IMPACT OF COVID-19 ON DIGITAL TRANSFORMATION

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Master of Management in the field of Digital Business

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ABSTRACT

The COVID-19 pandemic has been commonly referred to as a 'black swan event'; it has changed the world as we knew it, from how we live, learn, work and socialise. It is believed that the pandemic has fast-tracked the adoption of technology in many organisations to ensure business continuity and business sustainability; broadly said, the pandemic has fast-tracked digital transformation (DT) in different organisations. This paper aims to study the impact of the COVID-19 pandemic on DT in organisations in South Africa by focusing on the changes in IT capabilities in the DT framework. The research design is qualitative; the data collection was through semi-structured interviews with information communication technology (ICT) leaders representing different organisations in South Africa. The data was analysed using the thematic-analysis process to formulate initial codes, initial themes and final themes emerging from the study.

The results from the study show that, in terms of ICT in the organisation, the pandemic had a direct and positive impact on ICT strategy and ICT operations. In terms of IT capability transformation, the pandemic resulted in the optimisation and expansion of existing IT capabilities in the organisation and the building of new IT capabilities to meet emerging business needs. In terms of the focus of activities during the pandemic, there seems to be a split in organisations between the primary focus being on 'digital IT' or 'traditional IT'. Overall, the findings of the study show that the pandemic had a positive and significant impact on DT in organisations. However, a definitive conclusion on this would require expanding the scope of the research to all the components of a comprehensive DT framework.

This study is significant because it is one of the first studies to investigate the impact of the COVID-19 pandemic on organisations, on ICT in the organisation, on IT capability transformation and, to a greater extent, DT. The findings from the study show that in response to the pandemic, there is a need for agility in organisations; for organisations to execute on their existing strategy; the future-proofing of IT capabilities; the adoption of a hybrid working model; and for organisations to take risks and embrace new ideas.

Keywords: DT, COVID-19 pandemic, DT framework, IT capabilities, bimodal IT, traditional IT and Digital IT.

DECLARATION

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

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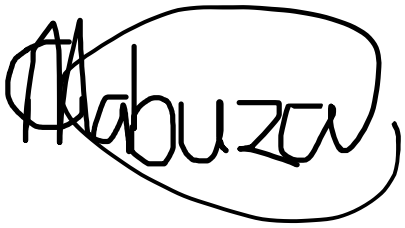
Signature: 

Signed at: Vorna Valley

On the 30th June 2021

DEDICATION

To Thebe Ramanna

For always listening to my ideas, for your support, advice, a shoulder to cry on and for being an amazing cheerleader. I would have never been able to go through this journey without you.

To my grandparents

My only wish is that you lived long enough to witness my continued attempts at making you proud of me.

ACKNOWLEDGEMENTS

First, I would like to thank the Lord Almighty.

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Thank you to all the participants for contributing to the study; thank you for the time and valuable insights.

And last, a big thank you to my friends, you probably heard the phrase ‘I am working on the thesis’ more than 100 times since this journey started. Thank you for your continued support and words of encouragement always.

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LIST OF ABBREVIATIONS

Acronym	Description
AI	Artificial Intelligence
API	Application Programming Interface
APP	Application
CAPEX	Capital Expenditure
COVID-19	Coronavirus Disease 2019
CIO	Chief Information Officer
DMM	Digital Maturity Model
DT	Digital Transformation
DTF	Digital Transformation Framework
DTS	Digital Transformation Strategy
ICT	Information Communication Technology
IoT	Internet of Things
IT	Information Technology
IS	Information Systems
MPLS	Multiprotocol Label Switching
OPEX	Operational Expense
QR Code	Quick Response Code
RW	Remote Worker
SaaS	Software as a Service

SD-WAN	Software Defined Wide Area Network
SMS	Short Message Service
uCaaS	Unified Communication as a Service
WFH	Work-from-Home
WHO	World Health Organisation

CHAPTER 1: INTRODUCTION

1.1 PURPOSE OF STUDY

The purpose of this study is to investigate the impact of COVID-19 on DT (digital transformation) in organisations in South Africa. The focus of the study will be on Information Technology (IT) capabilities of the organisation in the digital transformation framework (DTF).

1.2 CONTEXT OF STUDY

Technology is the "biggest story" in business today: it is a big story because the progress in all things digital is removing constraints and creating exciting new possibilities affecting everyone's lives and enterprises (Westerman et al., 2014). DT is a technology-induced change on many levels in the organisation, including the exploitation of digital technologies to improve existing processes and the exploration of digital innovation to create new information system (IS)/IT-based products, including new business models (Baram et al., 2019) and (Ismail et al., 2017).

DT requires dedicated strategies to integrate IT strategy and business strategy, offering improvements in performance, productivity and the competitiveness of an enterprise (Chanias et al., 2019). Organisations are starting to embrace DT by focusing on the development and execution of a DT Strategy. According to Rogers (2016), there are five domains of DT, these are the domains in organisations being reshaped by digital forces. The domains are customers, competition, data, innovation, and value; these five domains describe the digital business landscape today (Rogers, 2016).

DT often leads to two different IT work styles in traditional organisations. The first work style is known as 'classical IT' focused on predictability and 'keeping the lights on'. The second is a more exploratory work style focused on performing DT. This concept is known as bimodal IT (Haffke et al., 2017). Bimodal IT allows organisations to be agile, to experiment with new technology and pursue innovation while maintaining a reliable IT infrastructure that allows for operational excellence.

The COVID-19 pandemic has led to the closure of the physical doors of many organisations. As the virus spread across the world, many countries implemented restrictions on the movement of people to slow down the transmission of the virus. This often meant that the customers and employees of organisations have been required to limit their movements to their homes. It is believed that COVID-19 has fast-tracked the adoption of technology in many organisations to ensure business continuity and business sustainability; thus, while the physical doors of organisations might have had to close for an extended period of time, many organisations have opened their virtual doors.

1.3 RESEARCH PROBLEM

In the paper, 'COVID-19 and Work-from-Home: DT of the Workforce' Savic (2020) provides insights into the impact of the coronavirus pandemic on the sudden demand for work-from-home and the push for the DT of the workforce. This study provides evidence that COVID-19 has impacted the DT of the workforce in many organisations.

Although this study is significant and provides valuable insights, it is limited to the adoption of technology at the workforce level and does not look at the broader DT in the organisation. As far as the researcher could establish, there are no studies available that examine this phenomenon at all levels of the organisation in South African organisations.

1.4 RESEARCH OBJECTIVES

Main Objective: **To investigate the impact of COVID-19 on DT in organisations in South Africa by focusing on the transformation of IT capabilities.** From this objective, the following sub-objectives emerge:

- Sub-objective 1: To investigate how ICT in the organisation was impacted by the COVID-19 pandemic.
- Sub-objective 2: To investigate the technology capability changes in the organisation due to the COVID-19 pandemic.
- Sub-objective 3: To investigate the impact of the COVID-19 pandemic on the bimodal IT approach.

1.5 RESEARCH QUESTIONS

The primary research question for this study is**:** 'What is the impact of COVID-19 on DT of organisations in South Africa?'

The sub-questions for the study are:

- How was ICT in the organisation affected by the COVID-19 pandemic?
- What technological changes were made during the COVID-19 pandemic?
- How did the COVID-19 pandemic impact the bimodal IT approach?

1.6 SIGNIFICANCE OF STUDY

This study is significant because it can offer insights into how the COVID-19 pandemic has affected technology adoption in South African organisations, the IT capability transformation and the impact on the bimodal IT approach during the pandemic. The researcher found one study that was conducted to look at the adoption of technology by organisations because of the COVID-19 pandemic. This study focused only on the technology to enable remote working because of the increased demand for working from home (Savic, 2020).

This study contributes to academic knowledge because, by looking at the adoption of technology in all functions of the organisation as a result of the pandemic, it will provide insights beyond workforce transformation. This study will also contributes to academic knowledge by investigating the impact of the bimodal IT approach in organisations during the pandemic related to "digital IT" against 'keeping the lights on'. The researcher hopes that this research will give insights into the impact of the COVID-19 pandemic on DT in organisations in South Africa.

1.7 DELIMITATION OF STUDY

The delimitation of the study focuses on the change of IT capabilities in the organisation as it relates to the COVID-19 pandemic. The study focuses on organisations in South Africa, in both the public and private sector.

1.8 DEFINITION OF TERMS

Table 1.1. Definitions of key terms in the study

TERM	DEFINITION
DT	Technology-induced change affecting different levels of an organisation.
DT Strategy	The fusion of the business strategy and the IT strategy.
IT Capabilities	A collection of people, processes, information and technology resources that come together to make up the IT capabilities in an organisation.
Bimodal IT	The practice of managing two different modes of operation in the IT function.
COVID-19	Coronavirus disease 2019 is a novel respiratory disease caused by a recently discovered coronavirus.
Pandemic	The outbreak of a pandemic disease.

1.9 PROPOSED STUDY OUTLINE

Table 1.2. Proposed outline of the study

CHAPTER 1: **ORIENTATION**	Chapter 1 outlines the purpose of the study, the context of the study, research problem, research objectives, research questions and significance of the study.
CHAPTER 2: **LITERATURE REVIEW**	Chapter 2 is the literature review of the study, and this chapter will provide comprehensive definitions of DT, bimodal IT and COVID-19 as per available literature. This chapter will also provide summaries of prior studies in DT, bimodal IT and COVID-19.
CHAPTER 3: **RESEARCH METHODOLOGY**	Chapter 3 will outline the methodology to be used in the study. It will cover the research design, research method, population and sampling, validity and reliability, data collection, limitations and ethical considerations.
CHAPTER 4: **RESULTS**	Chapter 4 will present the results obtained from the data analysis of the interviews.
CHAPTER 5: **DISCUSSIONS**	Chapter 5 will discuss the results and findings of the study based on Chapter 4.
CHAPTER 6: **CONCLUSIONS AND RECOMMENDATIONS**	Chapter 6 will draw conclusions and provide recommendations.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews prior studies on digital transformation, bimodal IT and the COVID-19 pandemic to investigate the impact of the pandemic on digital transformation (DT). The first section provides definitions from the literature for DT, bimodal IT and COVID-19. The second section focuses on prior studies in relation to DT, the DT theoretical framework, IT capabilities in the organisation, bimodal IT and lastly, studies related to COVID-19 and digital technologies.

2.2 DEFINITIONS

2.2.1 Digital transformation

The concept of DT lacks a clear definition (Osmundsen, 2018). However, some researchers have proposed different definitions in the literature. According to Rogers (2016), DT is a technology-induced change on many levels of the organisation that includes both the exploitation of digital technologies to improve existing processes and the exploration of digital innovation, potentially transforming the business model (Rogers, 2016). Reis et al. (2018) found that there were three different definitions for DT in the existing literature:

(i) technology DT, based on the use of new digital technologies;
(ii) organisational DT, which is a change in organisational processes or the creation of new business models; and
(iii) social DT, which is based on influencing all aspects of human life.

(Reis et al., 2018)

From these three definitions, they proposed the following comprehensive definition, that DT is the use of new digital technologies that enable major business improvements and influence all aspects of a customer's life (Reis et al., 2018).

Haffke et al. (2017) proposed that DT entails tactical and strategic business moves triggered by data-driven insights and the launch of digital business models allowing new ways of capturing value (Haffke et al., 2017). Ismail et al. (2017) put forward a more comprehensive definition of DT, that it is the process through which companies converge multiple digital

technologies, enhanced with ubiquitous connectivity, to reach superior performance and sustained competitive advantage. Organisations do this by transforming multiple dimensions, including the business model, the customer experience and operations while simultaneously impacting people and networks.

2.2.2 Bimodal IT

DT resulted in a shift in the perception of the IT function and extended the role of the IT function beyond traditional services. This means that the new IT function needs to be at the forefront of exploring digital options to create a competitive advantage for the firm (Haffke et al., 2017). In some cases, DT in traditional organisations leads to two different modes of operation, this is known as bimodal IT. There is a fundamental research gap when discussing bimodal IT, most sources cite Gartner's definition, but there is no consensus on bimodal IT in the literature (Horlach et al., 2016).

Badr (2018) stipulates that bimodal IT can be defined as the simultaneous existence of two modes of IT, 'traditional IT' and 'digital IT' (Badr, 2018). However, Haffke et al. (2017) have provided a more comprehensive definition of bimodal IT, that it is a concept in which the traditional design of the IT function is not always suited to effectively balance both exploratory and exploitative tasks. They proposed that the IT function should operate in two parallel modes to have the agility to support the business with exploratory digital innovation while being able to maintain superior traditional IT operational performance. In bimodal IT, mode one encompasses the operation of the company's core systems, including sequential and long core development cycle and process-driven and control-driven infrastructure and organisation. While mode two is responsible for digital innovation, it reacts rapidly to changing customer needs; essentially, it is a customer-facing and a business-orientated IT organisation (Horlach et al., 2017).

2.2.3 COVID-19

According to the World Health Organization (WHO), coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. The virus was first discovered in Wuhan, China, towards the end of 2019, and as of June 2020, the virus had spread to over 213 countries and territories across the world (WHO, 2020). In the wake of the rapid spread of the virus, many countries responded by restricting the movement of people to 'flatten the curve'.

The restrictions are a public-health strategy to slow down the spread of the virus, ensuring that the health system is not overwhelmed by the number of people falling ill and requiring medical care. The quarantine and self-distancing measures implemented by different countries to curb the spread of the virus have had significant impacts on economic activities across different industries.

2.3 PRIOR STUDIES

2.3.1 Digital transformation

This section will focus on previous studies by looking at seven papers: Reis et al. (2018); Ismail et al. (2017); Fitzgerald et al. (2013); Berghaus and Back (2016); Osmundsen et al. (2018); Sebastian et al. (2017); and Loonam et al. (2018), indicated in Table 2.1.

DT is a popular concept among practitioners. However, this term tends to be neglected in the academic literature (Reis et al., 2018). In the paper, 'DT: A Literature Review and Guidelines for Future Research', Reis et al. investigate DT and proposed avenues for future research. The study was a literature review of 206 peer-reviewed articles focusing on specific keywords around DT. The findings from the paper show that the literature has two different perspectives on DT. The first view is that DT may be considered as a management "fashion" or as the reincarnation of past IT-enabled change with new outfits. The second view is that DT includes novel elements that deserve due attention and pose interesting challenges for future research.
Ismail et al. (2017) undertook a literature review that aimed to (i) review and consolidate the current body of knowledge regarding business-level DT; (ii) synthesize findings regarding the context, content and strategy process of DT; (iii) add novel insights regarding the positioning of DT; and (iv) reveal the key characteristics that distinguish it from previous technology-enabled transformation.

The findings from the study show that, firstly, companies transform due to two factors, internal factors such as cost savings, improved operations efficiency, proper management of information, strategic differentiation from competitors. Companies are also influenced by external factors, such as new IT/IS-based products in the market. Secondly, the dimensions of digital business include IT-enabled transformation, localised exploitation, internal integration, business process redesign, business network redesign and business scope redefinition. Lastly,

the findings show that the implementation of DT is not just about technologies being adopted; it is also about radical strategic and cultural change in the organisation.

DT is a strategic imperative. Fitzgerald et al. (2013) conducted a study to better understand how DT helps companies achieve their strategic objectives of improving the business. A quantitative survey was conducted that garnered responses from 1559 executives and managers in a wide range of industries. The findings show that firstly, digital immaturity is a widespread problem. Secondly, the benefits of DT include revenue creation, profitability and market valuation. And lastly, the challenges with DT implementation include leadership (lack of urgency, vision and picking a direction), institutional challenges (attitude of older workers, legacy technology, innovation fatigue and politics) and executing the change (making a case for DT and incentives).

A study by Berghaus and Back (2016) investigated the stages of DT by using the Digital Maturity Model (DMM) to calculate the stages of maturity using responses from participants. The participants were 547 individuals from 417 organisations in Switzerland and Germany. Through a cluster analysis of the weighted items, the following five maturing stages were identified, (i) promote and support; (ii) create and build; (iii) commit and transform; (iv) user-centred and elaborated processes; and (iv) data-driven enterprise.

The findings revealed three crucial concepts. Firstly, digital commitment and affinity among employees are important prerequisites for DT that often pre-exist in the workforce. Secondly, the use of digital data requires more strategic collaboration between IT and business and lastly, DT seems to be intuitively managed rather than strategically planned.

In the paper ‘DT: Drivers, Success factors and Implications’, Osmundsen et al. (2018) aimed to investigate DT in the organisational context to determine the drivers, success factors and implications of DT. The paper is an extensive literature review of DT articles. The findings show that DT drivers in an organisation can be internal and/or external, such as changing customer behaviour, the digital shifts in the industry, and the changing competitive landscape. The success factors include growing IS capabilities, developing a digital strategy and aligning business and IS. Moreover, the implications for DT can be new business models and reformed IS organisation.

In the paper, 'How Big Old Companies Navigate DT', Sebastian et al. (2017) looked at how old organisations navigate DT to succeed. This was a qualitative study of 25 companies that were embarking on a DT journey. The findings from the study show that there are two digital strategies, (i) customers' engagement strategy, which aims to create a seamless, omni-channel experience that makes it easier for customers to order, enquire, pay and receive consistent support from the channel at any time; and (ii) a digitised solution strategy to reformulate a company's value proposition by integrating a combination of products, services and data.

The findings from the study also show that two technology-enabled assets are essential in executing a digital strategy, (i) an operational backbone that enables operational excellence; and (ii) a digital services platform that enables rapid innovation. The recommendations for DT at large, older companies include, (i) defining a digital strategy; (ii) acting now to invest in an operational backbone; (iii) architecture a digital services platform; (iv) designing the digital services platform; and (v) adopting a services culture.

Loonam et al. (2018) studied how digitally enabled organisations use technology to implement DT strategies. In the paper, Loonam et al. reviewed ten case studies from literature and analysed the approaches these organisations have taken to implement digital transformation successfully. The findings from the study show that four themes are critical for organisations when implementing DT strategies, (i) strategy (business model)-centric actions; (ii) customer-centric actions; (iii) organisational-centric actions; and (iv) technology-centric actions.

2.3.2 Digital transformation theoretical framework

This section will focus on prior studies looking at DT frameworks from four different studies by Wade (2015), Bergus and Back (2016), Verina and Titko (2019), and Tratkowska (2019) (Table 2.2).

Wade (2015) explored a conceptual framework for DT in a case study as part of the Global Centre for Digital Business Transformation research. The findings from the paper show that the DT framework has seven components, these being:

(i) the business model (how to make money);
(ii) structure (how you are organised);

(iii) people (the people who work for you);
(iv) processes (how you do things);
(v) IT capability (how you collect and manage information);
(vi) offerings (your product and services); and
(vii) engagement model (how to engage with customers, suppliers, for example),

In the paper 'Stages in Digital Business Transformation: Results of an Empirical Maturity Study', Berghaus and Back (2016) proposed that the DT of an organisation can be assessed using a DMM. The model proposed in the paper has nine dimensions:

(i) customer experience;
(ii) product innovation;
(iii) strategy;
(iv) organisation;
(v) process digitisation;
(vi) collaboration;
(vii) information technology;
(viii) culture and expertise; and
(ix) transformation management.

Verina and Titko (2019) explored a conceptual framework for DT to provide a deep understanding of the concept of DT. The results of the study show there are seven components of DT and three key categories. The components of DT proposed in the paper are:

(i) processes (business activities, business operation, operational processes);
(ii) business models (lines of business, operating models, strategies);
(iii) customers (customer experience, customer requirements);
(iv) technologies (artificial intelligence, cloud, cybersecurity, devices, IoT);
(v) data (analytics, big data, vast amount of data);
(vi) leaders (C-level executives, managers, owners); and
(vii) employees (competencies, people, skills, staff, talents, workers, workforce).

The elements of DT proposed include:

(i) technologies (data, big data, cloud, mobile devices, social media, software, analytics, embedded devices, artificial intelligence, IoT, cybersecurity, Apps, marketplaces);
(ii) management/processes (business models, operating models, operating processes, strategies, business activities, organisational structure, organisational culture, coordination mechanism, products, new services); and
(iii) people (customers, employees/workforce/people, managers, executives, talents, suppliers, partners, stakeholders, competencies).

In the paper 'DT: Theoretical Backgrounds to Digital Change', Tratkowska (2019) investigates the existing definitions of DT to establish a structured approach towards its implications in structuring new business models, implementation activities and results phases. The results from the papers show that there are three categories of DT and that the DMM has five components. The categories of DT proposed in the paper include:

(i) organisational (organisational processes and their data, value creation, business models and extended supply chain);
(ii) technological (introducing novelties in technologies and innovations, which uses and enables major improvements or quality, efficiency and revenues); and
(iii) social (resulting from networking, communication channels, customer models or demands and creating new experiences and mindsets among customers).

The proposed components of DMM are:

(i) customers (assessing customer engagement, customer experience, insights and behaviour, and customer trust and perception);
(ii) strategy (brand management, ecosystem management, finance and investment, and market and customers);
(iii) technology (applications, IoT structure, data and analytics, delivery governance, network, security and technology architecture);
(iv) operations (Agile change management practices, automated resources management, integrated services management, real-time, insights and analytics, smart and adaptive process management, standards and governance automation); and

(v) organisation and culture (culture, leadership and governance, organisational design and talent management, workforce enablement).

A critical review of the DT frameworks indicates that a comprehensive framework is made of the following dimensions:

(i) leadership,
(ii) customer experience,
(iii) corporate strategy,
(iv) business model,
(v) organisational structure,
(vi) people,
(vii) service offerings,
(viii) engagement model,
(ix) organisational/business processes,
(x) culture,
(xi) technology capability/transformation, and
(xii) business operations.

For this study, the focus will be on technological capabilities and transformation.

2.3.3 IT capabilities in the organisation

This section will focus on prior studies on IT capabilities from two different studies by Bharadwaj (2000) and Mithas et al. (2011). This is illustrated in Table 2.3.

Several studies have been conducted to establish the relationship between business performance and IT capabilities in organisations to provide context into the value of IT in the organisation. According to Bharadwaj (2000), IT capabilities, in particular, the IT infrastructure (the physical IT assets of an organisation), the IT human resources (technical and managerial IT resources) and IT-enabled intangibles (customer orientation, knowledge assets and synergy in the organisation) have a direct, significant positive impact on the financial performance of an organisation. In other words, organisations with better and enhanced IT capabilities can and do exhibit better financial performance. The IT infrastructure provides the

platform to launch innovative IT applications faster than the competition. The human IT resources enable firms to conceive and implement such applications faster than the competition. A focus on IT-enabled intangibles enables firms to leverage or exploit pre-existing organisational intangibles such as customer orientation and synergy in a firm via co-presence and complementarity. IT capability is a resource that is not easily imitated or substituted; it isolates mechanisms such as time compression diseconomies and the connectedness of resources. Social complexity allows firms with a high IT capability to achieve and sustain superior performance.

Mithas et al. (2011) proposed that IT capabilities influence the development of three organisational capabilities. These are customer management capability, process management capability and performance management capability. Customer management capability is defined as an organisation's ability to determine its customers' requirements, expectations, and preferences. Performance management capability is an organisation's ability to attain flexibility, speed, and cost economy through the design and management of:

(i) product design and delivery processes, including new product design and manufacturing;
(ii) non-product and non-services business growth processes including innovation, research and development, supply chain management, supplier partnering, outsourcing, mergers and acquisitions, global expansion, and project management; and
(iii) support processes, such as finance and accounting, facilities management, and human resources management.

Senior IT leaders need to focus on IT strategy, IT governance, the management of IT resources, IT investments and information management capability as critical levels for organisational transformation and business excellence.

2.3.4 Bimodal IT

This section will focus on prior studies on bimodal IT in literature by looking at two papers, Holarch et al. (2016) and Haffke (2017), illustrated in Table 2.4.

In the paper 'Bimodal IT: Business-IT Alignment in the Age of DT', Holarch et al. (2016) looked at how business-IT alignments are affected by a bimodal IT organisation (this study was a literature review). The study revealed that firstly, the two IT modes, traditional and digital, need to be aligned with each other, in addition to this, the business units need to align their strategic and operational activities with the two modes in a faster and more agile manner. Secondly, bimodal IT implies concrete implementation steps in the IT organisation and IS infrastructure. Thirdly, bimodal IT implies a bimodality of operating models and processes in organisations. And lastly, organisations should ensure that they have the skills for a bimodal operating model.

Haffke et al. (2017) also studied bimodal IT. Their study was a qualitative study in which they interviewed executives at various organisations. The paper explored using a bimodal approach in organisations to create an IT function that can effectively support and drive the organisation's digital agenda. The findings from the study show that agility and ambidexterity are the two primary reasons why organisations implement a bimodal IT design. The study also revealed that there are three different bimodal IT archetypes, these being, (i) Bimodal IT on a project-by-project basis; (ii) IT function structurally subdivided into two modes; and (iii) Bimodal IT in two separate organisational divisions. The key finding is that bimodal IT is an interim transition step in the overarching transformation of the IT function. DT places different demands on IT, rather than it being an end state for the IT function.

2.3.5 Digital technology and COVID-19

There is a shortage of studies investigating the impact of COVID-19 on DT across the world because this is an ongoing pandemic. There are, however, some articles available. This section will focus on prior research on digital technology and COVID-19, per Table 2.5 (Keesara et al., 2020; Park et al., 2020; Savic, 2020; Wang et al., 2020; and Ting et al., 2020).

In the paper, 'COVID-19 and Work-from-Home: DT of the Workforce', Savic (2020) looked at the impact of the coronavirus pandemic on the sudden demand for work-from-home and the push for the DT of the workforce. The findings paper show that the COVID-19 pandemic has forced many organisations to re-look at where and how work can be done. Businesses must improve their capabilities for long-distance collaboration. Video conferencing, online purchasing, special deliveries, telemedicine, e-learning, electronic trading, online marketing, video streaming, and many other IT-enabled processes have undergone a virtual transformation, replacing traditional working and living practices.

In the paper, 'Response to COVID-29 in Taiwan: Big Data Analytics, New Technology and Proactive Testing', Wang et al. (2020) investigate the response of Taiwan to the COVID-19 pandemic using IT. The findings show that Taiwan integrated its health insurance database with its immigration and customs database to begin creating big data analytics; it generated real-time alerts during a clinical visit based on travel history and clinical symptoms to aid case identification. Taiwan also used QR code scanning, online reporting of travel history and health symptoms to classify travellers infectious risks based on the flight origin and travel history in the past 14 days. Persons with low risk were sent a health declaration border pass via SMS to their phones for faster immigration clearance, and those with higher risk were quarantined at home and tracked through their mobile phones to ensure that they remained at home during the incubation.

In the paper, 'Information Technology-Based Tracing Strategy in Response to COVID-19 in South Korea – Privacy Controversies', Park et al. (2020) looked at the use of IT-based tracing in South Korea in response to COVID-19 and the associated privacy issues. The study is a literature review of the approach to managing with the pandemic. The paper had four key findings. Firstly, data sharing about infected individuals in the public sector and among medical professionals has epidemiological benefits in containing the spread of a highly infectious disease like COVID-19, in which an early response is critical. Secondly, the use of integrated IT systems helped investigators save resources by automating the overall tracking process. Thirdly, the legal system needs to be refined to allow the use of aggregate data rather than individual-level data to prevent the misuse of data and address privacy concerns. Moreover, finally, it is essential to balance the need for information to test, track and quarantine with legitimate privacy concerns.

Ting et al. (2020) also recently conducted a study to explore the potential of four interrelated digital technologies: the IoT, Big Data Analytics, AI and Blockchain, on, (i) monitoring, surveillance, detection and prevention of COVID-19; and (ii) mitigating the impact of healthcare indirectly related to COVID-19.

The findings show that IoT provides a platform that provides public-health agencies with the data for monitoring the pandemic when it comes to monitoring, surveillance and detection. Big Data provides opportunities for performing modelling studies of viral activity for guiding the individual country healthcare policymakers to enhance preparation for the outbreak. Digital Technology can enhance public health education and communication. AI and deep learning can enhance detection and diagnosis, as well as facilitating the discovery of novel drugs.

In the paper, 'COVID-19 and the Health Care's Digital Revolution', Keesara et al. (2020) looked at the impact of COVID-19 on healthcare in the USA and the use of IT. The findings indicate there has been some use of digital technology in healthcare, but there is poor penetration in the market due to regulations. Thirty-eight per cent of chief executive officers of the United States' health care systems reported having no digital component in their overall strategic plan, and 94% cited regulations as factors limiting the implementation of digital strategies. Because of the COVID-19 pandemic, there has been some easing of the regulations, such as allowing the use of (Health Insurance Portability and Accountability Act) HIPPA non-compliant communication devices to treat patients in rural areas. The initial responses are important; however, the response to the pandemic demands a broader strategy to address reimbursement for new digital services, expanded regulatory relief, and evaluation of clinical care provided by these technologies.

2.4 SUMMARY AND CONCLUDING REMARKS

DT is a technology-induced change in an organisation driven by internal factors, such as cost savings, improved operations efficiency, proper management of information and strategic differentiation from competitors. DT is also driven by external factors, such as new IT/IS-based products in the market, changing customer behaviour, the digital shifts in the industry and the changing competitive landscape (Ismail et al., 2017 and Osmundsen et al., 2018). DT is a strategic imperative; it is not just about the technologies being adopted by the organisation but a strategic and cultural change in the whole organisation. The implementation of DT often fails

at the strategic and cultural level. The success factor of DT is the development of a digital strategy that aligns IT/IS and the business (Fitzgerald et al., 2013).

DT has led to a change in the perception of the IT function in an organisation. As stated above, DT is technology-induced, and as a result, the IT function is often required to go beyond traditional services. It often needs to be innovative and seek out digital options for the organisation (Haffke et al., 2017). Bimodal IT is a concept that can be used in organisations to drive DT. It is a concept that the traditional design of the IT function is not always suited to maintain superior traditional IT operational performance while also allowing for agility to support digital innovation. Bimodal IT is often an interim step in the DT journey of an organisation and not the end state of the IT function. The success factor for bimodal IT is that the two modes of IT, 'traditional IT' and 'digital IT', need to be aligned with each other and to the business as part of the digital strategy of the organisation (Holarch et al., 2016).

The literature currently available on COVID-19 and digital technology focuses on how countries like Taiwan, South Korea and the USA are responding to the COVID-19 pandemic using digital technology and the potential opportunities that exist in using technologies such as AI, IoT, Big Data Analytics, Blockchain and Video Conferencing (Park et al., 2020 and Keesara et al., 2020). Digital technology has been primarily used for the monitoring, surveillance, detection and prevention of COVID-19, and mitigating the impact on healthcare (Ting et al., 2020). Savic (2020) explores the DT of the workforce due to COVID-19 driven by the sudden demand for working from home.

Despite the importance of technology to combat COVID-19, there is a shortage of scientific studies examining the impact of COVID-19 on DT.

(i) The primary objective of this research is to investigate the impact of COVID-19 on DT in the South African context by focusing on the IT capability transformation in the organisation as a result of the pandemic.
(ii) The secondary objective of the study is to ascertain the impact of the COVID-19 pandemic on the bimodal IT approach.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 RESEARCH DESIGN

Research design is a comprehensive plan for data collection in a research project (Bhattacherjee, 2012). According to Hofstee (2011), the research design section is where the overall approach to testing the research question or statement is discussed. The topology of the research design can be classified into two categories: empirical and non-empirical studies (Mouton, 2013). Empirical studies derive new knowledge from data, whereas non-empirical studies use the literature review, modelling and philosophical and conceptual analysis to develop new knowledge. This study is an empirical study because this design allows for the researcher to derive in-depth data about the research problem.

3.2 RESEARCH METHOD

Research studies can use a quantitative research method, a qualitative research method or a mixed-method research method that is both quantitative and qualitative (Bhattacherjee, 2012). The qualitative research method usually has no measurements or statistics but uses words, descriptions and quotes to explore meaning. The quantitative method usually contains numbers, proportions and statistic (Williams, 2007). In this study, the empirical qualitative technique is adopted because the researcher seeks to get a deeper insight into the phenomena.

3.3 POPULATION AND SAMPLING

3.3.1 Population

Polit and Hungler (1999) refer to the population as an aggregate or totality of all the objects, subjects or members that conform to a set of specifications. In this study, the population is organisations in South Africa, both private sector and public sector organisations.

3.3.2 Sampling

Sampling refers to the selection of a subset of persons or things from a larger population, also known as a sampling frame (Scott & Morrison, 2007). In this study, the sample is ICT leaders of different organisations in South Africa, and the sample size is 14 participants. The sampling

methods is convenience sampling (the researcher started data collection from the customers the researcher works with), purposive sampling and snowball sampling (the researcher asked for recommendations from initial respondents).

3.4 DATA COLLECTION METHODS AND PROCEDURES

The primary data collections method adopted in this study is interviews with identified respondents to yield data for the research. The researcher used two instruments to capture the data, a notepad to write notes and a recorder. Due to COVID-19 restrictions enforcing social distancing, the researcher scheduled all the interviews virtually, which served as a backup tool for data collection as virtual calls were recorded using the platform, Webex and Zoom.

The process was as follows:

(i) The researcher called the identified respondents (the researcher's customers) to introduce them to the study and outlined the purpose of the study;
(ii) The researcher asked the identified participants to participate in the study in the form of an interview;
(iii) The researcher then set up interviews with participants who agree to be part of the study;
(iv) The participants were sent the interview questions before the interview to ensure that they were familiar with interview questions and were comfortable answering these questions;
(v) The participants were also sent the consent form to review before the interviews
(vi) The interviews were 30 – 60 minutes on average; at the beginning of the interview, the participants were informed that the interview would be recorded and verbal consent was requested to continue with the interview.
(vii) After the interview, the participant were asked by the researcher to recommend possible participants for the study; and
(viii) The recommended participant were approached by the researcher, starting with the data collection process.

3.5 DATA ANALYSIS

In qualitative research, the researcher's own assumptions, bias, and subjectivity should be stated upfront (Fabio et al., 2012) because qualitative analysis depends heavily on the researchers' analytic and integrative skills, as well as personal knowledge of the social context where the data is collected (Bhattacherjee, 2012). The primary aim of the analysis is to understand the various constitutive elements of one's data by inspecting the relationship between concepts, constructs or variables. The interpretation involves the synthesis of data into larger coherent wholes (Mouton, 2013). In this study, the analysis followed the thematic-analysis process as prescribed by Braun and Clarke (2006). This analysis process aims to identify patterns and themes in qualitative data analysis (Braun and Clarke, 2006).

Table 3.1. Thematic-analysis six steps outline

Step 1	Familiarity with the data – becoming familiar with the data requires reading and re-reading the interview transcripts and notes
Step 2	Generation of initial codes – the data is organised in a meaningful and systematic way
Step 3	Identification of themes – the theme is a pattern that captures something significant or interesting about the data
Step 4	Reviewing of themes – the themes identified will be reviewed, modified and developed further
Step 5	Definition of themes – this will be the final refinement of themes
Step 6	Writing of report – the research write-up

3.6 TRANSFERABILITY, CREDIBILITY AND DEPENDABILITY

3.6.1 Transferability

Transferability refers to the degree to which the results of the qualitative study can be transferred to other contexts and settings with different respondents (Korstjens and Moser, 2018). Data collection is consistent and similar with all the participants in the study through interviews with the same research instrument (questions). This process ensured transferability in the study.

3.6.2 Credibility

Credibility refers to the confidence that can be placed in the truth of the research findings; it is the equivalent of internal validity in quantitative research (Korstjens and Moser, 2018). The study uses triangulation to ensure credibility as follows, (i) by all the research participants representing different organisations and different industries and (ii) through the participants (CIOs, IT managers and IT engineers) representing different positions in their organisations and representing the gathering of data through different sources. The second method used to ensure credibility is prolonged engagement with the data through the thematic-analysis process.

3.6.3 Dependability

Dependability refers to the stability of the findings over time, including consistency (Korstjens and Moser, 2018). The data is analysed using the thematic-analysis process to generate initial codes, initial themes and final themes to ensure dependability in the study; this process can be used by other researchers who attempt to recreate the study.

3.7 LIMITATION

This study has four limitations as outlined below:

(i) The study will be qualitative only;
(ii) The qualitative nature of the study means that there is an inherent limitation due to the time allocated to this study;
(iii) Due to COVID-19 regulations, the data collection of data will have to be primarily virtual; and

(iv) The study will focus on one dimension of the DT framework being the IT capabilies of the organisation

3.8 ETHICAL CONSIDERATIONS

The following aspects will be addressed in this study:

(i) The purpose of the study was explained to all respondents and they were requested to sign the informed consent form.
(ii) The participants are not identifiable with any naming conversion, the participants are designated a number.
(iii) This study is done in line with the university's requirements, informed consent is obtained through signed consent forms.
(iv) A plagarims declaration form has been signed

3.9 ANTICIPATED CONTRIBUTION OF THE STUDY

This research is empirical, the evidence obtained is based on data collection from subject matter experts and this study allows the researcher to derive new knowledge from data.

3.9.1 Theoretical contributions

The research aims to add to the body of knowledge in the following research areas:

(i) The impact of COVID-19 on the ICT in the organisation;
(ii) The IT capability transformation in the organisation as a result of the pandemic; and
(iii) The impact of the COVID-19 pandemic on the bimodal IT approach.

3.9.2 Practical contributions

At an organisational level, the following contribution is anticipated:

(i) Demonstrate the technological and financial implication of COVID-19.

(ii) Provide some insight on the effectiveness of the bimodal approach on managing DT in organisations.

3.10 CONCLUSION

Table 3.2. Summary of research methodology

COMPONENT	SUMMARY
Research design and method	Empirical qualitative technique
Population and sampling	Convenient, purposive and snowball sampling
Data collection	Interviews
Data analysis	Thematic-analysis process
Transferability, credibility and dependability	Consistent data collection, triangulation, prolonged data engagement and thematic-analysis process

CHAPTER 4: PRESENTATION OF FINDINGS

4.1 INTRODUCTION

This chapter presents the findings from the study. The chapter is organised as follows: the first section provides background information on the participants in the study, including background information on the organisations the participants work for. The second section restates the research questions and research objectives. The third section outlines the data analysis process. The fourth section presents the findings concerning the three research objectives, and the final section outlines the summary of the findings.

4.2 BACKGROUND INFORMATION

4.2.1 Background information on participants and organisations

The background information gathered from the participants includes race, gender, age-range and education level. The organisation's information gathered from the participants includes the position of the participant in the organisation, the tenure (in years) in the organisation, the industry of operation and the number of employees in the organisation.

Table 4.1. Background information on the participants and the organisations.

P[1]	RACE	GENDER	AGE	EDUCATION	POSITION	[2]TENURE (YEARS)	INDUSTRY	[3]NO. OF EMPLOYEES
1	White	Male	30–40	Masters' Degree	Chief Information Officer	13	Retail	1000
2	Black	Male	40–50	Master's Degree	Chief Information Officer	5	Health Services	7000
3	White	Female	60–70	Technical Certificate	Chief Information Officer	38	Pathology	100
4	Black	Male	50–60	Bachelor's Degree	Chief Information	7	Lottery	300

P[1]	RACE	GENDER	AGE	EDUCATION	POSITION	[2]TENURE (YEARS)	INDUSTRY	[3]NO. OF EMPLOYEES
					Officer			
5	Black	Male	40–50	Masters' Degree	Chief Information Officer	1	Transport	180
6	White	Male	30–40	Technical Certificate	Chief Information Officer	17	Financial Services	60
7	Black	Female	40–50	Post Graduate Diploma	Chief Information Officer	2	Law Enforcement	550
8	Black	Male	40–50	Bachelor's Degree	IT Manager	12	Financial Services	1060
9	Black	Male	30–40	Masters' Degree	Technical Operations Manager	8	Automotive	6000
10	White	Male	20–30	Technical Certificate	IT Manager	2	Manufacturing, Agriculture & Fishing	800
11	Indian	Male	30–40	Diploma	IT Manager	5	Food and Beverage	1100
12	Black	Male	40–50	Honours Degree	Global Network Infrastructure Manager	3	Mining Equipment Manufacturing	15000
13	White	Male	40–50	Diploma	IT Lead Engineer	19	Financial Services	320
14	Black	Male	40–50	Post Graduate Diploma	IT Manager	10	Space	250

Notes: [1]R – Respondent; [2]Tenure – Number of years working at current organisation; [3]Number of employees – total number of employees working in the organisation

The biographical information on the participants shows the following, (i) the total number of participants in the study is 14; (ii) the age range is 20–60 years; (iii) the educatiton level includes technical certificate, diploma, bachelor's degree, post graduate degree, honours degree and master's degree; (iv) the roles are as follows, 7 (chief information officers), 1 (head of IT infrastructure), 1 (technical operations manager), 3 (IT managers), 1 (global network infrastructure manager) and 1 (IT lead engineer); (v) and the tenure in the organisationranges from 1 year to 38 years.

The background information on the organisations shows that following, (i) the number of industries represented in this study is 11; (ii) the industriy of operation includes retail, health services, pathology, lottery, transport, financial services, law enforcement, automotive, manufacturing, agriculture and fishing, food and beverage and mining equipment manufacturing; (iii) and the number of employees ranges from 60 to 15000.

4.3 RESTATING RESEARCH QUESTIONS AND OBJECTIVES

4.3.1 Research question

The primary research question for this study is**:** 'What is the impact of COVID-19 on the DT of organisations in South Africa?' From this question, the following sub-questions emerge:

Sub-Question 1: How was ICT in the organisation affected by the COVID-19 pandemic?
Sub-Question 2: What technological changes were made during the COVID-19 pandemic?
Sub-Question 3: How did the COVID-19 pandemic impact the bimodal IT approach?

4.3.2 Research objectives

Main Objective: To investigate the impact of COVID-19 on DT in organisations in South Africa by focusing on IT capabilities. The following sub-objectives emerge from these objectives:

Sub-Objective 1: To investigate how ICT in the organisation has been affected by the COVID-19 pandemic;

Sub-Objective 2: To investigate the technology capability changes in the organisation as a result of the COVID-19 pandemic;

Sub-Objective 3: To investigate the impact of the COVID-19 pandemic on the bimodal IT approach.

4.4 ANALYSIS OF DATA USING THE THEMATIC-ANALYSIS PROCESS

In this study, the analysis followed the thematic-analysis process as prescribed by Barun and Clarke (2006). This process intends to identify patterns and themes in qualitative data analysis (Barun and Clarke, 2006).

Figure 4:1 Diagrammatic representation of the thematic-analysis process

Adapted from Braun and Clarke, 2006

4.4.1 Familiarity with the data and generation of initial codes

The interviews were recorded and transcribed, then the researcher read through the transcripts and listened to the recordings to become familiar with the data. The initial codes were developed from the participants' answers in the interviews.

Table 0.6. shows that there were 243 initial codes generated from the data. In the first question theme, 'Business role of IT', 35 initial codes were generated; in the second question theme 'Impact of the COVID-19 pandemic on the ICT department', 37 initial codes were generated. On the third question theme, 'Technological changes in the organisation as a result of the COVID-19 pandemic', 75 initial codes were generated. On the fourth question theme, 'Bimodal IT approach during the COVID-19 pandemic lockdown', 70 initial codes were generated, and on the last question theme, 'Impact of COVID-19 pandemic on ICT landscape in South Africa, 26 initial codes were generated.

4.4.2 Identification of themes

The themes were identified from the initial codes. Table 0.7. shows that there were 115 initial themes identified from the initial codes. In the first question theme, 'Business role of IT', 16 initial themes were identified; in the second question theme, 'Impact of the COVID-19 pandemic on the ICT department', 17 initial themes were identified. On the third question theme, 'Technological changes in the organisation as a result of the COVID-19 pandemic', 41 initial themes were identified. On the fourth question theme, 'Bimodal IT approach during the COVID-19 pandemic lockdown', 29 initial themes were identified, and on the last question theme, 'Impact of COVID-19 pandemic on ICT landscape in South Africa, 12 initial themes were identified.

4.4.3 Review and finalisation of themes

The initial themes were reviewed, and were used to develop the final themes from the data. The final themes are presented and discussed in the paper. Table 0.8. shows that there were 94 final themes developed from initial themes. In the first question theme, 'Business role of IT', eight final themes developed; in the second question theme, 'Impact of the COVID-19 pandemic on the ICT department', 14 final themes developed. On the third question theme, 'Technological changes in the organisation as a result of the COVID-19 pandemic', 36 final themes developed; on the fourth question theme, 'Bimodal IT approach during the COVID-19 pandemic lockdown', 24 final themes were developed. On the last question theme, 'Impact of COVID-19 pandemic on ICT landscape in South Africa, 12 final themes were developed.

4.5 RESULTS PERTAINING TO RESEARCH OBJECTIVE 1

This section will present the results of the first research objective, which was to investigate how the ICT in the organisation was impacted by the COVID-19 pandemic.

4.5.1 Business role of Information Technology in the organisation

Table 0.9. shows a summary of the final themes idenfitied for the business role of IT in the organisation. The participants in the study used words such as '*strategic*', '*critical*', '*integral*', '*important*' and '*enabler*' when asked about the business role of IT in the organisation. IT is central to the business model in the organisation, business processes and the organisational

culture, which are the major themes identified in this research paper. IT is also identified as being important in sales and marketing, in human resources, in research, development and innovation and in supply chain. IT is central to the strategy, vision and objectives of the organisation.

4.5.2 The DT journey in different organisations

The DT journey organisations have been going through has primarily been focused on the business model and strategy, customer experience, business processes, people and culture, as well as technology capabilities based on the identified themes as per Table 0.10. The common expressions from the participants include '*automation of operations*', '*digital delivery of products and services*', '*digitising business processes*', '*digital marketing and advertising*' and '*adopting omni-channel*' when describing the DT in the organisations.

Looking more closely at these themes shows that organisations are implementing or have implemented omni-channel operation models concerning the business model and strategy. Customer experience includes the digital delivery of products and services, digital marketing, and business processes, including the automation of specific processes in the organisation. People and culture are change management activities aligned to DT. The enhancement of technology capabilities includes shifting the focus to automation, big data, artificial intelligence, cloud-based infrastructure and moving towards a software-defined network infrastructure.

4.5.3 Critical success factors to support DT initiatives

Table 0.11 shows a summary of the findings in relation to the critical success factors in the organisation to support DT initiatives. Different organisations have different success factors required to support DT initiatives and projects; these seem to be centralised around the technology capabilities of the organisation, the intended end-user, the skills availability and the organisational support. With regards to the technology capabilities, organisations usually look at integrating the DT initiatives and projects with the oganisations' existing infrastructure, the security of the proposed technology compared to existing security infrastructure, the connectivity and bandwidth requirements, the uptime, as well as the failover and disaster recovery.

There is also emphasis on the end-user adoption and adaptability to the new technology, as per the direct quotes below from the participants:

'impact of the new technology on the people in the organisation'
'*employee adoption*'
'*look the biggest success factor(s) is people, humans and attitude'*.

The availability of skills is an important consideration, this being the availability of internal and external skills as expresses below:

'*you have to have internal capability in terms of skills and agility to be able to execute on what you want to execute*'
'*number one for me is the resources, people. If you have the right skills to support your DT, half of your battles are won'*.

All the participants cited organisational as well as senior management support as the primary critical success factor in supporting DT; one participant had the following sentiments around organisational support: '*So, the first thing is the buy-in, and the buy-in from the top management, from the board. Without that, there's nothing you can do; it doesn't matter how much scale or budget, and knowledge you have, you need to get buy-in from the board, from the ExCo because you will hit a lot of problems on the road, you know, so they need to actually take ownership of the DT strategy*'.

4.5.4 The impact of the COVID-19 pandemic on the ICT department in the organisation

The significant impact of the COVID-19 pandemic during the initial lockdown in South Africa was the restriction on the movement of individuals because only essential movement was permitted. As a result, many organisations focused on how to operate the business away from the companys' building.

The statements below are direct quotes from participants on the impact of the COVID-19 pandemic in their organisations.

'*With COVID, we had to move people to go work-from-home. And although the company had a policy of working remotely, it was only 20% of the people that were working remotely. It accelerated the DT; it accelerated our efforts to make sure that we can have flexibility and have people working from home*.'

'*COVID-19 hugely impacted on IT due to new requirements that we had to put into place, development has been on practically 24 hour working I would say since mid-March.'*

'*…we were already in the process of moving to the cloud. And the impact was that we had to accelerate that; we had to move fast.'*

'*I think fortunately for us because we decided to make those decisions when we did prior to COVID. I think that it wasn't as disruptive as it would have been if we hadn't made those decisions. I think, look, it wasn't a free-sailing period of time, it was definitely very busy from (an) organising, from moving workstations to remote locations, allowing people to take workstations home, organising mobile connectivity for them in those remote locations, through to things like, quickly identifying how technology can assist in the COVID screening process, and temperature monitoring process, so there was a very quick burst of what solutions can the business provide? What solutions can the IT department support the business with? And how do we continue to operate the business from outside of our four walls*?'

'*The organisation has been lucky enough, because three years ago, when we deployed our enterprise architecture, when we interconnected our provinces, by hindsight, because you know, as a CIO, when you look at an ICT strategy, which is long-term, given the global developments, one of the drivers for my strategy was to look at provisioning of online services, another pillar was the remote operation. And another pillar was to ensure that in any partner that we engage with, they must actually be partners that are operating from a well-secured environment. So what happened was then, when the pandemic was then pronounced last year, we had already enabled our environment for staff to work remotely*.'

The initial COVID-19 lockdown impacted the ICT department in different organisations in three major ways. Firstly, there was an increase in the need to execute on the current ICT strategy and, to some degree, the enhancement of the existing strategy to fit the current business climate better. Secondly, ICT departments were required to optimise, expand and build new IT

capabilities for their organisations to ensure business continuity. And lastly, there was fast-tracking of IT infrastructure deployment and the adoption of new technologies as per Table 0.12.

4.5.5 The impact of the COVID-19 pandemic on the ICT strategy

Table 0.13 shows a summary of the findings in relation to the impact of the pandemic on the ICT strategy in the organisatin. The statements below on the impact of the COVID-19 pandemic on the ICT strategy in their organisations are directly from the participants.

'*Look, I treat word strategy very, very carefully and with huge respect. And for me, a strategy is something that is set on the level of the business. I don't believe in sub-strategies; IT strategy and HR strategy for me doesn't exist. You can have your tactics, you can have your tactical approach to your execution methods, your execution approach to support the strategy, but there is only one strategy, right? We have a vision and philosophy at the level of the company, we have a strategy at the level of the company to support the vision and philosophy, and we have the execution plan to support the strategy. This is how it works, vision and philosophy, strategy and execution. So in the case of IT, we, of course, we had to do tactical changes, obviously, as I mentioned before when it comes to deepening the integration of digital into the business and so on and so forth*.'

'*We didn't have to revisit it that much. You know, like I stated previously, we always had a DT strategy. And we are busy looking at cloud products, now moving to software as a service and infrastructure as a service. So the strategy kinda remains the same*.'

'*We had to change it and tweak it a little bit. To accommodate or to fast-track. Our strategy was already spearheaded over a three-year period to go into a digital environment, DT. So that's where we're heading to. So COVID then actually fast-tracked certain activities.'*

'*Yeah, absolutely. Not even though the IT strategy, the whole business model changed. How we conduct business is completely different to how we used to conduct business. We've revisited the business model, which obviously will inform the change in our IT strategy. So there are things that we used to do from a technology point of view that we are not doing anymore. And*

therefore it means that our strategy had to also change because our business model has also changed.'

Most organisations (10 out of 14) did not have to revisit or change their ICT strategy; however, there was strategy optimisation to some degree in most organisations. The optimisation came from the enhancement of IT capabilities focusing on automation, IT infrastructure modernisation, IT infrastructure optimisation, and the adoption of cloud computing and cloud software. Some organisations (4 out of 10) did have to revisit their ICT strategy due to the COVID-19 pandemic. In some instances, the organisational operating model had to change in its entity with the changing business needs, impacting the overall ICT strategy as per Table 4.2.

Table 4.2. Impact of COVID-19 pandemic on ICT strategy

RESPONDENT	DID YOU HAVE TO REVISIT YOUR ICT STRATEGY?
1	NO
2	YES
3	NO
4	YES
5	NO
6	NO
7	NO
8	NO
9	NO
10	NO
11	NO
12	YES
13	NO
14	YES

4.5.6 The impact of the COVID-19 pandemic on the ICT budget

Table 0.14. and Table 4.3. show a summary of the findings as it relates to the impact of the pandemic on the ICT budget. The four themes identified include; first, a repurpose of the

budget (four out of 14) in the ICT department to different projects, such as a focusing more on operational expenses against capital expenses. Second, an increase in the overall budget to allow for the acquiring of additional technology capabilities to allow for business continuity (four out of 14). Third, a decrease in the overall budget to support other critical business units as well as cutting overall organisational costs (one out of 14). And last, a zero change in the budget allocation and the use for the ICT department (five out of 14).

Table 4.3. Impact of COVID-19 pandemic on ICT budget

RESPONDENT	HOW DID YOU MANAGE THE ICT BUDGET?
1	Repurpose budget
2	Additional budget allocation
3	Additional budget allocation
4	Repurpose budget
5	No change in budget
6	No change in budget
7	Additional budget allocation
8	No change in budget
9	Repurpose budget
10	No change in budget
11	Decrease in budget
12	Repurpose budget
13	Additional budget allocation
14	No change in budget

4.5.7 Long-term strategy for the ICT department in different organisations

Table 0.15 shows a summary of the findings as it relates to the long-term strategy for the ICT department. The quotes below show some direct throughts from the particpants on the long-term strategy for their ICT department in the organisation.

'*I think it's improving on that existing investment and seeing what else we can get out of it.*'

'*So my department's long-term plan is to be a valued business partner to the organisation. So we have a bit of history, we were never seen as a sort of value partner; we were seen as more as a blocker in a sense of that if some department wanted a new system, they wouldn't depend on IT to deliver that.*'

'*From the IT point of view. It's very important that we keep the Service Level Agreement (SLA). We make sure that our system is available 99.9% very, very critical; it's part of our long-term strategy. It's not going to end this one, it's a lifetime objective. To keep our system stable and become available 99.9% and we continue with digitisation, we believe that there's just no other way. You know, DT is the only way that we can sustain our business now and in future; it's part of our long-term strategy.*'

'*Our long-term strategy is to minimise reliance on external consultants to build internal capacity. And number two, it is to make sure that even from a training program, we stay aligned to the latest technology trends that are happening out there. And thirdly, it's just to make sure that business is stable and happy from the services that we provide.*'

The long-term goals for ICT departments in different organisations include ICT being better positioned to support the greater business strategy and enabling the business model, the automation of business operations, infrastructure modernisation and optimisation', as well as moving towards Agile workflows.

4.5.8 General business impact of the COVID-19 pandemic on organisations in South Africa

The statements below are direct quotes from participants on the general impact of the COVID-19 pandemic in organisations in South Africa. Table 0.16. shows the summary of the findings in relation to the general business impact of the pandemic on organisations as per the sentiments from the participants. The quotes below show some of these sentiments.

'*I think it will change it bigtime, and hopefully for the better, because with this COVID, the government needs to basically assist organisations get connections in places, internet*

connections in places. So what is stipulated in the National Development Plan needs to come to life now, where pretty much all South Africans need to have access to broadband. And it needs to be reliable.'

'*If anything, I hope that it shows all businesses out there the relevance of IT and changing the perception around, not needing fancy tools. I think fancy tools, in some cases, have either saved a lot of companies or the lack thereof crippled a lot of companies, and I think other business owners out there should see that as … a very steep learning curve and apply that to their environments.*'

'*It has already changed the ICT landscape; those people that used to take IT as a supportive business unit, they now realise that actually, the CIO's, we've been crying, we've been showing them stuff from Gartner's, from Forester's, from all these conferences that it shouldn't be seen as a separate business unit, it must be seen as a strategic business unit.*'

'*Actually, I don't see change in the ICT landscape. It will just give more business to IT. So I think there will be more initiatives from different organisations, which will go into the IT services of IT, so there'll be more budgetary allocation to IT and digital initiatives.*'

'*There will be more demand for ICT; organisations will realise that now, ICT is a critical element of each and every organisation. It will become constant in each company. So, the level of support that the organisation will… remember that most organisations have always viewed ICT as a support function, like finance and other things in order to support organisation, but now I think that the shift with ICT no longer being a support function. It is a key critical element of the organisation, an enabler of the business.*'

The themes emerging from the study show that the general business impact of the COVID-19 pandemic on organisations in South Africa includes:

(i) the increase in remote and mobile working;
(ii) increase in productivity as a result of remote and mobile working;
(iii) increase in the importance and relevance of the ICT department in organisations;
(iv) phasing out of certain IT roles;
(v) prioritisation of DT;

(vi) modernisation of the IT infrastructure;
(vii) adoption of cloud computing and cloud software;
(viii) increase in focus on cybersecurity;
(ix) increase in need for connectivity across the country; and finally,
(x) the decrease in need and demand for corporate real estate.

4.6 RESULTS PERTAINING TO RESEARCH OBJECTIVE 2

This section will present the results of the second research objective, which was to investigate the technology capability changes in the organisation because of the COVID-19 pandemic.

4.6.1 IT capabilities in the organisation prior to the COVID-19 pandemic

Different organisations have been focusing on different IT capabilities over time as per Table 0.17. These include software-defined networking, automation of IT infrastructure, cloud computing, cloud software, collaboration and video communication software, hyper-converged infrastructure in the data centre, mobile devices, virtual desktop infrastructure, robotics, AI and data analytics.

4.6.2 Technology adoption as a result of the COVID-19 pandemic

IT capabilities introduced in different organisations as a result of the COVID-19 pandemic include automation of the IT infrastructure, optimisation of existing infrastructure, an increase in the capacity of IT infrastructure, infrastructure integration, video communication software, cloud computing, cloud software and cybersecurity as per Table 0.18. The technology adopted by different organisations was predominantly for internal use. However, in some organisations, the adoption was for customers and other external stakeholders, predominantly for external use.

4.6.3 Criteria for technology adoption

The criteria for new technology adoption include compatibility and interoperability with existing IT infrastructure, security, cloud computing and cloud software, API availability, bandwidth requirements, capacity and functionality, compliance with regulations and partnering ith the best IT vendors in the market as per Table 0.19.

4.6.4 Challenges in technology adoption

Different organisations experienced different challenges when adopting new technologies as a result of the pandemic. Some of these challenges include the integration of new IT capabilities with existing IT infrastructure, the increase in turnaround time for deployment and the increase in time for the delivery of IT equipment because of lockdown regulations, connectivity and bandwidth for end-users, end-user adoption and organisational alignment as per Table 0.20.

4.6.5 The impact of the COVID-19 pandemic on the security strategy

Table 0.21. show the summary of the findings in relation to the impact of the pandemic on the security strategy in the organisation. The statements below are quotes from the participants on the impact of the COVID-19 pandemic on the cybersecurity strategy/approach.

'*Yes, definitely. And it's not just only for this project; basically, globally, we had to look at our security strategy because after COVID-19, IT security analysis realised that fraudulent activities in IT just actually went up almost … almost fivefold in a lot of organisations. So we had to start tightening security everywhere*.'

'*You know, we always had … I have to revisit it, and yes, we did revisit it. However, we were in the process of changing our security. We had our external company do more checks than normal due to COVID-19. We know of all the treats coming in and the fishing coming in. And we know large companies are being attacked, and we didn't want to be attacked during that time. So we are thankful that we were not a target. I, however, don't take that lightly*.'

'*No, we didn't have to; our security approach was fine. I'm just trying to think, though, there were no major infosec changes. All that was in place already*.'

'*Yeah, so, strangely enough, we've been going through that process; I wouldn't say that COVID forced us to go through that review. I think we knew that we needed to do that way before, and it's an active thing that we were undergoing at the moment. But obviously, I think security has always been a focus point*.'

'*Well, I think the other thing was the issue around the change of policies; we had to change the policies to align with the new ways of doing things. We had to, for example, improve the number of characters that we put in a password and make it more complicated than before. So, yes, besides the technology, there are processes that we also had to redefine, and there are those processes that we have had to retire, and then we had to introduce new processes, which means the policies as well would have been updated*.'

'*Yeah, that one we had to because as you know, as I've indicated, traditionally, we've been an on-premise type organisation. So from our VPN* (virtual private network), *entry into our environment was just limited to your executives. But now, for example, we're bringing online services; the minute you bring online, one has to review and say, now you're bringing external people into the house. What other extra measures do we have to do, so we've adopted new standards with cybersecurity*.'

'*Yeah, I am moving to the cloud. But I've also articulated cybersecurity strategy in which I did a maturity assessment of my current posture of the security to identify the gaps, but in closing the gaps, I'm going with a managed security strategy in which I am giving all my security services to a particular vendor to manage them on my behalf primarily because I can't build an internal capability to quickly, even if I do, I cannot afford it. And some of these security skills are highly specialised, so you get them with the big vendors*'

'*Yes, definitely. Definitely, we had to, one of the things that we had to do was to ensure that all our devices are encrypted*'

Table 4.4. Impact of COVID-19 pandemic on security approach/strategy

RESPONDENT	DID YOU REVISIT YOUR SECURITY APPROACH/ STRATEGY AS A RESULT OF THE COVID-19 PANDEMIC?
1	NO
2	YES
3	YES
4	YES
5	YES
6	NO
7	YES
8	YES
9	YES
10	YES
11	YES
12	YES
13	NO
14	YES

Most organisations had to revisit their security strategy and approach (11 out of 14) as per Table 4.4. There are six major themes identified in the study on the impact of the COVID-19 pandemic on the security strategy in the organisation. These include a no change in the security strategy and execution, an increase in security focus, adoption of new security products and services, an increase in end-user awareness and training, an increase in cybersecurity monitoring, and the changing security policies in the organisation.

4.7 RESULTS PERTAINING TO RESEARCH OBJECTIVE 3

This section will present the results of the third research objective, which was to investigate the impact of the COVID-19 pandemic on the bimodal IT approach.

4.7.1 Bimodal IT approach in the organisation

Table 0.22. show a summary of the findings on the Bimodal approach in the organisation. Organisations have different approaches to managing IT; in some organisations, the DT strategy is part of the ICT department (seven out of 14), while in others, the DT strategy and activities are separate from the ICT department (seven out of 14) as per Table 4.5. In the case of this study, there is an equal split between organisations that have their DT strategy as part of the ICT strategy to organisations that have the DT strategy separate from the greater ICT strategy.

Table 4.5. DT strategy approach in the organisation

RESPONDENT	DO YOU HAVE A DT STRATEGY? OR IS IT PART OF THE ICT STRATEGY?
1	DT strategy part of ICT strategy
2	Separate DT strategy
3	DT strategy part of ICT strategy
4	Separate DT strategy
5	DT strategy part of ICT strategy
6	Separate DT strategy
7	DT strategy part of ICT strategy
8	Separate DT strategy
9	DT strategy part of ICT strategy
10	DT strategy part of ICT strategy
11	Separate DT strategy
12	Separate DT strategy
13	Separate DT strategy
14	DT strategy part of ICT strategy

The themes identified show three types of organisations as per the below as per Table 0.22.

(i) DT team is separate from the IT team in the first type of organisation. In these organisations, the IT team is primarily focused on the day-to-day operations ('keeping the lights on') while the DT team focuses on DT projects and initiatives. These teams can work closely together through consistent collaboration, or they can be completely separate.

(ii) In the second type of organisation, the DT team and the IT team form part of the greater ICT team. In these organisations, the IT team usually works collaboratively with the DT team to ensure business continuity in terms of infrastructure stability while supporting DT projects and initiatives.

(iii) In the third type of organisation, the IT team executes on the DT strategy, and the individual IT team members deliver on daily operational needs and drive DT projects and initiatives.

The statements below are quotes from the participants on the split of activities in the organisation between 'traditional IT' and 'DT' and the day-to-day organisational balance between the two modes of IT.

'*No, we do everything at the same time. If you've got a project and got day-to-day operations, we basically have to balance all those; that's because we cannot just simply say, let's add more resources, let's add more human power, we have to work with what we have. So, we have to be able to, at the same time, maintain our day-to-day operations, and at the same time, look at either optimisation projects or improvement projects; those needs should not affect the other.*'

'*It's more… it's more run and build, it's more operations and build and growth? Right. And this is exactly how the budget is… is split; there is a product that has been implemented into the architecture, and there is a life-cycle of this product. Implementation phase, the growth phase, is one team and life-cycle phase, the run phase or the operation phases, a different team. Not a different team, but it's a different set of people.*'

'*So, the IT organisation in our company is called GTO. And the GTO is split into run and build. So basically, the run structure is where I am in. So that's the infrastructure that's keeping the lights on. Okay. And then we've got the build guys, they build new stuff, they look at new stuff or innovative ways to deliver products.*'

'*I think it with a lot of effort, I would say, is the first answer. But I think we are a very small team for the size of the company that we have. But it's part to how we support the business. So we, I mean, from an infrastructure perspective, we rely heavily on our partners, our ICT partners. So, you know, we don't, or I myself, don't necessarily do the day-to-day running of making sure things are updated or the lights are kept on; I oversee that, but I don't physically do that. So I think that assists, and then yeah, that's pretty much the ... the ... the breaking point of the split between the two sectors.*'

'*There is no split because you can't digitise the company without relying on the guys that are keeping the lights on. So the only thing that I did was to build a new division that is focusing on digitisation. And then have a Chief Digital Officer and a team that is focusing on DT. But they also rely on the infrastructure guys; they rely guys that are keeping the lights on.*'

'*Well, I wouldn't say it's a split; it's more like a dual business management process.*'

'*No, there is no split currently. Because my learning from the past is that you cannot really split. I don't know, Gartner was trying to be smart with their bimodal, but my experience has shown that it has never worked. Because at the end of the day, there's an integration between old and new. When there's two speed modes, really, I have found that it doesn't work in my spirit. So we're really executing the strategy.*'

'*In view, there is a split because your day-to-day would entail keeping the lights on as you mentioned, and ensuring that your network is stable, ensuring that systems are accessible. There's availability and uptime of your system and the general maintenance of your systems, be it backup speed, patching and all of that. Now, the digital portion has a totally different set of focus; it is more application layer and architectural layer focused, it is not focusing at all on keeping the lights on, DT assumes the lights are on, you are building some capabilities on top of a base that is already in existence.*'

'*That's a good question. I never thought about it myself. Balancing the two is, I think, having the right tools to monitor and help you manage your day-to-day activities. That, to me, is what gives you enough time; if you have tools that will give you alerts if a particular system is down, give you alerts if you are running out of space, then your day-to-day is sort of automated*

monitoring. And then the DT becomes a project, you then separate the two, day-to-day is not a project, it's operational, it's the run of the mill, you would deal with challenges as a come up. With DT, it becomes a project where you've got different phases and chunks of things that you are trying to digitise or transform. So the balance is that the other one is project-based, and then the other one is operational, you will resolve challenges as they happen.'

When asked if there was a split in activities in the organisation between 'traditional IT' against 'Digital IT', 8 out of 14 of the participants stated that there was no split in activities while the rest of the participants (6 out of 14) were able to identify a split of activities in the organisation as per Table 4.6.

Table 4.6. Split of activities between 'traditional IT' and 'Digital IT' in the organisation

RESPONDENT	IS THERE A SPLIT OF ICT ACTIVITIES IN THE ORGANISATION (TRADITIONAL IT VS DT ACTIVITIES)
1	NO
2	YES
3	NO
4	NO
5	NO
6	NO
7	YES
8	YES
9	NO
10	NO
11	YES
12	YES
13	YES
14	NO

The balance in activities between DT initiatives and traditional IT initiatives is usually based on the organisation's approach to managing IT.

(i) For organisations with separate DT teams and IT teams, each department has its own specific mandate, goals, objectives, activities and initiatives.

(ii) For organisations with the DT team and the IT team forming part of the greater ICT team, there are dedicated projects for DT initiatives and traditional IT projects.

(iii) For organisations with the IT team executing on the DT strategy and activities, initiatives are dictated by business needs, the individual team contributors, the managers of the teams and sometimes the outsourcing of traditional IT projects to allow the IT team to focus on DT initiatives.

4.7.2 Impact of the COVID-19 pandemic on Bimodal IT approach in the organisation

Table 0.23. shows a summary of the findings as it relates to the impact of the pandemic on the Bimodal IT approach in the organisation. The statements below are direct quotes from the participants on the impact of the COVID-19 pandemic on the bimodal IT approach in the organisation.

'*The proportions have changed. Because as I mentioned initially, you end up having to bring forward your digitisation implementation strategy when you had it planned for maybe the third year. So you try to juggle two things at the same time.*'

'*You know if there's one thing that this pandemic has helped with as the group CIO, was the fact that there was much collaboration between IT and business, which is something that was never there before because this was more like a crisis management where everybody needed to come and, sit and say their inputs and all sorts of things. So it was given that from the IT point of view, we needed to work as a team between the team that is doing support and maintenance. Between the team that is doing infrastructure and the new digital team. Fortunately, because we started with this DT, we had the digital team that was focusing (on) the digital solutions; the only thing that I did was to add more capacity so that we accelerate more because now, we have so many things that we needed to do that, you know, for example, those things that were planned for this year, we had to do them before the end of June last year, because of the pandemic.*'

'*I think, in the early stages, all focus was on making sure that the user base could function, you know, during that initial phase, and assisting in whatever way possible, to make sure that, you*

know, people that weren't used to working remotely now can work remotely. So yeah, I think that was the focus point for them. So there was definitely a shift in effort. But once that had subsided, you know, going back to our day-to-day operations.'

'*No, we just … we just work longer and harder now. That's one of the results of COVID-19 and everybody working at home. The productivity, I would say definitely increased definitely.*'

'*Rather more enhanced because we are now sort of, at the same time doing this, we are sort of trying to find more efficient ways of doing what we have always been doing. So we're finding better ways of doing the same thing with fewer resources and fewer costs, at lower costs.*'

When asked if the pandemic resulted in changes in the proportions of operation between 'traditional IT' and 'DT', 8 out of 14 of the participants stated the proportions had changed whilte the rest (6 out of 14) of the participants stated there was no change as per Table 4.7.

Table 4.7. Impact of COVID-19 on proportions of activity split in the organisation between 'traditional IT' and 'Digial IT'.

Respondent	Was there a change in terms of proportions as the result of COVID-19? (traditional IT vs DT activities)
1	NO
2	YES
3	YES
4	YES
5	NO
6	NO
7	YES
8	YES
9	NO
10	YES
11	NO
12	YES
13	NO

Respondent	Was there a change in terms of proportions as the result of COVID-19? (traditional IT vs DT activities)
14	YES

The pandemic had four major impacts on the bimodal IT approach in different organisations. There has been a substantial increase in DT initiatives in some organisations compared to traditional IT projects, while in other organisations, the opposite is true. In some organisations, DT initiatives have been suspended to focus on traditional IT projects, and in other organisations, the pandemic has had no impact on the split of activities between DT initiatives and traditional IT projects.

4.8 SUMMARY OF FINDINGS

4.8.1 Summary of findings in relation to Research Objective 1

The business role of IT in the organisation is central to the business model, business processes and organisational culture. The DT strategy in organisations has focused on improving customer experience, the business model and strategy, the technology capabilities in the organisation, business operations, people, and culture. The critical success factors for organisations to support DT activities are centred around organisational support, the availability of skills, the technology capabilities and the intended end-user.

The COVID-19 pandemic mainly resulted in the need to execute on the existing ICT strategy and, to a greater extent, the optimisation of the existing strategy. It also resulted in the fast-tracking of IT deployment andadoption; as well as the optimisation, the expansion, and the building of new IT capabilities in different organisations. Regarding the ICT budget, the COVID-19 pandemic had four major impacts: organisations either had to repurpose the ICT budget, increase the overall ICT budget, decrease the overall ICT budget or, in some instances, there were no budget changes.

4.8.2 Summary of findings in relations to Research Objective 2

Before the pandemic, organisations focused on developing different IT capabilities, including software-defined networking, automation of existing infrastructure, adopting cloud computing

and cloud software, deploying collaboration software and video communication software and focusing on technologies such as data centre hyperconvergence and enabling mobility of work.

The focus on IT capabilities in organisations as a result of the COVID-19 pandemic includes the increased automation of the IT infrastructure, the optimisation and modernisation of existing infrastructure, integration of different components in the infrastructure, as well as increasing the capacity of the infrastructure to accommodate a dynamic and evolving work environment. There is also a greater focus on adopting cloud computing and cloud software as core capabilities in the modernisation and optimisation of the infrastructure. The focus is also on adopting technologies such as robotics, artificial intelligence and data analytics in core business processes and systems while consistently prioritising security.

The criteria used for adopting new technologies in organisations are centred on features of the technologies, security, interoperability, and compliance and regulations. The challenges organisations have when adopting new technologies include the integration of new technology with existing infrastructure, the increase in turnaround time for deployment as a result of the restrictions on movement (including the delivery of critical equipment, end-user adoption and support, change management from an employee and customer perspective) and, crucially, the connectivity and bandwidth availability in different parts of the country where employees are based (this includes the impact of load-shedding on work continuity).

The impact of the COVID-19 pandemic on the cybersecurity strategy/approach in organisations was a more increased focus on cybersecurity. Included in this is the adoption of new products and services, an increase in monitoring tools, changing security policies, engaging ecosystem partners for support and, critically, end-user awareness and training.

4.8.3 Summary of findings in relations Research Objective 3

Organisations have different approaches to managing IT projects and initiatives. In some organisations, the DT strategy is part of the greater ICT strategy, while in other organisations, the DT strategy is separate in terms of development and the execution of the ICT strategy. The management of this differs per organisation. In some organisations, the DT and IT teams are separate and can either be part of the greater ICT team or operate in completely separate business units. In other organisations, the DT teams and the IT teams are part of the greater

ICT team and work closely together. In some organisations, there are no separate DT teams; the IT team executes on the DT strategy on a project/initiative basis.

In terms of balancing activities between day-to-day projects and DT projects, some organisations have dedicated DT resources, others have dedicated DT projects. Some organisations manage this from emerging business needs, while in others, the managers are responsible for splitting activities in the team based on business needs and key performance indicators In still other organisations, the 'traditional IT' activities are outsourced, and internally, the focus is around DT only. In contrast, in other organisations, there is no split of activities; individual contributors create their own split based on merging business needs, role and job description. The impact of the COVID-19 pandemic on the split of activities between day-to-day projects and DT projects also differs per organisation. The four major themes are either an increase in DT activities, an increase in IT activities, DT activities put on hold or, in some organisations, there was no change in the proportions of operation before the pandemic or as a result of the pandemic.

CHAPTER 5: DISCUSSION OF RESULTS

5.1 INTRODUCTION

This chapter provides an analysis of the results presented in Chapter 4. The first section will provide analysis concerning the first research objective, the second section will provide analysis regarding the second research objective, and the third section will provide analysis concerning the third research objective. The final section will provide a summary relating to the analysis of the results of the three research objectives.

Table 5.1. Summary of the discussion of results based on the proposition and themes for each research objective

RESEARCH OBJECTIVE	PROPOSITION	THEMES
To investigate how the ICT in the organisation was impacted by the COVID-19 pandemic.	The impact of the COVID-19 pandemic on the ICT in the organisation was mainly on the ICT strategy and ICT operations.	(1) ICT strategy (2) ICT operations
To investigate the technology capability changes in the organisation as a result of the COVID-19 pandemic.	The COVID-19 pandemic resulted in the optimisation, expansion/or and the building of new IT capabilities in the organisation.	(1) Optimisation and expansion of existing IT capabilities (2) Building new IT capabilities
To investigate the impact of the COVID-19 pandemic on the bimodal IT approach.	The COVID-19 pandemic had a mixed impact on the bimodal approach to IT – between no impact on the organisation and an impact on the type of IT mode focus in the organisation.	(1) Increase in DT (2) Increase in 'traditional IT'

5.2 DISCUSSION ON RESEARCH OBJECTIVE 1

This section will analyse the results relating to the first research objective, investigating how the ICT in the organisation was impacted by the COVID-19 pandemic.

Proposition: The impact of the COVID-19 pandemic on the ICT in the organisation was mainly on the ICT strategy and ICT operations.

5.2.1 ICT strategy

Ismail et al. (2017) proposed that companies transform due to two factors, these being internal factors and external factors. Figure 5.1 shows that the internal context for DT is centred around, for example, cost savings, operational efficiency, management of information needs and strategic differentiation from competitors. The external context for DT is due to the improvement in technology cost and performance, new IT/IS-based products and services in the market, changing industries, market volatility, client expectations, and competitive rivalries primarily in the form of start-ups.

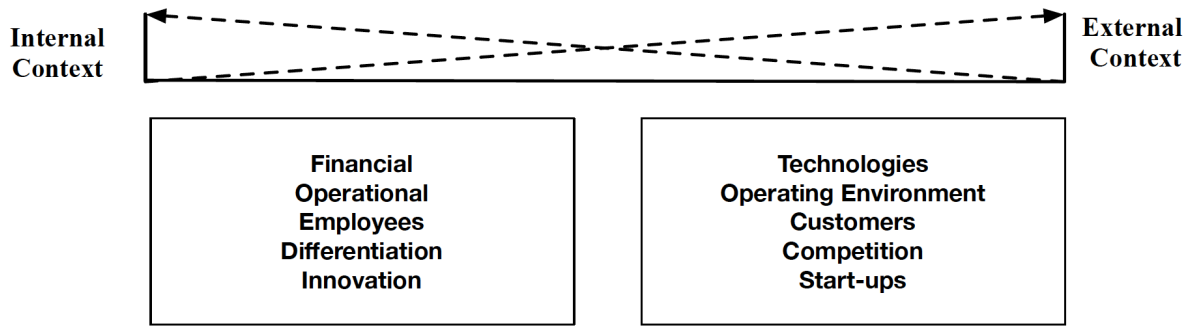

Figure 5.1 DT context

Source: Ismail et al. (2017)

The findings from the study show transformation is based on both internal and (primarily) external factors with regards to the pabdemic, this aligns with findings in the literature. The findings of the study show that the pandemic affected the ICT strategy. The three major themes emerging show that the impact was either an increase in the execution of the existing strategy, optimisation and improvement of the existing strategy and the development and adoption of

new strategy in response to the pandemic. To determine the impact of the pandemic on ICT strategy, it is important to understand the business role of IT in the organisation to understand how the impact of the pandemic on the ICT strategy could impact the greater organisation.

5.2.1.1 Business role of IT

In line with the literature, the findings from this study show that IT is significant and often central to the organisations' business model and business processes. The IT resource-based view of organisations suggests that firms can and do differentiate themselves based on their IT resources. An organisation's IT infrastructure, human IT skills, and ability to leverage IT for intangible benefits serve organisation-specific resources (Bharadwaj, 2000). When asked to describe the role of IT in the organisation, ICT leaders often placed IT as significant in the running of different business units such as operations, sales and marketing, HR, supply chain and research and development. IT was also placed at the forefront of developing the business model and strategic changes to the business model from time to time and the development of the organisational strategy.

In addition to this, organisations have been adapting their IT capabilities, infrastructure and skills, as part of their DT journey focusing on different emerging technologies such as Software Defined Networking, Big Data, Artificial Intelligence, Cloud Computing and Cloud Software. IT is also used to introduce automation to systems and processes that were historically manual. In the paper, 'DT: Drivers, Success factors and Implications', Osmundsen et al. (2018) place growing IS capabilities as a critical success factor for DT. This is in line with the findings from Sebastina et al. (2017) that technology-enabled assets are essential to executing digital strategy, being an operational backbone that enables operational excellence and digital service platforms to enable rapid innovation.

5.2.1.2 Executing existing strategy

The findings from the study show that for many organisations, the pandemic seems to have accelerated the execution of their existing ICT strategy. The IT capabilities identified as being important to the organisations' ability to continue operations outside their concrete walls, such as unified communication platforms, which have been central to the 'Work-From-Home' strategy a lot of organisations have had to adopt (Savic, 2020), these would have been ICT

capabilities part of the greater strategy in the long term and were most likely projects that were in the pipeline for acquisition, deployment and adoption over time.

The literature suggests that the challenges of DT implementation in organisations are centred, amongst other things, around the lack of urgency from the leadership of the organisation, institutional challenges with politics (internal power centres) and executing on the change because of struggles with computing the return on investment (Fitzgerald et al., 2013). In this study, ICT leaders noted how organisational buy-in and support is important to any DT initiative and project. Often ICT leaders spend much time 'selling' the DT agenda to senior organisational leaders and stakeholders. The pandemic increased organisational buy-in and support of the ICT strategy (in instances where the ICT strategy was already aligned to the appropriate IT response to the pandemic). There was also support in terms of resources and budget to increase the execution of the existing strategy to ensure business continuity.

5.2.1.3 Optimisation of existing strategy

Over and above the execution of the existing strategy, organisations also saw an increase in the need to optimise parts of their existing strategy in line with emerging organisational needs. Literature shows that DT seems to be intuitively managed rather than strategically planned. Berghaus and Back (2016) hypothesised that companies tend to experiment with digital innovation or react to external changes at the beginning of the transformation process. In line with the literature, the decision for organisations to optimise the existing strategy is a result of 'external changes' in the form of the pandemic.

By and large, emerging organisational needs were the biggest driver in strategy optimisation. For example, for the manufacturing organisation that had to resume operations in their manufacturing plant or for organisations deemed as providing essential products and services; and thus could operate throughout the different lockdown levels, an emerging need was the use of technology in COVID-19 screening protocols in order to adhere to regulations. In this instance, if the proposed solution is to use location analytics to track the movement of individuals in the plants through their phones, then a need would arise to evaluate the current IT capabilities in the plants. If a new technology needs to be adopted, then the new technology intended for adoption needs to interoperable with existing infrastructure and the resources and/or skills required in the acquisition, deployment and adoption.

5.2.1.4 Development and adoption of a new ICT strategy

The impact of the pandemic on the organisation was the development and adoption of a new ICT strategy to meet emerging business needs, as well as to achieve desired business outcomes. According to Ismail et al. (2017), the dimensions of IT-enabled transformation include localised exploitation, internal integration, business process redesign, business network redesign and business scope redefinition (Table 5.2). Organisations that went through developing and adopting a new ICT strategy as a result of the pandemic to align to the emerging business needs and to support the business in what has been popularly termed the 'new normal', can be considered to have gone through IT-enabled transformation. As such, the dimensions suggested below would apply.

Table 5.2. Five levels of IT-Enabled Transformation

Source: Venkatraman (1994)

IT-ENABLED TRANSFORMATION	CHARACTERISTICS
Localised exploitation	Decentralised leveraging of IT systems in organisational functions
Internal integration	Systematic leveraging of IT capabilities throughout the entire business process
Business process redesign	Redesigning the current business process and organisational design
Business network redesign	Redesigning the nature of the exchange between multiple stakeholders in a business network
Business scope redefinition	Expanding the business scope and fundamentally restructuring activities in the value chain

Other organisations had to re-look at the entire business model or, to a greater extent, the business operations model of the organisation. Key elements were addressed, such as:

(i) the product and service offering;
(ii) the delivery of the product and service offering to customers;
(iii) the resources required;
(iv) more specifically, the human resources required; and
(v) the place(s) of operation.

A revision of the business model or the business operations model directly impacted the ICT strategy as the ICT strategy had to be aligned to the revised business model or operations model. It is important to note that not all organisations that developed and adopted a new ICT strategy did this as a result of a revision in the business model or operations model. The implications for DT can be reformed IT in the organisation and a new business model. With DT, IT becomes more integrated with the business, and the role becomes strategic while traditional IT requirements are challenged (Osmundsen et al., 2018). In addition to reformed IT, the development of new business models can be common implications of DT.

5.2.2 ICT operations

In the DMM proposed by Tratkowska (2019), there are five assessment areas, these are customers, strategy, technology, operations and organisation and culture. Tratkowska (2019) found the operations dimension of the DMM covers agile chang management practices, automated resources management, integrated services management, real-time insights and analytics, smart and adaptive process management, as well as standards and governance automation. The findings from the study show that the operational impact of the pandemic on ICT operations was the fast-tracking of IT deployment and adoption, as well as the establishment of remote IT teams.

5.2.2.1 Fast-tracking IT deployment and adoption

The first operational impact of the pandemic on ICT in many organisations was that the ICT projects planned pre-pandemic were reprioritised based on emerging business needs. Some projects were put on hold, and some projects, particularly projects to meet current business needs, were fast-tracked. The projects that were put on hold were mainly projects that could

not be progressed due to different factors, such as the limited availability of human resources in physical form and limited equipment availability due to supply chain disruptions. Some projects were put on hold simply because they were not considered critical to ensuring business continuity.

Some planned pre-pandemic projects and new projects became critical in other organisations and had to be fast-tracked to meet emerging business needs. For example, projects such as rolling out unified communication platforms and virtual private networks (VPN) to all employees to support remote working fall into that category. The interesting part of this process was not only that critical projects were fast-tracked, but also the increased pace of deployment and adoption. Projects that would typically take a longer timeframe to complete were completed in significantly reduced timeframes.

5.2.2.2 Remote IT teams

The second operational impact of the pandemic on ICT was moving IT teams remotely. Many organisations can recount how they adopted a 'work-from-home' policy for their employees. It is important to note that the IT teams also had to operate remotely. This is significant because the teams had to support the business and, most importantly, support users remotely. For many organisations, this meant that they had to develop capabilities to support users remotely within the IT teams.

5.3 DISCUSSION ON RESEARCH OBJECTIVE 2

This section will analyse the results concerning the second research objective, which was to investigate the technology capability changes in the organisation because of the COVID-19 pandemic.

Proposition: The COVID-19 pandemic resulted in the optimisation, expansion/or and the building of new IT capabilities in the organisation.

5.3.1 Technology capability changes as a result of the COVID-19 pandemic

It was first necessary to explore any changes to the technology capabilities prior to the pandemic to understand whether organisations had to make any changes to their technology capabilities as a result of the pandemic. Before the pandemic, organisations had been adopting different technologies. The focus seems to have been on modernising the existing infrastructure and adopting a cloud approach for the infrastructure refresh and upgrade. Mithas et al. (2011) argue that IT capabilities influence the development of three organisational capabilities: customer management capability, process management capability and performance management capability.

Technology is one of the assessment areas of the DMM by Tratkowska (2019) with an organisational focus on applications, IoT structure, data and analytics, delivery governance, network, security and technology architecture. The pandemic did result in changes to technology capabilities in different organisations. The focus areas of these changes were the IT capabilities that would support:

(i) the delivering of products and services to customers remotely and virtually;
(ii) the automation of business processes and system;
(iii) the moving of workstations remotely; and
(iv) securing remote work stations.

5.3.1.1 Optimisation and expansion of IT capabilities

The pandemic presented unique challenges to different organisations, mainly centred on how organisations could continue business operations in view of changing regulations and changing societal norms. The direct impact of this at the ICT level resulted is the need to optimise and expand IT capabilities to meet changing business needs. For some organisations, the IT capabilities, namely, the infrastructure in place pre-pandemic was best placed to support the changing organisational needs resulting from the pandemic. For other organisations, the infrastructure in place pre-pandemic needed to be optimised and expanded to cater for new requirements.

5.3.1.2 Building new IT capabilities

For other organisations, the infrastructure in place pre-pandemic was not adequate to support new business requirements, and thus, at the ICT level, the focus had to be on building new IT capabilities, both infrastructure and skills capabilities. The focus was on infrastructure modernisation from the infrastructure side, with an interesting focus on cloud computing, cloud-based services, and cloud storage.

5.4 DISCUSSION ON RESEARCH OBJECTIVE 3

This section analyses the results of the third research objective, which was to investigate the impact of the COVID-19 pandemic on the bimodal IT approach.

Proposition: The COVID-19 pandemic had a mixed impact on the bimodal approach to IT between no impact at all on the organisation and an impact on the type of IT mode focus in the organisation.

5.4.1 Bimodal IT approach in the organisation

It is important to understand the organisational view of IT operations pre-pandemic to understand the impact of the pandemic on the bimodal IT approach. In the paper 'The Transformative Role of Bimodal IT in the era of Digital Business', Haffke et al. (2017) proposed three different bimodal IT archetypes:

(i) bimodal IT on a project-by-project basis;
(ii) IT function structurally subdivided into two modes; and
(iii) bimodal IT in two separate organisational divisions (Figure 5.2).

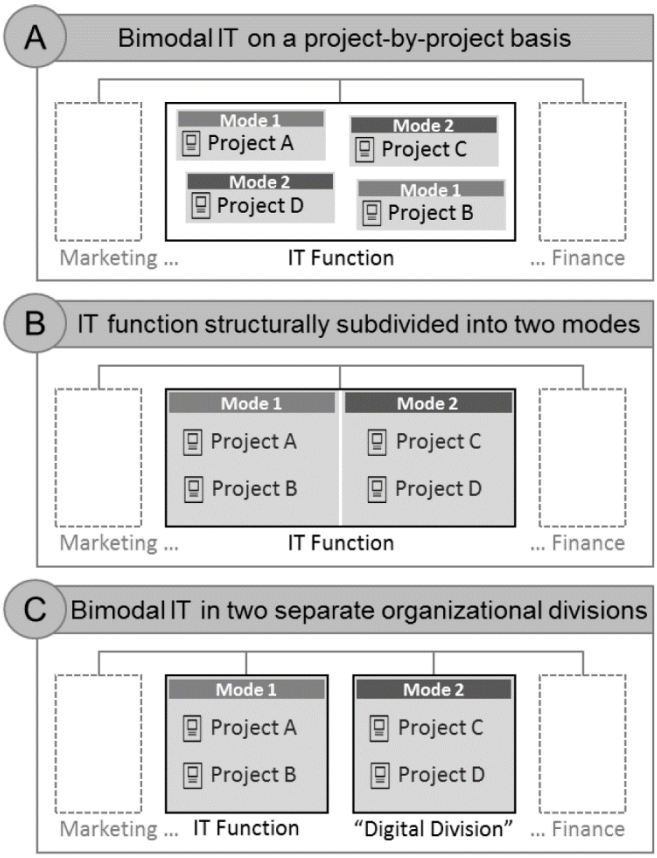

Figure 5:2 Three archetypes of bimodal IT design

Source: Haffke et al. (2017)

The results show that there is almost an even division in the organisations in the study on whether there is a split in IT activities between 'traditional IT' against 'digital IT'. There is also an even split in the approach to ICT strategy against DT strategy, where some organisations have a DT strategy separate from the ICT strategy, while others have the DT strategy as part of the greater ICT strategy. Organisations that have the DT strategy as part of the greater ICT strategy either have a bimodal approach to IT or mentioned 'not subscribing' to the bimodal IT approach due to concerns of its effectiveness in delivering desired business outcomes. Holarch et al. (2016) make a note of the criticism of bimodal IT. The criticism is centred on how bimodal IT can be harmful by:

(i) maintaining 'organisational silos';
(ii) creating new silos and dividing IT in the organisation;

(iii) creating tension in the organisation between the two IT modes 'traditional IT' against 'digital IT';
(iv) creating competition that results in non-cooperation;
(v) a lack of or reduced collaboration between the two IT modes; and
(vi) a rigid control structure resulting in 'silo thinking'.

As per the findings in the literature, for the organisations that have a separate DT strategy from an ICT strategy, there is a very clear bimodal approach to IT, whether it is formally recognised in the organisation or not. In the separation of the teams (IT team against DT team) represented in Figure 5.3, for example.

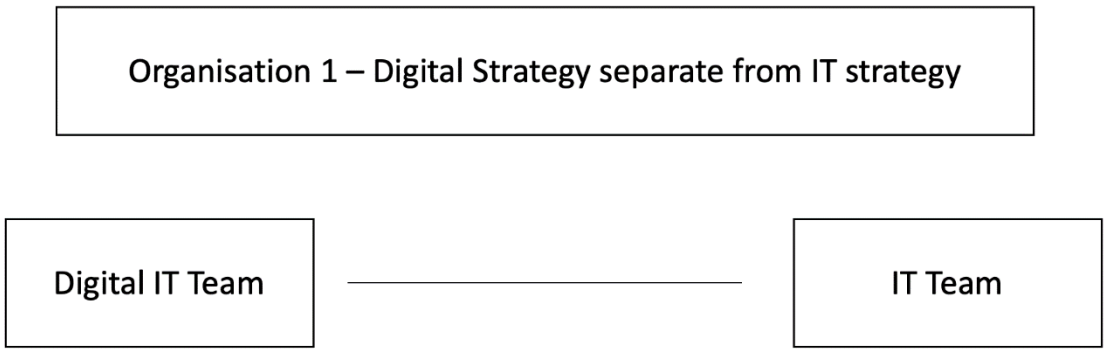

Figure 5:3 Representation of organisations that have a DT strategy separate from ICT strategy

In the organisations with the DT strategy as part of the greater ICT strategy, the distinction is not clear. In some of these organisations, there is a bimodal approach to IT (whether formally recognised or not). This can be seen in the split of activities in the greater ICT team or the split of activities in the day-to-day activities of individual team members (Figure 5.4). For other organisations, the acknowledgement of no split in activities cannot be taken at face value as there being no bimodal approach to IT in the organisation but instead, a high-level focus on one operational mode, either 'traditional IT' or 'digital IT'.

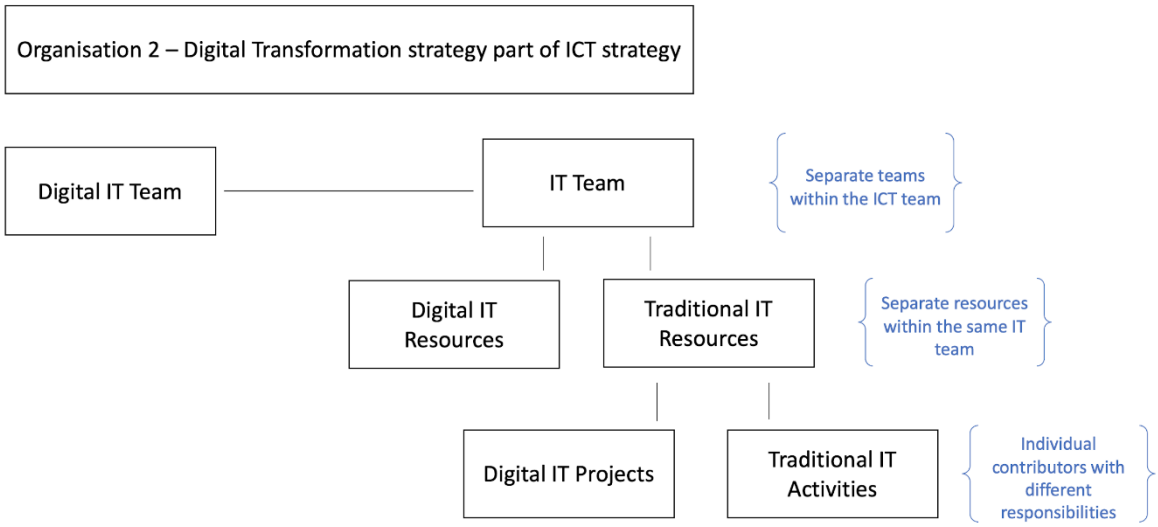

Figure 5.4. Representation of organisations that have DT as part of the greater ICT strategy

5.4.2 Bimodal IT approach in the organisation as a result of the pandemic

In assessing the impact of the pandemic on the bimodal approach to IT, the parameter used in this study is the change in operational proportions between 'traditional IT' against 'digital IT'. Looking only at this parameter, the study shows an even split in the organisations on whether work proportions changed or not due to the pandemic. For some organisations, the pandemic had no impact on the work proportions than before the pandemic. Furthermore, there was an impact on work proportions in other organisations, and this impact is split between an increase in DT activities or an increase in traditional IT activities.

5.4.2.1 Increase in traditional IT activities

The initial pandemic hard lockdown was sudden for many organisations; for some, this resulted in an increase in 'traditional IT' activities to 'keep the lights on' and to ensure business continuity. In these organisations, the DT projects and initiatives were mostly put on hold to focus all resources onto:

(i) enabling remote working,
(ii) securing remote workstations and
(iii) training and supporting remote users.

The findings in the study show that organisations that had to increase 'traditional IT' activities as a result of the pandemic are organisations that had to significantly optimise, expand and build new IT capabilities to meet business needs.

5.4.2.2 Increase in DT activities

While some organisations had to increase 'traditional IT' activities to support the business through the pandemic, others experienced the opposite, an increase in DT activities and initiatives. The focus of this seems not to have been on just 'keeping the lights on' during the lockdown periods while waiting for the 'return to normal', but an organisational acknowledgement that DT would ensure business continuity in the 'new normal' regardless of what the 'new normal' was.

It is important to note that these organisations most likely had the infrastructure in place pre-pandemic to respond effectively to the pandemic. Even though the DT activities and initiatives at the ICT level were focused on IT capabilities and transformation, DT activities and initiatives were focused on other components of DT at the organisational level. These components include customer experience, corporate strategy, business model, people, services offerings, engagement model and organisational/business processes.

5.5 SUMMARY OF DISCUSSION OF RESULTS

In summary, concerning the first research objective, the impact of the pandemic on ICT in the organisation was mainly on ICT strategy and ICT operations. On the second research objective, the pandemic resulted in the optimisation, expansion/or and the building of new IT capabilities in the organisation. Moreover, on the last research objective, the pandemic had a mixed impact on the bimodal approach to IT between no impact on the organisation and an impact on the type of IT mode focus in the organisation.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter provides conclusions and recommendations from the study. The first section will focus on the conclusions of the research questions and objectives, the second section will outline recommendations from the study, the third section will outline the limitations of the study, and the last section will provide suggestions for further research.

6.2 RESEARCH CONCLUSION

6.2.1 Conclusion pertaining to the first research question

Research Question: How was ICT in the organisation affected by the COVID-19 pandemic?

The results of the study show that the COVID-19 pandemic had two major impacts on ICT in the organisation, namely, the ICT strategy and ICT operations. The ICT strategy is the plan or approach organisations use in developing and managing their IT capabilities to support the greater organisational strategy. The three emerging themes on the impact of the pandemic on the ICT strategy are,

(iv) the execution on the existing ICT strategy;
(v) the optimisation of the existing ICT strategy; and
(vi) the development and adoption of a new ICT strategy.

The results from the study also show that the impact of the pandemic on ICT operations was

(i) the fast-tracking of IT deployment and the adoption; and
(ii) the establishment of remote IT teams.

6.2.2 Conclusion pertaining to the second research question

Research Question: What technological changes were made during the COVID-19 pandemic?

The IT capabilities of an organisation are made up of three components, namely,

(i) the IT infrastructure,
(ii) the IT human resources; and
(iii) the IT-enabled intangibles (Bharadwaj, 2000).

The themes emerging from the study show that the impact of the pandemic on IT capabilities was

(i) the optimisation and the expansion of existing IT capabilities in the organisation; and
(ii) the building and development of new IT capabilities in support of emerging business needs.

6.2.3 Conclusion pertaining to the third research question

Research Question: What was the impact of the COVID-19 pandemic on the bimodal IT approach?

The bimodal IT approach is defined as the existence of two IT modes in an organisation, 'traditional IT', which is primarily responsible for 'keeping the lights on' and 'digital IT', which can be regarded as the DT engine of the organisation (Badr, 2018). The study results show that the pandemic had a mixed impact on the bimodal approach to IT in organisations. There is an approximate split between

(i) organisations that saw an increase in 'digital IT' activities and
(ii) organisations that experienced an increase in 'traditional IT' activities/initiatives/projects.

6.2.4 General research conclusion

As outlined in Chapter 1, the title of this study concerns the impact of COVID-19 on DT; the purpose of this study is to investigate the impact of COVID-19 on Digital Transformation in organisations in South Africa. To make a conclusion on whether the pandemic had an impact on Digital Transformation, the research would have to study all the dimensions (leadership, customer experience, corporate strategy, business model, organisational structure, people, service offerings, engagement model, organisational/business processes, culture, technology capability/transformation and business operations) of a comprehensive DT framework in all organisations selected to participate. This would have made the scope of the study too broad, and as a result, one dimension was selected as the focus of the research: the IT capabilities. The findings from the study show that the pandemic had a positive impact on IT capabilities in the organisation, observed through the optimisation, expansion and the building of new IT capabilities in organisations as a result of the pandemic.

6.3 RECOMMENDATIONS

Organisational agility

The COVID-19 pandemic impacted organisations differently. What becomes abundantly clear from the study is that organisations had to adapt and navigate doing business in the "new normal" and will have to do the same for the "next normal". This requires organisational agility: McKinsey defines organisational agility as the ability of an organisation to renew itself, adapt, change quickly, and succeed in a rapidly changing, ambiguous, turbulent environment (McKinsey, 2015).

Executing on strategy

The findings from the study show that, for some organisations, the pandemic resulted in the execution of their existing strategy more than the need to optimise or adopt a new strategy. It is important to execute on strategy, organisations often have strategic goals that are best suited to drive business growth, respond to emerging business needs and achieve desired business outcomes. The shortfall is often not on the strategy or strategic goals but on the execution. In the study, IT leaders spoke about how the pandemic made it possible to execute their existing strategy to ensure business continuity. Not only did IT leaders get to execute on existing strategies, the projects and initiative were fast tracked and timelines significantly reduced.

Future-proofing of IT capabilities

Organisations that had an easier transition to doing business in a pandemic were organisations that had IT capabilities that are "future-proof". Nobody could have predicted the COVID-19 pandemic and how it would impact business, people and society in general. However, there are organisations that had IT capabilities in place which were as good as the organisation having predicted the pandemic. What has become clear is that organisations need to future proof their IT capabilities to enable them to effectively respond to any future emerging business needs.

Hybrid working model

Work-from-home is likely the most significant outcome of the COVID-19 pandemic, with the restriction of movement of individuals across the world, a lot of organisations that could, adopted a work-from-home operational model in an effort to ensure business continuity outside of the organisational concrete walls. In a post pandemic world, the "new normal" and "next normal" the work-from-home model is likely to stay as organisations have seen that for the most part, the model works. However, most organisations are not likely to do away with offices entirely, the future of work is likely a hybrid model in which some employees work-from-home, some employees work from the office and most employees work from both home and the office at different times.

Taking risks and embracing new ideas

The pandemic has shown that being prepared for any eventuality should be the building block of any organisational strategy. Organisations need to be willing to take risks and embrace new ideas, they need to dare to explore ideas they had been reluctant to try before and to think outside the box. Organisations that fail to do this will likely have to shut their doors to make way for organisations that will push the boundaries of innovation.

6.4 LIMITATIONS

The limitations of the study primarily arise from the methodology and difficulty in finding suitable participants for the study; these are discussed below.

6.4.1 Limitations as a result of the methodology

IT capabilities in the DT framework

This study aims to investigate the impact of COVID-19 on DT in organisations in South Africa. The research would have had to study all the dimensions of a comprehensive DT framework in all organisations selected to participate in the study to conclude whether the pandemic impacted DT. When looking at multiple organisations, this is too wide a scope; thus, the study focuses on one dimension, which is IT capabilities. A comprehensive research design would need to consider all the dimensions of DT to make a definitive conclusion.

Inability to generalise the research findings

The research design of the study is a qualitative empirical research design, and data collection was through interviews with the participants. Fourteen participants represented fourteen different organisations and twelve different industries. By qualitative standards, the study is comprehensive; however, the data and sample size is not sufficient to generalise the findings from the study.

Lack of previous research on the topic

This study primarily focuses on the COVID-19 pandemic, a recent phenomenon in the world and particularly in literature. As a result, when this study was first proposed, there were very few previous studies available. This situation has changed slightly in the year the study has been in progress; however, in the greater scheme of the literature, there is still a significant lack of previous research on the topic.

Qualitative research is not statistically representative

Qualitative research, by its nature, is not statistically representative, and the same applies to this study. The lack of mathematical analysis in research means that the research is unique and will probably be challenging to replicate.

Time constraints

As a result of the research design of this study, significant time constraints applied to the research data collection process, the transcribing process and the data analysis process. Due to this limitation, the study could not have a significant sample size.

6.4.2 Limitation as a result of the availability of participants

Access

This study required the participants to be senior ICT leaders in the respective organisations to which the researcher had limited access.

6.5 SUGGESTIONS FOR FURTHER RESEARCH

The suggestions for further research have been derived from the study's conclusions, the recommendations by the researcher and the limitations of the study.

Comprehensive study into the impact of the pandemic on DT

As discussed in the conclusion and limitations, this study focuses on the IT capabilities in the DT framework. A more comprehensive study is required in which the DT framework is studied in one organisation.

Quantitative research into the research topic

The research design of this study is qualitative in nature; ideally, further research into the topic involve a quantitative research design into this research topic. Quantitative research would provide more insights on the findings and conclusions from this paper.

Techceleration in organisations in South Africa

The pandemic resulted in adopting new technologies across different industries that can be defined as ‘techceleration’. Techceleration is defined as the accelerated adoption of technology because of rapid technology advancement. The research can be based on the impact of the pandemic on different industries, focusing on one industry at a time: for example, the impact of the pandemic on health care.

How many years into the future has the pandemic pushed organisations in South Africa?

At the back of research into the techceleration in organisations in South Africa, an interesting study would be a quantitative study into how many years into the future the pandemic has pushed organisations in South Africa.

Impact of the pandemic on innovation in South African organisations

The pandemic has forced organisations to review the products and services they offer and how they deliver these products and services to their customers. Some organisations have had to review entire business models: an interesting study would be to investigate the impact of the pandemic on innovation in organisations in South Africa.

Impact of the pandemic on start-ups in South Africa

Start-ups are often seen as the engines of innovation, and they often rely on investment and funding to continue operations. It would be useful to examine the impact of the pandemic on funding/investment into start-ups and the innovation in start-ups.

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APPENDIX A

CHAPTER 2

Table 0.1. Prior studies in DT

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
Reis et al.	2018	To explore the state of DT and proposed avenues for future research	There are two views of DT in literature, these are: (i) DT may be considered as a management fashion or as the reincarnation of past IT-enabled change with new outfits. (ii) DT includes novel elements that deserve due attention and pose interesting challenges for future research.
Ismail et al.	2017	To review and consolidate the current body of knowledge regarding business-level digital transformation	Three key findings: (i) Companies transform due to internal and external factors. (ii) Dimensions of digital business include IT-enabled transformation, localised exploitation, internal integration, business process redesign, business network redesign and business scope redefinition (iii) Implementation of DT is about the radical strategic and cultural change in the organisation
Fitzgerald et al.	2013	To explore how DT helps companies achieve their strategic imperative of	Three key findings: (i) Digital immaturity is a widespread problem (ii) The benefits of DT are revenue creation, profitability and market valuation (iii) Challenges with DT include leadership, institutional challenges and executing the

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
		improving the business	change.
Berghaus and Back	2016	DMM to calculate the stages of maturity using responses from participants	Three key findings: (i) Digital commitment and affinity among employees are important prerequisites for DT that often pre-exist in the workforce (ii) The use of digital data requires more strategic collaboration between IT and business (iii) DT seems to be intuitively managed rather than strategically planned.
Osmundsen et al.	2018	To investigate the DT in the organisational context, to determine the drivers, success factors and implications of DT	Three key findings: (i) Drivers of DT in an organisation can be internal and external (ii) The success factors include growing IS capabilities, developing a digital strategy and aligning business and IS (iii) The implications for DT can be new business models and reformed IS organisation.
Sebastian et al.	2017	To examine big old companies navigate DT	Three key findings: (i) There are two digital strategies, customers engagement strategy and digitised solution strategy (ii) Two technology-enabled assets are essential to executing a digital strategy, an operational backbone enables operational excellence, and a digital services platform enables rapid innovation. (iii) Recommendations include defining a

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
			digital strategy, acting now to invest in an operational backbone, architecture a digital services platform, designing the digital services platform and adopting a services culture.
Loonam et al.	2018	To examine how digitally enabled organisations use technology to implement DT strategies	There are four themes critical for organisations when implementing DT strategies: (i) Strategy (business model) - centric actions (ii) Customer-centric actions (iii) Organisational-centric actions (iv) Technology-centric actions

Table 0.2. Prior studies on DT Framework

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
Wade	2015	To explore a conceptual framework for DT	Proposed DT framework: (i) the business model (how to make money), (ii) structure (how you are organised), (iii) people (the people who work for you), (iv) processes (how you do things), (v) IT capability (how you collect and manage information), (vi) offerings (your product and services) and (vii) engagement model (how to engage with customers, suppliers, etc.)
Berghaus and Back	2016	Using the DMM from Berghaus and Back (2016) to calculate stages of maturity	The model proposed in the paper has nine dimensions, these being (i) customer experience, (ii) product innovation, (iii) strategy, (iv) organisation, (v) process digitisation, (vi) collaboration, (vii) IT, (viii)

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
		using responses from the participants	culture and expertise and (ix) transformation management.
Verina and Titko	2019	The aim of the study was to provide a deep understanding of the concept of DT, specifying its key elements/components/categories	DT components: (i) Processes (business activities, business operations, operational processes) (ii) Business models (lines of business, operating models, strategies) (iii) Customers (customer experience, customer requirement) (iv) Technologies (artificial intelligence, cloud, cybersecurity, devices, internet of things [IoT]) (v) Data (analytics, big data, vast amount of data) (vi) Leaders (C-level executives, managers, owners) (vii) Employees (competencies, people, skills, staff, talents, workers, workforce) DT elements: (i) Technologies (data, big data, cloud, mobile devices, social media, software, analytics, embedded devices, artificial intelligence, IoT, cybersecurity, app marketplaces) (ii) Management/Processes (business models, operating models, operations processes, strategies, business activities, organisational structure, organisational culture, coordination mechanism, products, new services)

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
			(iii) People (customers, employees/workforce/people/, managers, executives, talents, oners, suppliers, partners, stakeholder, competencies)
Tratkowska	2019	The purpose of this paper is to review the existing definitions of DT (abbrev. DT) and to establish a structured approach in its implications in the phases, structuring new business models, implementation activities and results	Categories of DT: (i) Organisational - whereas organisational processes and their idea, value creation, business models and extended supply chain are concerned as main aims of change brought by the DT. (ii) Technological - which stands for introducing novelties in technologies and innovations, which use and enables major improvements or quality, efficiency and revenues. (iii) Social - resulting in networking, communication channels, customer models of demands and creating new experiences and mindset among customers. DMM: (i) Customer - where concentrates over assessing customer engagement, customer experience, insights and behaviour and customer trust and perception (ii) Strategy - in this dimension, brand management, ecosystem management, finance and investment, market and customer are considered. Moreover, the assessment covers portfolio, ideation and innovation

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
			sphere, but also strategic and stakeholders management (iii) Technology - under assessment of this section are: applications, IoT structure, Data and Analytics, Delivery Governance, Network, Security, Technology Architecture (iv) Operations - this area covers Agile change management practices, automated resources management, integrated services management, real-time, insights and analytics, smart and adaptive process management, standards and governance automation (v) Organisation and culture - last but not least, dimension in DMM, assess culture, leadership and governance, organisational design and talent management, workforce enablement

Table 0.3. Prior studies on IT capabilities in the organisation

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
Bharadwaj	2000	This paper examines the association between IT capability and the firms performance	The key findings from this study show that firms can and do differentiate themselves on the basis of their IT resources. (i) The study provides a three-fold identification of IT resources in terms of IT infrastructure, human IT skills and IT-enabled

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
			intangibles, which creates an organisational IT capability. (ii) The IT infrastructure provides the platform to launch innovative IT applications faster than the competition; the human IT resource enables firms to conceive of and implement such applications faster than the competition, and a focus on IT-enabled intangibles enables firms to leverage or exploit pre-existing organisational intangibles such as customer orientation and synergy in a firm via co-presence and complementarity. (iii) There is a positive and significant association between superior IT capability and superior firm performance. (iv) IT capability is a resource that is not easily imitated or substituted; isolating mechanisms such as time compression diseconomies, the connectedness of resources, and social complexity allow firms with high IT capability to achieve and sustain superior performance. (v) Given the complexity associated with creating a firm-wide IT capability, in any sample of IT spenders, only a small subset of the sample is likely to have the right IT resources in place for achieving competitive advantage. (vi) IT capability is not so much a specific set of sophisticated technological functionalities as it is an enterprise-wide capability to leverage

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
			technology to differentiate from the competition.
Mithas et al.	2011	This paper develops a conceptual model linking IT-enabled information management capability with three organisational capabilities (customer management capability, process management capability and performance capability)	The key findings from this study show that: (i) The three organisational capabilities of customer management, process management, and performance management mediate the links between information management capability and firm performance. (ii) The results point to the role of information management capability as an enabler of organisational capabilities and provide evidence that information management capability provides the base capability through which firms can build higher-order capabilities. (iii) Senior IT leaders need to focus on IT strategy, IT governance, management of IT resources, IT investments and information management capability as important levels for organisational transformation and business excellence. (iv) When managers understand that organisational capabilities act as a precedent for firm performance and information management capability is a fundamental platform and precedes the development of these higher-level organisational capabilities, they are more likely to view IT as an essential tool for strategic transformation of an enterprise.

Table 0.4. Prior studies in bimodal IT

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
Holarch et al.	2016	To determine how business-IT alignments are affected by a bimodal IT organisation	Four key findings: (i) The two IT modes, traditional and digital, need to be aligned with each other and the business units need to align their strategic and operational activities with the two modes in a faster and more agile manner. (ii) Bimodal IT implies concrete implementation steps in the IT organisation and IS infrastructure. (iii) Bimodal IT implies a bimodality of operating models and processes in organisations. (iv) Organisations should ensure that they have the skills for a bimodal operating model.
Haffke et al.	2017	Explore the use of a bimodal approach in organisations that in order to create an IT function that can effectively support and drive the organisation's digital agenda	Three key findings: (i) Agility and ambidexterity are the two primary reasons why organisations implement a bimodal IT design (ii) There are three different bimodal IT archetypes. (iii) Bimodal IT is an interim transition step in the overarching transformation of the IT function, as DT places different demands on IT, rather than it being an end state for the IT function.

Table 0.5. Prior studies on Digital Technology and COVID-19

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
Savic	2020	To explore the impact of the coronavirus pandemic on the sudden demand for work-from-home and the push for the digital transformation of the workforce	Video conferencing, online purchasing, special deliveries, telemedicine, e-learning, electronic trading, online marketing, video streaming, and many other IT-enabled processes have undergone a virtual transformation, replacing traditional work practices
Wang et al.	2020	To investigate the response of Taiwan to the COVID-19 pandemic using IT	Two key findings: (i) Taiwan integrated its health insurance database with its immigration and customs database to begin the creation of big data analytics (ii) Taiwan also used QR code scanning, online reporting of travel history and health symptoms to classify travellers infectious risks
Park et al.	2020	To explore the use of IT-based tracing in South Korea in response to COVID-19 and the privacy issues associated with this	Four key findings: (i) Data sharing about infected individuals in the public sector and among medical professionals has epidemiological benefits in containing the spread of a highly infectious disease (ii) The use of integrated IT systems helped investigators save resources by automating the overall tracking process (iii) The legal system needs to be refined to

AUTHOR	YEAR	PURPOSE OF THE STUDY	KEY FINDINGS
			allow for the use of aggregate data rather than individual-level data to prevent the misuse of data and to address privacy concerns (iv) It is important to balance the need for information to test, track and quarantine with legitimate privacy concerns
Ting et al.	2020	To explore the potential of four interrelated digital technologies, these being the IoT, Big Data Analytics, AI and Blockchain	IoT, Big Data Analytics, AI and Blockchain can be used for monitoring, surveillance, detection and prevention of COVID-19, as well as mitigating the impact of healthcare indirectly related to COVID-19.
Keesara et al.	2020	To explore the impact of COVID-19 on healthcare in the USA and the use of IT	As a result of the COVID-19 pandemic, there has been some easing of regulations, such as the allowance of the use of HIPPA non-compliant communication divides to treat patients in rural areas.

Table 0.6. Initial codes developed from data analysis

	QUESTIONS	INITIAL CODES
Business role of IT	How would you describe the business role of information technology in your organisation?	Integral to operations Collaboration Work applications IT becoming digital guidance department DT driving the go-to-market strategy of the organisation Ensuring sustainability of future business Strategic role Critical to business IT used to create and deliver products to customers Integral to internal collaboration IT provides systems used in manufacturing of product IT is critical to supply chain Strategic business partner Business performance based on existing IT platforms Translate business requirements to business solutions using IT Customer services Implementation of business objectives DT driver
	Briefly describe the digital business transformation journey your company has undergone so far/ is going to	Automation of operations Data analytics to improve customer service Artificial Intelligence for an increase in productivity Omni-channel Digital and mobile first approach Digital marketing and advertising Business applications to enhance communication Digital delivery of products

	QUESTIONS	INITIAL CODES
	undergo in the future	Cloud-first approach Agile approach to projects Moving away from generic MPLS network to an SD-WAN network Adopting SaaS-based work applications Using data to drive innovation Change management issues in DT journey Digitising business products and services Digitising business processes Modernisation of infrastructure
Impact of the COVID-19 pandemic on the ICT department	How was the ICT department impacted by the COVID-19 pandemic lockdown?	Increased execution on existing strategy Expanding existing capabilities Acceleration of e-commerce Accelerate and support business with existing resources Increased workload to meet business needs Development of integrations not present before Increase in demand for automation Building capabilities to support users remotely Projects put on hold due to lack of equipment delivery Increase use of collaboration tools due to remote working Increase in need to use technology for COVID-19 screening protocols Moving workstations to remote locations Operating the business away from the company building ICT was critical to coming up with a plan to ensure remote working Acceleration of DT

	QUESTIONS	INITIAL CODES
		Increase investment in technology
	Did you have to revisit your ICT strategy? If so, what changed?	Moving towards more automation Move away from traditional network infrastructure Tactical and execution changes to existing architecture Optimisation in current architecture Removal of legacy infrastructure Cloud-based approach to architecture design Consolidation of customer communication channels Adding to existing strategy Operation changes to buy additional IT stock and hold it in the organisation Review of strategy to change project priorities but no change to strategy Complete reset of business model
	How did you manage the ICT budget? What strategy did you adopt (additional budget or repurpose the budget, for example)?	Repurpose budget Increase in cost savings due to IT investment Moving from Capex to Opex Increase in IT budget Increase budget towards the end-user Increase in Opex for licenses and internet lines Increase budget on collaboration software licenses No additional budget allocation Re-apply for budget already approved motivating for projects Repurpose budget for connectivity
Techno-logical changes made	What technologies did you introduce before the COVID-19	SD-WAN Remote working Automation of active directory Different SaaS systems

	QUESTIONS	INITIAL CODES
during the COVID-19 pandemic lockdown	pandemic lockdown?	Best in class cutting edge applications Google Suite Collaboration software Mobile worker technologies Refreshing of existing wireless infrastructure Moved to hyper-converged infrastructure in Data Centre Laptop only as the endpoint strategy Virtual desktop infrastructure SD-WAN to make disaster recovery from the internet efficient Automation of business processes Robotics, AI and Data Analytics
	What technological changes did you implement as a result of the COVID-19 pandemic lockdown?	Automation distribution systems Video conferencing in warehouse Virtual customer engagement Adoption of SaaS for customer engagement and support in contact centre Acceleration of technology adoption Electronic ordering Volume-based changes No technologies introduced as a result of the pandemic Change in data centre design to accommodate remote users Increase in capacity of existing technology COVID-19 screening technology for control access Communication technology for employees Improve internet security Adobe workflow and adobe sign for digital signing

	QUESTIONS	INITIAL CODES
		Digital customer engagement tools Virtual private network Security monitoring tools
	Which technological changes are customer-related, and which ones are internal?	Customer- and partner-facing technology introduced Predominantly customer-facing technology Predominantly internal-facing technology Internal only technology
	What were the criteria used for technology adoption?	Compatibility with network infrastructure IT Security SaaS first approach Best in class Ease of integration into existing architecture API availability Capacity and functionality Bandwidth requirements of solution Regulations implemented by government for compliance Uninterrupted customer services Architecture approach
	What challenges has the organisation faced in adopting new technologies as a result of the COVID-19 pandemic? How	Long delivery time for critical IT equipment Integration of new technology into existing architecture Turnaround time Connectivity – load-shedding impacts connectivity End-user technology adoption Training required for end-users Feature limitations to existing collaboration tools

	QUESTIONS	INITIAL CODES
	did you overcome these challenges? (Lessons?)	Connectivity and bandwidth Align new technology to global team Change management from customers Change management from employees Getting additional budget allocation Supporting users remotely Organisational culture Regulatory compliance
	Did you revisit your security approach/strategy (for example, cyber, information) due to the COVID-19 pandemic?	Increase in cybersecurity attacks globally Tightening security Focusing on security built into applications Decrease in focus of security perimeter Increase in security posture analysis No security changes Increase in training and awareness for users Security review before the pandemic Consistent monitoring of security Change some security policies to cater for remote working Increase monitoring on links Adopting new security solutions Maturity assessment of security
Bimodal IT approach during the COVID-19 pandemic lockdown	Do you have a DT strategy? Or is it part of the ICT strategy?	DT Strategy Combining IT and DT DT strategy is business strategy ICT strategy is IT + DT IT supports DT team in requirements Collaboration of IT and business towards DT DT focused on creating digital company

	QUESTIONS	INITIAL CODES
	Is there a split of ICT activities in the organisation (for example, traditional IT vs DT activities)? How did this split evolve?	Split of activities between IT and DT No split of activities between IT and DT No organisational split Run, build, data and digital systems are separate teams DT projects focused on improving existing infrastructure DT team formed to leverage existing data Separate DT team
	How do you balance your day-to-day projects and DT projects? Explain in terms of proportions	Individuals have to manage traditional IT and DT Life cycles of technology adoption, implementation-growth-run-operations No best practices in terms of IT and DT activities Dependant/evolves with business needs Split in activities based on business needs DT activities organised as sprints Managers responsible for creating split of activities for employees ICT partners manage existing infrastructure and IT team focuses on DT Dedicated DT team supported by IT DT projects run with oversight of IT Logical split based on deliverables No dedicated time to DT, but delivery on projects is required More focus on DT
	Was there a change in terms of proportions as the result of COVID-19?	Increase in DT activities Increase in traditional IT activities due to lockdown DT projects stopped due to vendors not being able to come on-site Increase in productivity

	QUESTIONS	INITIAL CODES
		Focus on users to enable remote working Remained the same Increase in DT activities as a result of working from home Increased team collaboration Increased capacity
	What are the critical success factors for your IT organisation to support digital business transformation?	Analysis of existing technologies vs new ideas Impact of new technology on the people in the organisation Buy-in from business executives Conformation to cybersecurity regulations 99.9% uptime Low response time Proper disaster recovery Employee adaptability Failover Connectivity and bandwidth Business buy-in Adoption Keep a stable environment going IT to be an innovative team that supports strategic objectives of the business Collaboration between business and IT Investment from business Skills in the team Change management programme Business needs and strategy
	What is the department long-	Optimise connectivity Improve customer engagement

	QUESTIONS	INITIAL CODES
	term plan?	Accelerate automation of operations Data analytics to improve customer service Support growth of the business and support the vision Data sharing between different stakeholders Migration to cloud and SaaS Move to Agile approach Improving on existing IT investments Valued business partner to the business Improve customer services Building analytics team Build internal capacity Alignment with latest technology available Using IT to enable the business
Impact of the COVID-19 pandemic on organisa-tions in South Africa.	How do you see the COVID-19 pandemic changing the ICT landscape in different organisations in South Africa?	Acceleration of remote working Change in office space requirements Increased productivity from remote working Change relationship of companies and local ICT partners Create urgency for digitisation for business continuity Removing legacy infrastructure to save costs Digitisation of operations Increase in demand for collaboration software Increase in demand for SD-WAN and decrease in need for MPLS Organisations to pay attention to security Move towards cloud Fibre-to-the-home with increasing bandwidth requirement Voice technology to expand to remote users Government has a major role in improving

	QUESTIONS	INITIAL CODES
		connectivity across the country Businesses to understand relevance and importance of IT Digital working space of now is without borders Importance of adoption of tools businesses have invested in IT can be used to drive business outcomes Change in perception of the workplace Decrease in need to own infrastructure Move from Capex to Opex Enabling mobility of users Some IT roles will not be necessary Nature of work will change IT will become a strategic business unit Dynamic policy making

Table 0.7. Initial themes developed from initial codes

	QUESTIONS	INITIAL THEMES
Business role of IT	How would you describe the business role of information technology in your organisation?	IT in operations IT in sales and marketing IT in strategy IT in human resources IT in research, development and innovation IT in supply chain IT in business model
	Briefly describe the digital business transformation journey your company has	Automation Big Data Artificial Intelligence Digital marketing

	QUESTIONS	INITIAL THEMES
	undergone so far/is going to undergo in the future	Digital delivery of products Cloud-based infrastructure Software-defined networking Omni-channel Change management
Impact of the COVID-19 pandemic on the ICT department	How was the ICT department impacted by the COVID-19 pandemic lockdown?	Execution of existing strategy Increased pace of deployment Increased pace of adoption Building new capabilities Expanding existing capabilities Reprioritisation of projects
	Did you have to revisit your ICT Strategy? If so, what changed?	Automation IT infrastructure modernisation IT infrastructure optimisation Cloud computing Cloud software Change in strategy Optimisation of existing strategy
	How did you manage the ICT budget? What strategy did you adopt (additional budget or repurpose the budget, for example)?	Repurpose budget Increase in overall budget Decrease in overall budget No budget changes
Technological changes made during the COVID-19 pandemic	What technologies did you introduce before the COVID-19 pandemic lockdown?	Software-defined networking Automation in IT infrastructure Cloud computing Cloud software Collaboration software

	QUESTIONS	INITIAL THEMES
lockdown		Video communication software Hyper-converged infrastructure Mobile devices Virtual desktop infrastructure
	What technological changes did you implement as a result of the COVID-19 pandemic lockdown?	Automation in IT infrastructure IT infrastructure optimisation Increase capacity of IT infrastructure Infrastructure integration Video communication software Cloud computing Cloud software Infrastructure integration Cybersecurity
	Which technological changes are customer-related and which ones are internal?	Technology for internal use Technology for external use Technology for internal and external use
	What were the criteria used for technology adoption?	Compatibility and interoperability Cybersecurity Cloud computing and cloud software API availability Bandwidth requirements Market leaders Capacity and functionality Compliance with regulations
	What challenges has the organisation faced in the adoption of new technologies as a result of	Integration with existing infrastructure Increase turnaround time for deployment Connectivity and bandwidth End-user adoption

	QUESTIONS	INITIAL THEMES
	the COVID-19 pandemic? How did you overcome these challenges? (Lessons?)	Increase turnaround time for equipment delivery Organisational alignment
	Did you revisit your security approach/strategy (for example, cyber, information) due to the COVID-19 pandemic?	Increase in cybersecurity focus No change in cybersecurity strategy and execution Adoption of new cybersecurity products and services Increase in end-user awareness and training Increase in cybersecurity monitoring Change in cybersecurity policies
Bimodal IT approach during the COVID-19 pandemic lockdown	Do you have a DT strategy? Or is it part of the ICT strategy?	ICT and DT strategies separate DT strategy part of ICT strategy
	Is there a split of ICT activities in the organisation (for example, traditional IT vs DT activities)? How did this split evolve?	DT and IT teams are separate DT and IT teams are not separate IT teams execute DT strategy
	How do you balance your day-to-day projects and DT projects? Explain in terms of proportions?	Dedicated DT team Dependant on business needs Dedicated DT projects Individual contributor splits activities Manger splits activities in the team IT projects outsourced No split in activities

	QUESTIONS	INITIAL THEMES
	Was there a change in terms of proportions as a result of COVID-19?	Increase in DT activities Increase in IT activities DT projects put on hold No change in DT and IT activities
	What are the critical success factors for your IT organisation to support digital business transformation?	Integration with existing infrastructure End-user adoption and adaptability Senior management support and buy-in Cybersecurity Connectivity and bandwidth requirements Uptime Failover and disaster recovery
	What is the department's long-term plan?	Support business strategy Automation of operations Cloud computing and cloud software Big data Optimising IT infrastructures Agile software development
Impact of the COVID-19 pandemic on organisations in South Africa	How do you see the COVID-19 pandemic changing the ICT landscape in different organisations in South Africa?	Remote working Increase in productivity due to RW Increase in importance and relevance of IT Business digitisation Modernisation of IT infrastructure Adoption of cloud computing and cloud software Adoption of software-defined networking Increase in focus on cybersecurity Increase in need for connectivity Mobile working Decrease in need for corporate real estate

	QUESTIONS	INITIAL THEMES
		Phasing out of certain IT roles

Table 0.8. Final themes developed from initial themes

	QUESTIONS	FINAL THEMES
Business role of IT	How would you describe the business role of information technology in your organisation?	Business model Business processes Organisational culture
	Briefly describe the digital business transformation journey your company has undergone so far/is going to undergo in the future	Customer experience Business model and strategy Technology capabilities Business operations People and culture
Impact of the COVID-19 pandemic on the ICT department	How was the ICT department impacted by the COVID-19 pandemic lockdown?	Executing and optimisation of existing strategy Optimisation, expansion and the building of new IT capabilities Fast-tracking IT deployment and adoption
	Did you have to revisit your ICT Strategy? If so, what changed?	Automation IT infrastructure modernisation IT infrastructure optimisation Cloud computing Cloud software Change in strategy Optimisation of existing strategy

	QUESTIONS	FINAL THEMES
	How did you manage the ICT budget? What strategy did you adopt (for instance, additional budget or repurpose the budget)?	Repurpose budget Increase in overall budget Decrease in overall budget No budget changes
Technological changes made during the COVID-19 pandemic lockdown	What technologies did you introduce before the COVID-19 pandemic lockdown?	Software-defined networking Automation in IT infrastructure Cloud computing Cloud software Collaboration software Video communication software Hyper-converged infrastructure Mobile devices Virtual desktop infrastructure
	What technological changes did you implement as a result of the COVID-19 pandemic lockdown?	Automation in IT infrastructure IT infrastructure optimisation Increased capacity of IT infrastructure Infrastructure integration Video communication software Cloud computing Cloud software Infrastructure integration Cybersecurity
	Which technological changes are customer-related and which ones are internal?	Technology for internal use Technology for external use Technology for internal and external use

	QUESTIONS	FINAL THEMES
	What were the criteria used for technology adoption?	Features Security Interoperability
	What challenges has the organisation faced in the adoption of new technologies as a result of the COVID-19 pandemic? How did you overcome these challenges? (Lessons?)	Integration with existing infrastructure Increased turnaround time for deployment Connectivity and bandwidth End-user adoption Increased turnaround time for equipment delivery Organisational alignment
	Did you revisit your security approach/strategy (cyber, information, etc.) due to the COVID-19 pandemic?	Increase in cybersecurity focus No change in cybersecurity strategy and execution Adoption of new cybersecurity products and services Increase in end-user awareness and training Increase in cybersecurity monitoring Change in cybersecurity policies
Bimodal IT approach during the COVID-19 pandemic lockdown	Do you have a DT strategy? Or is it part of the ICT strategy?	ICT and DT strategies separate DT strategy part of ICT strategy
	Is there a split of ICT activities in the organisation (i.e. traditional IT vs DT activities)? How did this split evolve?	DT and IT teams are separate DT and IT teams are not separate IT teams execute DT strategy

	QUESTIONS	FINAL THEMES
	How do you balance your day-to-day projects and DT projects? Explain in terms of proportions?	Dedicated DT team Dependant on business needs Dedicated DT projects Individual contributor splits activities Manger splits activities in the team IT projects outsourced No split in activities
	Was there a change in terms of proportions as the result of COVID-19?	Increase in DT activities Increase in IT activities DT projects put on hold No change in DT and IT activities
	What are the critical success factors for your IT organisation to support digital business transformation?	Technology capabilities End-user Skills Organisational support
	What is the department's long-term plan?	Enable business model and strategy Automation of operations Infrastructure modernisation and optimisation Agile workflows
Impact of the COVID-19 pandemic on organisations in South Africa	How do you see the COVID-19 pandemic changing the ICT landscape in different organisations in South Africa?	Remote working Increase in productivity due to RW Increase in importance and relevance of IT Business digitisation Modernisation of IT infrastructure Adoption of cloud computing and cloud software Adoption of software-defined networking

	QUESTIONS	FINAL THEMES
		Increase in focus on cybersecurity Increase in need for connectivity Mobile working Decrease in need for corporate real estate Phasing out of certain IT roles Dynamic policy making

Table 0.9. Initial codes, initial themes and final themes on the role of IT in the organisation.

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
How would you describe the business role of IT in your organisation?	Integral to operations Collaboration Work applications IT becoming digital guidance department DT driving go to market strategy Ensuring sustainability of future business Strategic role Critical to business IT used to create and deliver products to customers Integral to internal collaboration IT provides systems used in manufacturing of product	IT in operations IT in sales and marketing IT in strategy IT in HR IT in research, development and innovation IT in supply chain IT in business model	Business model Business processes Organisational culture

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
	IT is critical to supply chain Strategic business partner Business performance based on existing IT platforms Translate business requirements to business solutions using IT Customer services Implementation of business objectives DT driver		

Table 0.10. Initial codes, initial themes and final themes on the DT journey in different organisations.

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
Briefly describe the digital business transformation journey your company has undergone so far/ is going to	Automation of operations Data analytics to improve customer service Artificial Intelligence for increase in productivity Omni-channel Digital and mobile first approach Digital marketing and advertising	Automation Big Data Artificial Intelligence Digital marketing Digital delivery of products Cloud-based infrastructure Software-defined networking	Customer experience Business model and strategy Technology capabilities Business operations People and culture

undergo in the future	Business applications to enhance communication Digital delivery of products Cloud-first approach Agile approach to projects Moving away from generic MPLS network to an SD-WAN network Adopting SaaS-based work applications Using data to drive innovation Change management issues in DT journey Digitising business products and services Digitising business processes Modernisation of infrastructure	Omni-channel Change management	

Table 0.11. Initial codes, initial themes and final themes on the critical success factors for the support of DT initiatives and projects in the organisation.

	INITIAL CODES	**INITIAL THEMES**	**FINAL THEMES**
What are the critical success factors for your IT organisation to support digital	Analysis of existing technologies vs new ideas Impact of new technology on the	Integration with existing infrastructure End-user adoption and adaptability	Technology capabilities End-user Skills

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
business transformation?	people in the organisation Buy-in from business executives Conformation to cybersecurity regulations 99.9% uptime Low response time Proper disaster recovery Employee adaptability Failover Connectivity and bandwidth Business buy-in Adoption Keep a stable environment going IT to be an innovative team that support strategic objectives of the business Collaboration between business and IT Investment from business Skills in the team	Senior management support and buy-in Cybersecurity Connectivity and bandwidth requirements Uptime Failover and disaster recovery	Organisational support

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
	Change management programme Business needs and strategy		

Table 0.12. Initial codes, initial themes and final themes on the impact of the COVID-19 pandemic on the ICT department in different organisations.

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
How was the ICT department impacted by the COVID-19 pandemic lockdown?	Increased execution on existing strategy Expanding existing capabilities Acceleration of e-commerce Accelerate and support business with existing resources Increased workload to meet business needs Development of integrations not present before Increase in demand for automation Building capabilities to support users remotely	Execution of existing strategy Increased pace of deployment Increased pace of adoption Building new capabilities Expanding existing capabilities Reprioritisation of projects	Executing and optimisation of existing strategy Optimisation, expansion and the building of new IT capabilities Fast-tracking IT deployment and adoption

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
	Projects put on hold due to lack of equipment delivery Increased use of collaboration tools due to remote working Increase in need to use technology for COVID-19 screening protocols Moving workstations to remote locations Operating the business outside of company building ICT was critical to coming up with a plan to ensure remote working Acceleration of DT Increased investment in technology		

Table 0.13. Initial codes, initial themes and final themes on the impact of the COVID-19 pandemic on the ICT strategy.

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
Did you have to revisit your ICT Strategy? If so, what changed?	Moving towards more automation Move away from traditional network infrastructure	Automation IT infrastructure modernisation IT infrastructure optimisation Cloud computing	Automation IT infrastructure modernisation IT infrastructure optimisation Cloud computing

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
	Tactical and execution changes to existing architecture Optimisation in current architecture Removal of legacy infrastructure Cloud-based approach to architecture design Consolidation of customer communication channels Adding to existing strategy Operation changes to buy additional IT stock and hold it in the organisation Review of strategy to change project priorities but no change to strategy Complete reset of business model	Cloud software Change in strategy Optimisation of existing strategy	Cloud software Change in strategy Optimisation of existing strategy

Table 0.14. Initial codes, initial themes and final themes on the impact of the COVID-19 pandemic on the ICT budget

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
How did you manage the ICT budget? What strategy	Repurpose budget Increase in cost savings due to IT investment	Repurpose budget Increase in overall budget	Repurpose budget Increase in overall budget

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
did you adopt (i.e. additional budget or repurpose the budget)?	Moving from Capex to Opex Increase in IT budget Increased budget towards the end-user Increase in Opex for licenses and internet lines Increase budget on collaboration software licenses No additional budget allocation Re-apply for budget already approved motivating for projects Repurpose budget for connectivity	Decrease in overall budget No budget changes	Decrease in overall budget No budget changes

Table 0.15. Initial codes, initial themes and final themes on the long-term strategy/plan for the ICT department in different organisations.

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
What is the department's long-term plan?	Optimise connectivity Improve customer engagement Accelerate automation of operations Data analytics to improve customer service	Support business strategy Automation of operations Cloud computing and cloud software Big Data Optimising IT infrastructures	Enable business model and strategy Automation of operations Infrastructure modernisation and optimisation Agile workflows

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
	Support growth of the business and support the vision Data sharing between different stakeholders Migration to cloud and SaaS Move to Agile approach Improving on existing IT investments Valued business partner to the business Improve customer services Building analytics team Build internal capacity Alignment with latest technology available Using IT to enable the business	Agile software development	

Table 0.16. Initial codes, initial themes and final themes on the general business impact of the COVID-19 pandemic on organisations in South Africa.

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
How do you see the COVID-19 pandemic changing the	Acceleration of remote working Change in office space requirements	Remote working Increase in productivity due to RW Increase in importance and relevance of IT	Remote working Increase in productivity due to RW

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
ICT landscape in different organisations in South Africa?	Increased productivity from remote working Change relationship of companies and local ICT partners Create urgency for digitisation for business continuity Removing legacy infrastructure to save costs Digitisation of operations Increase in demand for collaborative software Increase in demand for SD-WAN and decrease in need for MPLS Organisations to pay attention to security Move towards cloud Fibre to the home with increasing bandwidth requirement Voice technology to expand to remote users Government has a major role in improving connectivity across the country	Business digitisation Modernisation of IT infrastructure Adoption of cloud computing and cloud software Adoption of software-defined networking Increase in focus on cybersecurity Increase in need for connectivity Mobile working Decrease in need for corporate real estate Phasing out of certain IT roles	Increase in importance and relevance of IT Business digitisation Modernisation of IT infrastructure Adoption of cloud computing and cloud software Adoption of software-defined networking Increase in focus on cybersecurity Increase in need for connectivity Mobile working Decrease in need for corporate real estate Phasing out of certain IT roles

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
	Businesses to understand relevance and importance of IT Digital working space of now is without borders Importance of adoption of tools businesses have invested in IT can be used to drive business outcomes Change in perception of the workplace Decrease in need to own infrastructure Move from Capex to Opex Enabling mobility of users Some IT roles will not be necessary Nature of work will change IT will become a strategic business unit Dynamic policy making		

Table 0.17. Initial codes, initial themes and final themes on the IT capabilities in the organisation prior to the COVID-19 pandemic

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
What technologies did you introduce prior to the COVID-19 pandemic lockdown?	SD-WAN Remote working Automation of active directory Different SaaS systems Best in class cutting edge applications Google Suite Collaboration software Mobile worker technologies Refreshing of existing wireless infrastructure Moved to hyper-converged infrastructure in Data centre Laptop only as the endpoint strategy Virtual desktop infrastructure SD-WAN to make disaster recovery from the internet efficient	Software-defined networking Automation in IT infrastructure Cloud computing Cloud software Collaboration software Video communication software Hyper-converged infrastructure Mobile devices Virtual desktop infrastructure	Software-defined networking Automation in IT infrastructure Cloud computing Cloud software Collaboration software Video communication software Hyper-converged infrastructure Mobile devices Virtual desktop infrastructure

	Automation of business processes Robotics, AI and Data Analytics		

Table 0.18. Initial codes, initial themes and final themes on the technology adoption in different organisations in South Africa as a result of the COVID-19 pandemic

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
What technological changes did you implement as a result of the COVID-19 pandemic lockdown?	Automation distribution systems Video conferencing in warehouse Virtual customer engagement Adoption of SaaS for customer engagement and support in contact centre Acceleration of technology adoption Electronic ordering Volume-based changes No technologies introduced as a result of the pandemic Change in data centre design to accommodate remote users	Automation in IT infrastructure IT infrastructure optimisation Increase capacity of IT infrastructure Infrastructure integration Video communication software Cloud computing Cloud software Infrastructure integration Cybersecurity	Automation in IT infrastructure IT infrastructure optimisation Increase capacity of IT infrastructure Infrastructure integration Video communication software Cloud computing Cloud software Infrastructure integration Cybersecurity

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
	Increase in capacity of existing technology COVID-19 screening technology for control access Communication technology for employees Improve internet security Adobe workflow and adobe sign for digital signing Digital customer engagement tools Virtual private network Security monitoring tools		

Table 0.19. Initial codes, initial themes and final themes on the criteria that was used in different organisations to adopt new technology

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
What was the criteria used for technology adoption?	Compatibility with network infrastructure IT Security SaaS first approach Best in class Ease of integration into existing architecture API availability Capacity and functionality	Compatibility and interoperability Cybersecurity Cloud computing and cloud software API availability Bandwidth requirements Market leaders Capacity and functionality	Features Security Interoperability

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
	Bandwidth requirements of solution Regulations implemented by government for compliance Uninterrupted customer services Architecture approach	Compliance with regulations	

Table 0.20. Initial codes, initial themes, and final themes on the challenges different organisations faced when trying to adopt new technologies.

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
What challenges has the organisation faced in the adoption of new technologies as a result of the COVID-19 pandemic? How did you overcome these challenges? (Lessons?)	Long delivery time for critical IT equipment Integration of new technology into existing architecture Turnaround time Connectivity – load-shedding impacts connectivity End-user technology adoption Training required for end-users Feature limitations to existing collaboration tools	Integration with existing infrastructure Increased turnaround time for deployment Connectivity and bandwidth End-user adoption Increased turnaround time for equipment delivery Organisational alignment	Integration with existing infrastructure Increased turnaround time for deployment Connectivity and bandwidth End-user adoption Increased turnaround time for equipment delivery Organisational alignment

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
	Connectivity and bandwidth Align new technology to global team Change management from customers Change management from employees Getting additional budget allocation Supporting users remotely Organisational culture Regulatory compliance		

Table 0.21. Initial codes, initial themes and final themes on the impact of the COVID-19 pandemic on the security strategy

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
Did you revisit your security approach/strategy (i.e. cyber, information, etc.) due to the COVID-19 pandemic?	Increase in cybersecurity attacks globally Tightening security Focusing on security built into applications Decrease in focus of security perimeter	Increase in cybersecurity focus No change in cybersecurity strategy and execution Adoption of new cybersecurity products and services	Increase in cybersecurity focus No change in cybersecurity strategy and execution Adoption of new cybersecurity

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
	Increase in security posture analysis No security changes Increase in training and awareness to users Security review before the pandemic Consistent monitoring of security Change some security policies to cater for remote working Increased monitoring on links Adopting new security solutions Maturity assessment of security	Increase in end-user awareness and training Increase in cybersecurity monitoring Change in cybersecurity policies	products and services Increase in end-user awareness and training Increase in cybersecurity monitoring Change in cybersecurity policies

Table 0.22. Initial codes, initial themes and final themes on the DT strategy in different organisations

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
Do you have a DT strategy? Or is it part of the ICT strategy?	DT strategy Combining IT and DT DT strategy is business strategy ICT strategy is IT + DT IT supports DT team in requirements Collaboration of IT and business towards DT DT focused on creating digital company	ICT and DT strategies separate DT strategy part of ICT strategy	ICT and DT strategies separate DT strategy part of ICT strategy

Table 0.23. Initial codes, initial themes and final themes on the split of activities in different organisations between 'traditional IT and DT' as well as the balance between 'traditional IT and DT.'

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
Do you have a DT strategy? Or is it part of the ICT strategy?	DT strategy Combining IT and DT DT strategy is business strategy ICT strategy is IT + DT IT supports DT team in requirements Collaboration of IT and business towards DT DT focused on creating digital company	ICT and DT strategies separate DT strategy part of ICT strategy	ICT and DT strategies separate DT strategy part of ICT strategy
	INITIAL CODES	**INITIAL THEMES**	**FINAL THEMES**
Is there a split of ICT activities in the organisation (i.e. traditional IT vs DT activities)? How did this split evolve?	Split of activities between IT and DT No split of activities between IT and DT No organisational split Run, build, data and digital systems are separate teams DT projects focused on improving existing infrastructure DT team formed to leverage existing data Separate DT team	DT and IT teams are separate DT and IT teams are not separate IT teams execute DT strategy	DT and IT teams are separate DT and IT teams are not separate IT teams execute DT strategy

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
How do you balance your day-to-day projects and DT projects? Explain in terms of proportions?	Individuals have to manage traditional IT and DT Life cycles of technology adoption, implementation-growth-run-operations No best practices in terms of IT and DT activities Dependant/evolves with business needs Split in activities based on business needs DT activities organised as sprints Managers responsible for creating split of activities for employees ICT partners manage existing infrastructure and IT team focuses on DT Dedicated DT team supported by IT DT projects run with oversight of IT Logical split based on deliverables	Dedicated DT team Dependent on business needs Dedicated DT projects Individual contributor splits activities Manger splits activities in the team IT projects outsourced No split in activities	Dedicated DT team Dependent on business needs Dedicated DT projects Individual contributor splits activities Manger splits activities in the team IT projects outsourced No split in activities

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
	No dedicated time to DT but deliver on projects is required More focus on DT		

Table 0.24. Initial codes, initial themes and final themes on the split between 'traditional IT and DT' initiative and projects in the organisation as a result of the COVID-19 pandemic

	INITIAL CODES	INITIAL THEMES	FINAL THEMES
Was there a change in terms of proportions as the result of COVID-19?	Increase in DT activities Increase in traditional IT activities due to lockdown DT projects stopped due to vendors not being able to come on-site Increased in productivity Focus on users to enable remote working Remained the same Increase in DT activities as a result of working from home Increased team collaboration Increased capacity	Increase in DT activities Increase in IT activities DT projects put on hold No change in DT and IT activities	Increase in DT activities Increase in IT activities DT projects put on hold No change in DT and IT activities

APPENDIX B

THE RESEARCH INSTRUMENT

Biographical information

RESPONDENT	EDUCATION LEVEL	AGE RANGE	CITY OF RESIDENCE	ROLE	TENURE IN ORGANISATION
R1					
R2					

Company information

RESPONDENT	INDUSTRY	NO. OF EMPLOYEES
R1		
R2		

Introductory questions:

- How would you describe the business role of information technology in your organisation?
- Briefly describe the digital business transformation journey your company has undergone so far/is going to undergo in the future.

How was ICT in the organisation affected by the COVID-19 pandemic?

- How was the ICT department impacted by the COVID-19 pandemic lockdown?
- Did you have to revisit your ICT Strategy? If so, what changed?
- How did you manage the ICT budget? What strategy did you adopt (i.e. additional budget or repurpose the budget)?

What technological changes were made during the COVID-19 pandemic?

- What technologies did you introduce before the COVID-19 pandemic lockdown?
- What technological changes did you implement as a result of the COVID-19 pandemic lockdown?

- Which technological changes are customer-related, and which ones are internal?
- What were the criteria used for technology adoption?

– What challenges has the organisation faced in the adoption of new technologies as a result of the COVID-19 pandemic? How did you overcome these challenges? (Lessons?)
– Did you revisit your security approach/strategy (cyber, information, etc.) as a result of the COVID-19 pandemic?

How effective was the bimodal IT approach during COVID-19 pandemic?

– Do you have a digital transformation strategy? Or is it part of the ICT strategy?
– Is there a split of ICT activities in the organisation (i.e. traditional IT against DT activities)? How did this split evolve?
– How do you balance your day-to-day projects and digital transformation projects? Explain in terms of proportions?
– Was there a change in terms of proportions as the result of COVID-19?
– What are the critical success factors for your IT organisation to support digital business transformation?
– What is the department's long-term plan?

Open-ended questions?

– How do you see the COVID-19 pandemic changing the ICT landscape in different organisations in South Africa?

APPENDIX C

CONSENT FORM

Title of project: Impact of COVID-19 on Digital Transformation

Name of researcher: Jabulile Mabuza

I, ……., agree to participate in this research project. The research has been explained to me and I understand what my participation will involve. I agree to the following:

(Please circle the relevant options below).

I agree that my participation will remain anonymous	YES	NO
I agree that the researcher may use anonymous quotes in his / her research report	YES	NO
I agree that the interview may be audio recorded	YES	NO
I agree that the information I provide may be used anonymously after this project has ended, for academic purposes by other researchers, subject to their own ethics clearance being obtained.	YES	NO

…… (signature)
…… (name of participant)
…… (date)

…… (signature)
…… (name of person seeking consent)
…… (date)

APPENDIX D

RESEARCH INTERVIEW INVITATION LETTER

Dear Sir / Madam,

My name is Jabulile Mabuza and I am a Masters' student in Digital Business at the University of the Witwatersrand, Johannesburg. As part of my studies, I have to undertake a research project, and I am investigating the impact of the COVID-19 pandemic on Digital Transformation under the supervision of Dr Tebogo Sethibe. The aim of this research project is to look at the adoption of technology by organizations in South Africa.

As part of this project, I would like to invite you to take part in an interview. This activity will involve you being asked a number of questions and will take around 20 - 30 minutes. With your permission, I would also like to record the interview using a digital device.

There will be no personal costs to you if you participate in this project, you will not receive any direct benefits from participation but there are no disadvantages or penalties if you do not choose to participate or if you withdraw from the study. You may withdraw at any time or not answer any question if you do not want to. The interview will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely and not disclosed to anyone else. I will be using a pseudonym (false name) to represent your participation in my final research report. If you experience any distress or discomfort at any point in this process, we will stop the interview and/or resume another time.

If you have any questions during or afterwards about this research, feel free to contact me on the details listed below. This study will be written up as a research report which will be available online through the university library website. If you wish to receive a summary of this report, I will be happy to send it to you. If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrec-medical.researchoffice@wits.ac.za

Yours sincerely,
Jabulile Mabuza

Researcher:
Jabulile Mabuza, 550554@students.wits.ac.za

Supervisor:
Tebogo Sethibe, SethibeT@arc.agric.za

APPENDIX E

ETHICS CLEARANCE CERTIFICATE

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SCHOOL OF GRADUATE SCHOOL OF BUSINESS ADMINISTRATION ETHICS COMMITTEE
CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: WBS/BA550554/932**
PROJECT TITLE	The impact of COVID-19 on Digital Transformation
INVESTIGATOR	Miss Jabulile Mabuza
SCHOOL/DEPARTMENT OF INVESTIGATOR	MM (Digital Business)
DATE CONSIDERED	20 July 2020
DECISION OF THE COMMITTEE	Approved unconditionally
RISK LEVEL	LOW RISK
EXPIRY DATE	30 JUNE 2021

ISSUE DATE OF CERTIFICATE 4 August 2020 **CHAIRPERSON** _____
(Dr MDJ Matshabaphala)

cc: Supervisor: Dr Sethibe

DECLARATION OF INVESTIGATOR

To be completed in duplicate and **ONE COPY** returned to the Chairperson of the School/Department ethics committee.

I fully understand the conditions under which I am are 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/we undertake to resubmit the protocol to the Committee.

_____ 17 / 08 /2020
Signature **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES