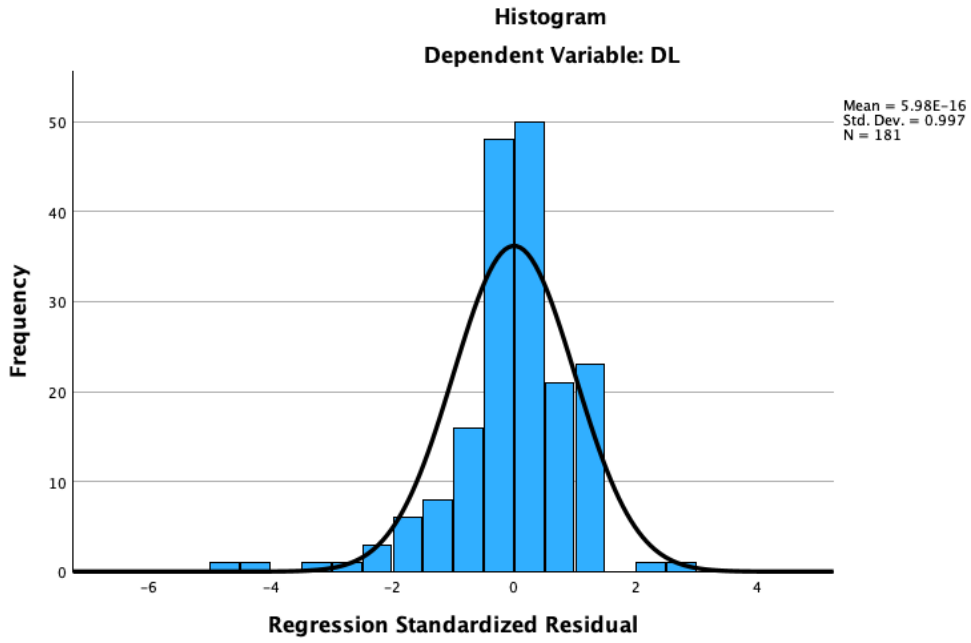

Figure D 0-4: DL/DT distribution of residuals

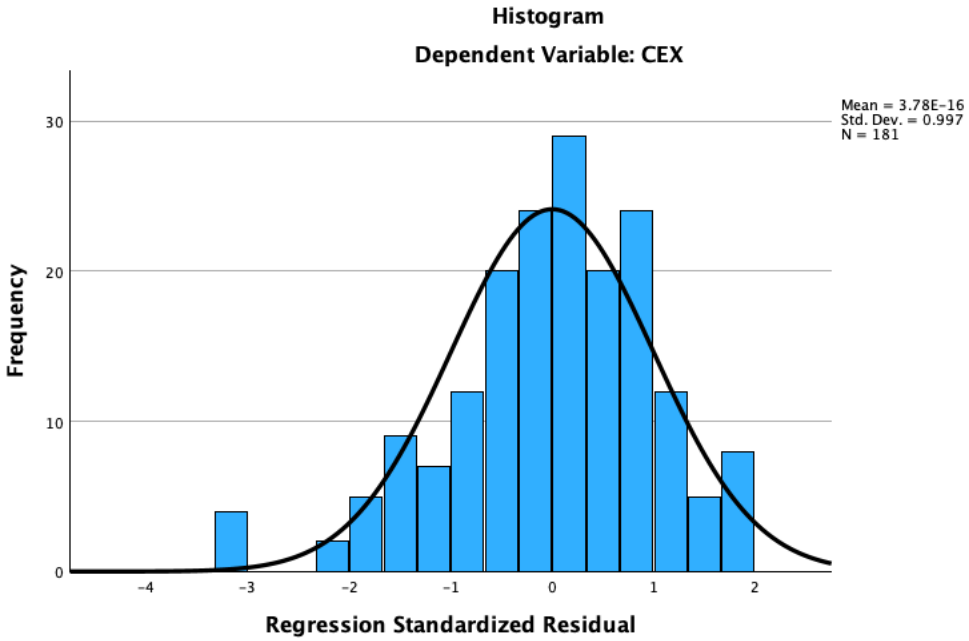

Figure D 0-5: CEX/DL distribution of residuals

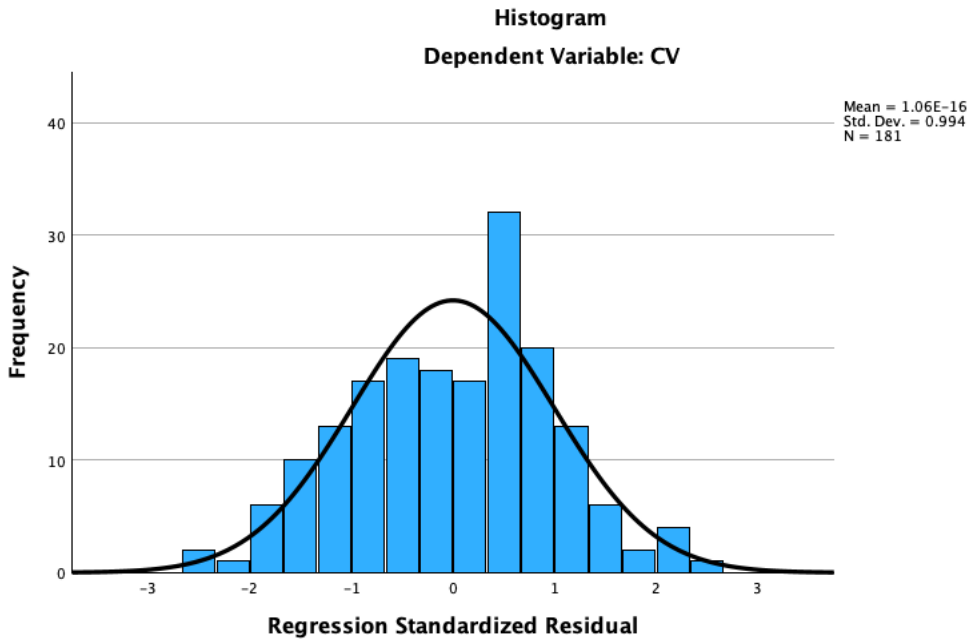

Figure D 0-6: CV/CEX/DL distribution of residuals

APPENDIX E: Ethics Clearance

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg

Wits Business School

Wits Business School Ethics Committee
Constituted under the University Human Research Ethics Committee (Non-Medical)

Ethics Clearance Certificate

Ethics protocol number: WBS/BA371836/162

This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below).
This certificate is only valid if permission has been granted by the Registrar's Office of Wits University.

Project title	The potential impact of digital transformation adoption on customer experience and customer value in the South African mobile telecommunications sector
Investigator / Researcher	Ms Nadine Sigamoney
Nature of Project	MBA (Research Article)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed anonymity and confidentiality.
Issue Date of Certificate	9/12/2023
Expiry date	Date of submission of the project / research report
Chairperson	Dr Pius Oba ☎ +27 11 717 3976 +27 82 733 6587 pius.oba@wits.ac.za

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Declaration by Researcher

One copy must be signed by the Researcher and returned to the Chairperson of the Wits Business School Ethics Committee.

I fully understand the conditions under which I am authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I undertake to resubmit the protocol to the Committee.

Signature

2023/09/17
Date:

APPENDIX F: Turnitin Originality Report

371836_ARP_Nadine Sigamoney_vFINAL-1.pdf

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