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**Research Report: Master of Management in the field of Digital Business.**

# Digitalisation of government services for service delivery: Case of The City of Ekurhuleni

**by**

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This report is dedicated to the Divine Being who provided me with the fortitude, insight, and comprehension during challenging moments, to Professor Tendani Mawela, my supervisor, whose commitment was remarkable, and to my beloved spouse and three children for their prayers, empathy, and unwavering backing.

# Table of Contents


| | | |
|---|---|---|
| ABSTRACT | | 1 |
| CHAPTER 1: INTRODUCTION | | 3 |
| 1.1 | STATEMENT OF PURPOSE | 3 |
| 1.4.1 | HOW CAN DIGITALISATION IMPROVE SERVICE DELIVERY IN THE CITY OF EKURHULENI? | 6 |
| 1.4.2 | WHAT ARE THE PERCEIVED BENEFITS OF DIGITALISATION? | 6 |
| 1.4.3 | WHAT ARE THE CHALLENGES OF DIGITALISATION IN THE CITY OF EKURHULENI? | 6 |
| 1.4.4 | WHAT ARE THE CRITICAL SUCCESS FACTORS FOR DIGITALISATION IN THE CITY OF EKURHULENI? | 6 |
| 1.5 | AIM OF THE STUDY | 6 |
| 1.6 | RESEARCH OBJECTIVES / RATIONALE | 6 |
| 1.7 | DELIMITATION / LIMITATION OF THE STUDY | 7 |
| 1.8 | DEFINITION OF TERMS | 7 |
| 1.9 | ASSUMPTIONS | 8 |
| 1.10 | CONTRIBUTION OF THIS RESEARCH | 9 |
| 1.11.1 | CHAPTER 1: INTRODUCTION. | 10 |
| 1.11.2 | CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK | 10 |
| 1.11.3 | CHAPTER 3: RESEARCH METHODOLOGY. | 10 |
| 1.11.4 | CHAPTER 4: FINDINGS AND DISCUSSIONS. | 11 |
| 1.11.5 | CHAPTER 5: CONCLUSION AND RECOMMENDATIONS | 11 |
| CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK | | 12 |
| 2.1 | INTRODUCTION | 12 |
| 2.2 | DIGITALISATION DEFINITION | 15 |
| 2.3 | PERCEIVED BENEFITS OF DIGITALISATION | 16 |
| 2.3.1 | COST SAVINGS | 17 |
| 2.3.2 | INCREASED TRANSPARENCY | 17 |
| 2.3.3 | ACCESSIBILITY AND EFFICIENCY | 18 |
| 2.3.4 | REDUCTION IN CORRUPTION ACTIVITIES | 18 |
| 2.3.5 | CITIZENS AND STAKEHOLDER VALUE CREATION | 18 |
| 2.3.6 | IMPROVED DECISION MAKING | 19 |
| 2.4.1 | ICT INFRASTRUCTURE | 20 |
| 2.4.2 | LEADERSHIP | 20 |
| 2.4.3 | AVAILABILITY OF SKILLS AND TRAINING | 21 |
| 2.4.4 | ORGANISATIONAL CULTURE | 21 |
| 2.4.5 | POLICY GAP AND FRAMEWORKS | 22 |
| 2.5 | CHALLENGES OF DIGITALISATION. | 23 |
| 2.5.1 | DIGITAL LITERACY | 23 |

2.5.2 Lack of Digital Infrastructure 24
2.5.3 Change management 25
2.5.4 Lack of funding. 26
2.5.5 Digital divide 26
2.5.6 Interoperability and Legacy Systems 27
2.6 Global adoption of digitalisation 28
2.6.1 City of Cape Town 29
2.6.2 Copenhagen (Denmark) 30
2.6.3 The City of Kigali (Rwanda) 31
2.6.4 City of Ekurhuleni (CoE) 31
2.7 Implementation strategy 32
2.8 Theoretical Framework 33
2.8.1 Diffusion of innovation (DOI) theory 35
2.8.2 Technology, Organisation, and Environment (TOE) Theory 36
2.8.3 Integrating DOI and TOE 38
2.8.4 Key Lessons from the Literature 39
2.9 Chapter Summary 40
CHAPTER 3: RESEARCH METHODOLOGY 41
3.1 Introduction 41
3.2 Research approach 41
3.3 Research design 42
3.4 Research paradigm 43
3.5 Data collection methods 43
3.6 Population and sample 44
3.6.1 Population 44
3.6.2 Sample and sampling method 44
3.7 Procedure for data collection and instrument 45
3.8 Data analysis strategies and interpretation 45
3.9 Possible limitations and challenges of the study 47
3.10 Quality Assurance 47
3.11 Ethical considerations 47
3.12 Summary of Research Methodology 48
3.13 Chapter Summary 49
CHAPTER 4: FINDINGS AND DISCUSSIONS 50
4.1 Introduction 50
4.2 DEMOGRAPHICS OF PARTICIPANTS 51
4.3 Analysis and interpretation of factors. 52

4.3.1 PERCEIVED BENEFITS OF DIGITALISATION 53
4.3.1.1 BENEFITS RELATED TO TECHNOLOGICAL FACTOR 53
4.3.1.1.1 COMMUNICATION 53
4.3.1.1.2 SCALABILITY 54
4.3.1.1.3 SECURITY 55
4.3.1.1.4 IT INFRASTRUCTURE 56
4.3.1.2 BENEFITS RELATED TO ORGANISATIONAL FACTORS. 57
4.3.1.2.1 TRANSPARENCY 57
4.3.1.2.2 SERVICE DELIVERY 57
4.3.1.2.3 AGILITY 58
4.3.1.2.4 CULTURE CHANGE 59
4.3.1.3 BENEFITS RELATED TO ENVIRONMENTAL FACTORS. 60
4.3.1.3.1 NETWORK CONNECTIVITY 60
4.3.1.3.2 INFRASTRUCTURE 60
4.3.1.4 DOI FACTORS ON BENEFITS OF DIGITALISATION 61
4.3.1.4.1 TRIALABILITY 61
4.3.1.4.2 RELATIVE ADVANTAGE 61
4.3.2 CHALLENGES OF DIGITALISATION IN THE CITY OF EKURHULENI 62
4.3.2.1 CHALLENGES RELATED TO TECHNOLOGICAL FACTORS. 62
4.3.2.1.1 NETWORK 62
4.3.2.1.2 POLICIES 63
4.3.2.1.3 SECURITY 64
4.3.2.1.4 ACCESS 64
4.3.2.2 CHALLENGES RELATED TO ORGANISATIONAL FACTORS. 65
4.3.2.2.1 SKILLS 65
4.3.2.2.2 LEADERSHIP 65
4.3.2.2.3 POLITICS 66
4.3.2.2.4 LABOUR 67
4.3.2.2.3 BUDGET 67
4.3.2.3 CHALLENGES RELATED TO ENVIRONMENTAL FACTORS. 68
4.3.2.3.1 LITERACY AND USAGE 68
4.3.2.3.2 LOAD-SHEDDING 69
4.3.2.3.3 DIGITAL DIVIDE 70
4.3.2.3.4 CRIME 71
4.3.2.4 DOI RELATED CHALLENGES 72
4.3.2.4.1 COMPATIBILITY AND LEGACY SYSTEMS 72
4.3.2.4.2 COMPLEXITY 73
4.3.3 CRITICAL SUCCESS FACTORS FOR DIGITALISATION IN THE CITY OF EKURHULENI 73

4.3.3.1 SKILL 74
4.3.3.2 BUDGET 75
4.3.3.3 LEADERSHIP AND MANAGEMENT SUPPORT 75
4.3.3.4 GOVERNANCE AND POLICY 76
4.4 FINDINGS 76
4.4.3 CHAPTER SUMMARY. 77
CHAPTER 5: CONCLUSION AND RECOMMENDATIONS 79
5.1 INTRODUCTION 79
5.2 SUMMARY OF THE KEY FINDINGS 80
5.2.1 BENEFITS 80
5.2.2 CHALLENGES 83
5.2.3 CRITICAL SUCCESS FACTORS 85
5.3 ADDRESSING THE RESEARCH QUESTION. 87
5.4 RECOMMENDATIONS 87
5.4 RESEARCH CONTRIBUTIONS 89
5.4.1 RESEARCHER'S CONTRIBUTIONS 89
5.4.2 THEORETICAL CONTRIBUTIONS 89
5.4.3 METHODOLOGICAL CONTRIBUTIONS 90
5.4.4 PRACTICAL CONTRIBUTIONS 90
5.5 LIMITATIONS AND FUTURE RESEARCH 91
5.6 CONCLUSION 91

**List of Figures** **Page number**


Figure 1.1 Research outline……..09
Figure 2.1 Literature review structure……12
Figure 2.2: Publication trends……14
Figure 2.3: Country publication trends……14
Figure 2.4: City of Ekurhuleni Levels of education……23
Figure 2.5 Digital Strategy Delivery…….32
Figure 2.6. DOI Theory…….....34
Figure 2.7. TOE Theory……..36
Figure 2.8. DOI and TOE Framework…….…….…37

**List of Tables** **Page Number**


Table 1.1 Clarification of Terms……..……11
Table 3.1 Interpretivism benefits……41
Table 3.2 Thematic analysis process……..44
Table 3.3 Summary of Research……..47
Table 5.1 Perceived Benefits Findings……79
Table 5.2 Challenges of Digitalisation Findings……82
Table 5.3 Critical Success Factor Findings……87
Table 5.4 Guidelines for Digitalisation Implementation……89

## ABSTRACT

The implementation of digital solutions presents numerous opportunities for both private and public organizations, aiming to enhance effectiveness, efficiency, and gain competitive advantage. While the private sector has already embraced digitalisation, the public sector has lagged in adopting technology. This study aims to highlight the benefits of digitalisation, identify the challenges hindering its adoption, and propose a framework for its implementation. Digitalisation is viewed as a means to enhance agility within organizations. South African municipalities and the public sector have faced widespread criticism from citizens regarding inefficiency and ineffectiveness. Therefore, many of these entities have initiated efforts to automate their services to enhance service delivery. Automating services and systems could have addressed criticisms of poor service delivery. However, this effort is hindered by unstable and unreliable networks, as well as a shortage of experienced personnel to oversee the digitalisation process. Consequently, South African municipalities often outsource many of their services to third-party companies through professional services to overcome these challenges. Despite the well-documented benefits of outsourcing digitalisation services, municipalities lack guidance on how to do so successfully. Insufficient research has been conducted on this emerging trend of digitalisation.

Thus, this study aimed to formulate a model for the implementation of digitalisation in the city of Ekurhuleni. Employing a qualitative approach, data was gathered from the city's ICT department. Subsequently, qualitative analysis was conducted on the data obtained from middle and senior management. The findings revealed that organizational factors, either collectively or individually, exert a significant influence on the adoption of digitalisation. The analysis revealed that technological factors, including innovation characteristics and organizational readiness for technology, are significant determinants of digitalisation adoption. Environmental factors were also identified as influential in this regard. This study addresses the lack of literature on digitalisation adoption in municipalities and proposes a model that can guide further research in this area. Additionally, the developed model can inform decision-making processes regarding digitalisation adoption in government. Other cities can utilize this model to inform their own digitalisation strategies, thereby making a valuable contribution to practice and management.

*Keywords: digitalisation, service delivery, digitization, infrastructure, network, digital divide, Information and communication technology.*

# CHAPTER 1: INTRODUCTION

## 1.1 Statement of purpose

The Fourth Industrial Revolution (4IR) has created a scenario where business organisations are reconsidering their established methods of doing business and has in effect, also encouraged creativity, effectiveness, and flexibility in the face of rapid technological change. As noted by Mayer & Wegerle, (2021), the 4IR changes the status quo in society, businesses, and industries by introducing changes, which will affect the majority of businesses and also introduce new ways of performing work. Organisations and governments will have to find ways to align themselves with these new technologies. They will have to invest in knowledge and training to fully understand these new technologies. Additionally, change management must be at the centre to ensure proper change is made and it is successful.

According to Statistics South Africa, the city of Ekurhuleni is mostly urban, with 99,4% of its population residing in urban areas ranging from non-formal dwellings to more well-off urban residential suburbs (COGTA, 2020). Based on this statistic, one would suggest that the level of technology adoption in the city is at its advanced stage, but the opposite is true. Larsson & Teigland (2019) highlights that adopting digital technologies can ensure that governments improve public accountability and public service delivery. This can be achieved through direct or indirect benefits. Direct benefits of digitising government services can improve the efficiency of how service delivery is currently being rendered. This could include lowering costs associated with delivery whereas indirect benefits of digitalisation ensure that there are improved services through strengthening feedback flows from users to service providers (Larsson & Teigland, 2019).

Technology advancement in this era of the fourth industrial revolution can improve growth and improve operations in local government (Reddy, 2019). Digitalisation in its nature not only involves the dynamic relationship between public services and clients but also incorporates how work in the public administration sector can be transformed (Andersson 2022). This is critical towards service delivery as citizens will have access to government processes digitally and it will ensure that governments meet their mandate to provide quality services to their citizens with minimal interaction with a human in the loop. Larsson & Teigland (2019) also argues that in the developing

world, digitalisation projects in the public sector have often fallen short of delivering expected results. This is because in many cases, these projects are not even implemented at all, and this gives challenges to the achievement of quality service delivery.

Furthermore, strategy formulation and implementation play a pivotal role in ensuring value is extracted from digitalisation. The gap between strategy and implementation needs to be closed for the successful implementation of digital transformation projects (Correani, 2020). According to Correani (2020), digital strategy implementation is the way an organisation translates the strategy into a plan that describes a list of actions to be done. This is where the majority of South African Municipalities fail.

This paper's objective is to propose a framework for the effective digitalisation of government services toward supporting public service delivery in the city of Ekurhuleni. This comes from the understanding of the benefits and limitations of the digitalisation of government services for service delivery. There is a need therefore to come up with a framework for the implementation of digitalisation in government to ensure that the process is achieving the overall goal of service delivery to communities.

### 1.2 Background of the research study

The city of Ekurhuleni is currently on a low digital maturity level as most of its service delivery is rendered manually. There is an intense human interface. Since the advent of democracy, the cities in South Africa have been faced with challenges in delivering services to the people. Citizens expected more from the democratic government. Most of the challenges range from lack of service delivery, limited budget, and the lack of digital transformation to fast-track the speed at which service is being rendered. There is also weak governance and poor leadership (Reddy, 2019).

Digital transformation is changing the way service delivery is being rendered by governments. Digital transformation or the use of technology has moved from just being an enabling tool to being an asset that the government can leverage to strengthen and reshape its strategy of meeting the needs of its people. The utilisation of technology in different cities is not uniformly adopted due to the uneven distribution of technology access. There is a huge digital divide which marginalises some sectors of communities due to the lack of easy access to digital services (Carlsson, 2023).

The process of manual service delivery opens the city to unethical behaviours. The introduction of digital technologies in government will transform the way service is being delivered. Introducing digitalisation refers to the bigger set of transformations and changes that are required to translate digitisation into organisational, social, or individual benefits (Lee, 2023).

Digitalisation is becoming a mainstream of government reform that raises expectations in terms of improved public value delivered by the government, raising both the efficiency and effectiveness of public administration (Dobrolyubova, 2020). There is an appreciation of digital transformation in the private sector and the use of technology is being adopted quicker than the public sector. Citizens also expect the public sector to deliver services quicker and with improved value. Governments are therefore forced to change the way they offer services to their citizens. There should be an enhanced level of transparency, and satisfaction to the citizens (Mergela, 2019).

Various benefits come with the implementation of digitalisation by the government. These benefits include citizen engagement and government efficiency. Service delivery could also improve if more services offered are being digitised. Automating and reducing the number of humans in the loop will also help to curb bribe-soliciting processes, and reduce bureaucratic procedures (Santiso, 2022).

### 1.3 Research problem

The upsurge of protests due to unsatisfactory services delivered by the city is the main reason it needs to relook at new ways of rendering services. Local communities all over the country started to protest progressively in 2004. This has been due to the government's failure to provide services like water, housing, sanitation, and electricity (Botes, 2018). Botes (2018) goes on to note that most of these protests happen as a result of not only the lack of speed at which the government provide services but also the poor quality of services and the selective nature of their service delivery. The implementation of digital transformation could prove to be quite an expensive expenditure for the government due to limited financial resources, but the lives of citizens will improve exponentially should the government successfully invest in digital transformation (Sabir, 2022). It is for this reason that we look at the digitalisation of the city’s services to improve service delivery and improve the citizen's quality of life.

## 1.4 Research question

The primary research question is as follows:

### 1.4.1 How can digitalisation improve service delivery in the City of Ekurhuleni?

The secondary research questions are:

### 1.4.2 What are the perceived benefits of digitalisation?

### 1.4.3 What are the challenges of digitalisation in the City of Ekurhuleni?

### 1.4.4 What are the critical success factors for digitalisation in the City of Ekurhuleni?

## 1.5 Aim of the study

The private sector is increasingly embracing digitalisation, but the public sector appears to lag behind. This study aims to explore the benefits, challenges, and key success factors of digitalisation in the city of Ekurhuleni, utilizing the Technology-Organization-Environment (TOE) and Diffusion of Innovations (DOI) theories. The city of Ekurhuleni will serve as the case study for this research.

## 1.6 Research Objectives / Rationale

The implementation of digitalisation in the city is anticipated to deliver quality service. The study aims to achieve the following objectives:

1.6.1 To outline outcomes and benefits of digitalisation for the City of Ekurhuleni and its citizens.

1.6.2 To identify the challenges of digitalisation for service delivery faced by the City of Ekurhuleni.

1.6.3 To identify critical success factors for digitalisation in the City of Ekurhuleni

1.6.4 To propose a framework for effective digitalisation of government services for service delivery in The City of Ekurhuleni

## 1.7 Delimitation / Limitation of the Study

Theofanidis (2019) defines delimitations as the limitations the author would not like to discuss in the study consciously. Delimitations are purposefully included in the study to act as boundaries that make it easy for the researcher to achieve the main objectives of the study. The study aims to develop a framework for effectively digitalise government services for service delivery in the City of Ekurhuleni.

This was achieved through the use of a qualitative research approach to capture the experiences and opinions of participants towards the matter under investigation. The study focuses on the benefits of digitalisation and the culture of the city towards digitalisation. The research will concentrate on the ICT department.

The scope of the study focuses on how the implementation of technology may improve service delivery in the city of Ekurhuleni. The study also looked at the digital divide that acts as a barrier for consumers to benefit from technology. It will focus on the Information and Communication Technologies (ICT) department as the enabler of other departments to render efficient service delivery in the city. The selected department is strategically positioned to adopt technologies that will benefit other departments. The integration of Information Communication Technologies and digital technology tools in the provision of service delivery plays an important role in improving the levels of effectiveness of Local Government service delivery operations. It is noted that the levels of effectiveness of these innovations encounter a lot of challenges (Davis, 2019).

## 1.8 Definition of terms

The table below contains some terms and definitions to assist the reader in understanding the recurring terminologies used in this study.

TABLE 1.1: CLARIFICATION OF TERMS

| Terms | Definition |
|---|---|
| *Digitalisation* | Refers to the bigger set of transformations and changes that are required to make that digitisation process work (Lee, 2023).<br>Digitalisation refers to the use of digital technologies and data that has been converted into digital form to impact the way work gets done and transform how customers and |

| | |
|---|---|
| | companies engage to create new value (digital) and new revenue streams (Ashworth, 2020). |
| *Digitisation* | Is about the transfer of any information from a conventional analogue kind of storage to a digital one (Girrbach, 2021).<br>Digitisation is the conversion of analogue to digital (Chapco-Wade, 2018, p. 3). |
| *Digital divide* | The gap between communities and individuals in different geographical areas, lack of access to network, internet and ICT infrastructure, knowledge, and skills (Fang & Gill, Digital Divide: An Inquiry on the Native Communities of, 2022). |
| *Digital transformation* | Digital transformation is defined as a process aimed at enhancing an entity by instigating substantial changes to its attributes through the integration of information, computing, communication, and connectivity technologies (Vial, 2019) |
| *E-government* | E-government refers to the utilization of Information and Communication Technologies (ICTs) by governments to enhance access to and delivery of government services and operations for citizens. It can also be seen as employing technology to enhance public service delivery, communication capabilities, and to increase the efficiency and effectiveness of governments (Adam, 2020). |
| *Information and communication technology (ICT* | Information and Communication Technology (ICT) is the fusion of informatics technology with other related technologies, particularly communication technology (Ncamphalala & Vyas-Doorgapersad, 2022a). |

## 1.9 Assumptions

It is assumed that there is employee acceptance of technology. The city is highly unionised, and labour-organised movements might have a different view on the implementation of digitalisation. There is also an assumption that the employees that were selected for the research sample are knowledgeable about digitalisation or aware of the digital transformation agenda taking place in government and some parts of the world. The researcher further assumes that the executive will make provision for budget availability to implement digital technologies.

Current organisational infrastructure can be easily integrated with new technology and there are adequate skills to support new technologies. According to Huang (2022), enhancing ICT infrastructure in a city may lead to the attraction of higher-quality labour for firms. Additionally, it can aid in cost reduction and enhance information transparency for firms, ultimately contributing to overall firm productivity. The City Executives and ICT department leadership will consider implementing and improving the organisation's maturity level to enable the process of digitalisation.

## 1.10 Contribution of this research

Below is a list of the anticipated contributions to the study:

1.10.1 The research offers a framework for understanding the factors influencing the adoption of digitalisation in the City of Ekurhuleni.

1.10.2 The study provides a framework for the adoption of digitalisation using the combination of Diffusion of Innovation (DOI) and Technology, organisation, and environment (TOE) theory.

1.10.3 The research contributes to the understanding of strategy execution for digitalisation in municipalities.

## 1.11 Research outline

This research is divided into five chapters. To guide the reader on the structure and content of each chapter, an outline is presented along with a brief summary of each chapter.

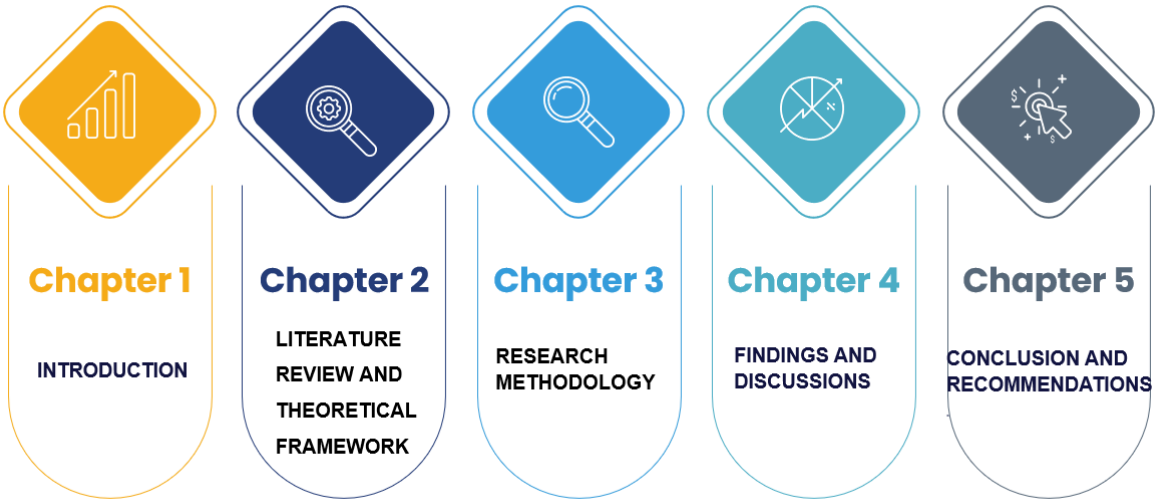



Figure 1.1 Research outline

### 1.11.1 Chapter 1: Introduction.

This chapter provides an introduction and the background of the study. It also outlines the research problem to be addressed by this study, research questions to be answered, research objectives and delimitation of the study. The chapter also highlights the issues that necessitate the research in this area of digitalisation of services in the City of Ekurhuleni. A contribution that the study might make in the improvement of how service delivery is currently rendered in the city was also identified.

### 1.11.2 Chapter 2: Literature Review and Theoretical Framework

This chapter reviews literature on digitalisation, covering its benefits and implementation challenges in various cities. It compares global adoption rates, analyses critical success factors, and discusses strategies for improving service delivery through digitalisation. The chapter concludes with an overview of the theoretical foundations of the study, focusing on the DOI and TOE frameworks.

### 1.11.3 Chapter 3: Research Methodology.

This chapter details the research methodology used in the study, emphasizing the qualitative approach to examining digitalisation in the city of Ekurhuleni. It describes data collection methods such as Microsoft Teams meetings, in-person interviews, and

written responses, which were employed to ensure the reliability and validity of the findings. The chapter also discusses sampling techniques, participant selection, and data analysis.

### 1.11.4 Chapter 4: Findings and Discussions.

The chapter presents the results of data analysis and discusses each analysed component. It begins with a detailed examination of the participants' demographics, followed by an in-depth discussion of the findings. The chapter concludes with a description of the collected data results.

### 1.11.5 Chapter 5: Conclusion and Recommendations

This chapter interprets the results and addresses the research question, the study's goal, and its objectives. It further synthesizes the study into recommendations, research contributions, and methodological, theoretical, and practical contributions. The chapter concludes by discussing the study's limitations and identifying gaps for future research to address.

# CHAPTER 2: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

*There are many challenges encountered in the implementation of digitalisation. They vary from financial constraints, leadership, infrastructure readiness, culture of government employees and corruption. Most municipalities in the country often run short of financial resources to implement digital technologies. There is also a huge gap in skills required for a successful implementation of digitalisation. This chapter will focus on digitalisation in detail and discuss its challenges and benefits towards service delivery. The views will be related to the benefits and enablers of digitalisation. The study also looks at the theoretical framework that underpins the study.*

Figure 2.1 below illustrates the literature review structure that will be followed in this chapter.

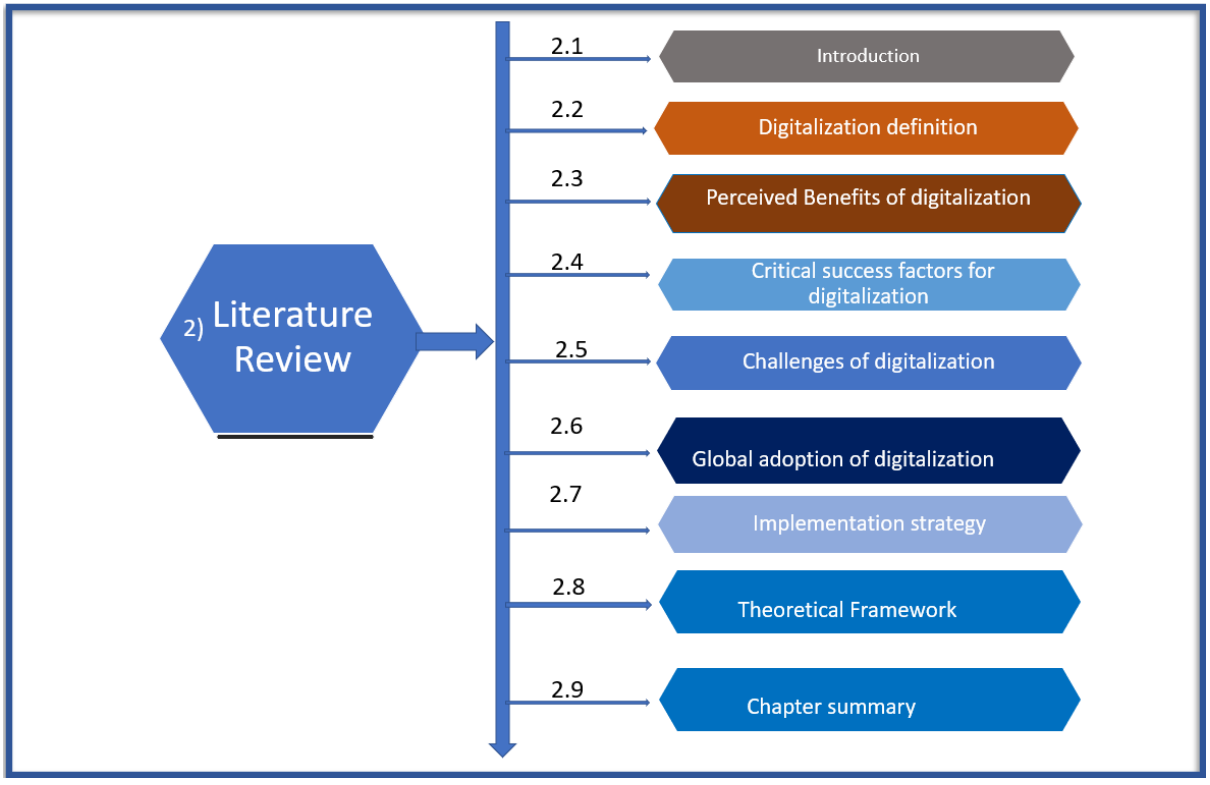



Figure 2.1 Literature review structure

## 2.1 Introduction

The literature review is characterised as a systematic, explicit, and reproducible method employed to identify, evaluate, and synthesise the existing body of completed and recorded work generated by researchers, scholars, and practitioners (Fink, 2019).

Moreover, conducting a literature review serves as a valuable method for consolidating research findings to present evidence at a meta-level and identify areas requiring further investigation. This is an essential element in the development of theoretical frameworks (Luft et al., 2022; Snyder, 2019).

A literature review can generally be characterized as a methodical approach to gathering and integrating prior research (Snyder, 2019). Digitalisation is an emerging trend influencing cities to adapt and improve digital capabilities in every aspect of service delivery. Globally it has enabled cities to overcome uncertainties and respond to developmental demands in an effective manner (Deepu and Ravi, 2021). Scholars have articulated that digitalisation is not about only technology adoption, rather, it is about the fundamental shift that occurs in a city's strategic processes, knowledge and socio-technical approaches (Park and Saraf, 2016).

As the city's internal and external elements and their relationships become transformed by digital technology (Freitas Junior et al., 2020), it may, directly and indirectly, impact the development of the city Meng and Wang (2020) in developing countries, the uncertain impact of digitalisation on service delivery places the decision-makers who need to determine the feasibility of investing and predicting the intended benefits of digital transformation in a challenging position. Although the influence of digitalisation has been documented in the literature (Matthess and Kunkel, 2020), it is unclear what and how to measure the impact of digitalisation on service delivery.

The annual publications on digital transformation are presented in Figure 2.2. Annual publications have increased dramatically, indicating the growing academic interest in digital transformation. During the years between 2000 and 2002, annual publications were few due to the lack of concerns on digital transformation, digitalisation, and other urban problems within city development. However, annual publications gradually increased from 2003 to 2011. This reflects that more researchers began to pay attention to this field. It also echoes the global trend of digital transformation. In addition, with increasing awareness, more people began to embrace the positive effects of digital platforms, particularly in developing countries.

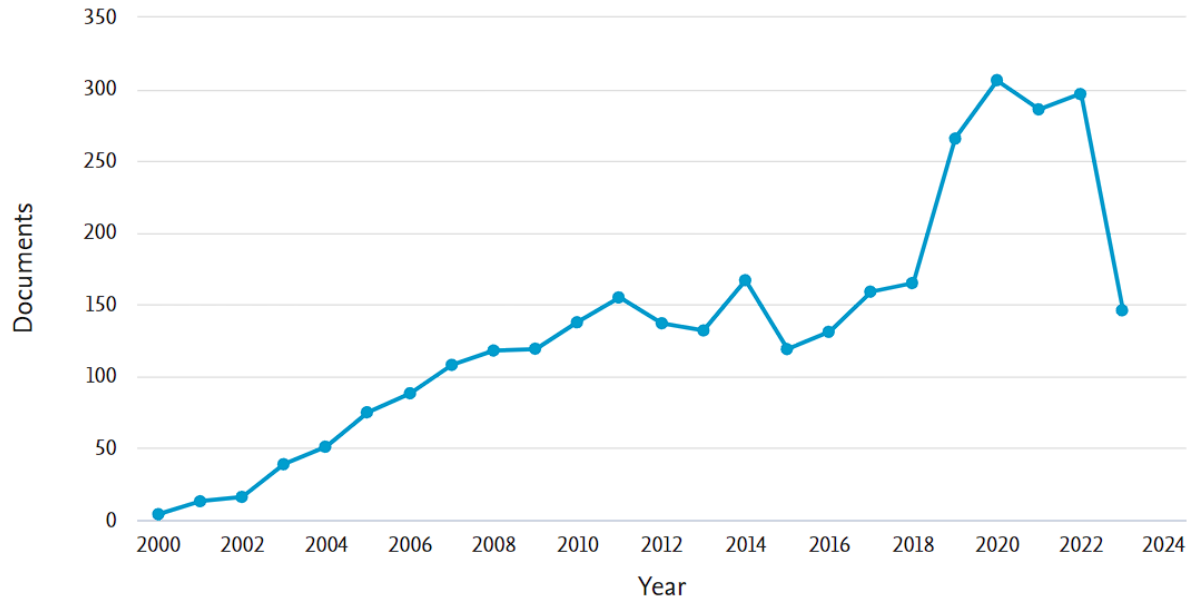



Figure 2.2: Publication trends: sourced from
(Reis & Melão, 2023)

The collective publications originating from a particular country can serve as an indicator of the academic focus and overall proficiency of that country in the respective research domain. Figure 2.3 illustrates countries where only the nationality of the first author is taken into account. The USA accounted for a majority of the papers. The United Kingdom is the second most productive country, while China is the third most productive country. South Africa was the leading African country in publications on digital transformation followed by Egypt. It is not surprising that the USA and China are the most productive countries as they have invested in ICT infrastructure and supporting research fields.

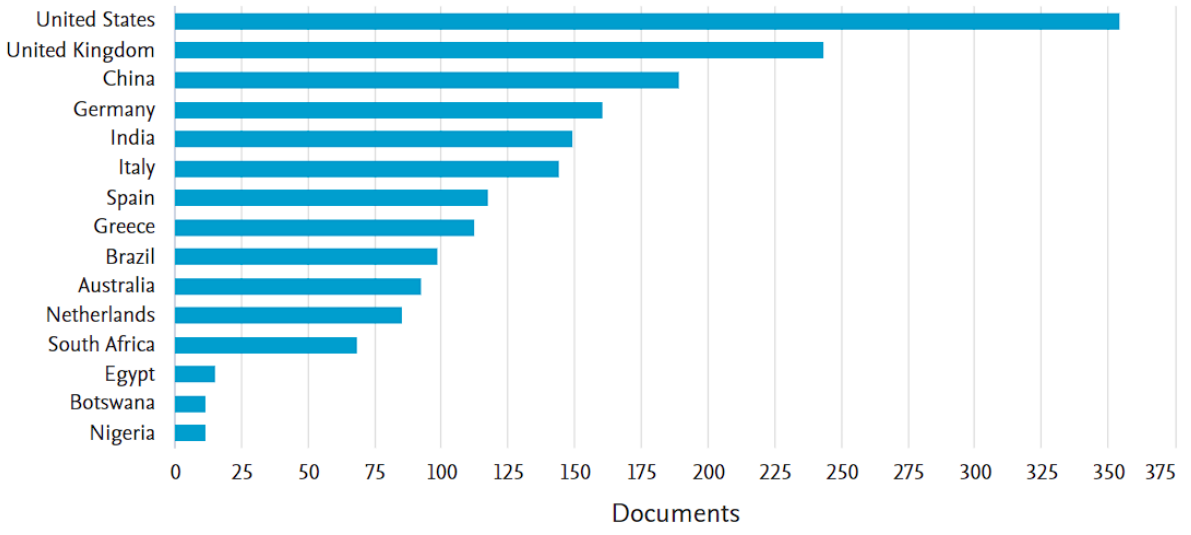


Figure 2.3: Country publication trends: sourced from (Rha & Lee, 2022)

This section will look at the concept of digitalisation adoption in the public sector in the global context. The study will also discuss the benefits that come with digitalisation and explore the digital maturity of other cities globally.

## 2.2 Digitalisation definition

Digitalisation in simple terms refers to a process where analogue processes are ultimately discontinued in favour of the integration of a digital format to change a business model to generate income and opportunities for an organisation or government parastatal. Digitalisation also influences the preferences of citizens in their interactions with the public sector, seeking accessibility through digital channels available round the clock (Ruud, 2017). Digitalisation encompasses the capacity of digital technology to gather data, identify patterns, and facilitate more informed business decisions. It entails leveraging emerging digital technologies like social media, mobile devices, analytics, and embedded devices to drive substantial improvements in company operations (Marszalek, 2022). Lee (2023) refers to digitalisation as a bigger set of transformations and changes that are required to make that digitisation process work. Lindgren (2019) defines digitalisation as the application of digital technology to wider social and institutional environments, forming a sociotechnical process.

Digitalisation within the economy or organizations broadly encompasses the digitization of business models, products, and services, as well as entire processes or their components. However, regarding processes, this doesn't always entail complete automation devoid of human intervention (Fleischmann, 2020*).* While there is a large number of studies on digitalisation there is, however, no general and universally accepted definition of the term. It is important to note that there are commonalities in all the definitions as they all incorporate and emphasize process, society, and technology. The definition that is most aligned with this research is the one suggested by Lee (2023): "…digitalisation is a bigger set of all transformations and changes that are required to make that digitisation process work".

## 2.3 Perceived benefits of digitalisation

Before looking at the benefits of digitalisation, we must distinguish between these closely related words, Digitisation, digitalisation, and digital transformation. Most literatures have used these words interchangeably even though their meanings are not the same. Digitisation, as defined by Bloomberg (2018), involves the conversion of analog information into binary code (zeroes and ones), enabling computers to store, process, and transmit the information effectively. Armstrong and Lee (2023) characterize digitalisation as encompassing the broader spectrum of transformations and changes necessary to enable the digitisation process. On the other hand, Vial (2019) defines digital transformation as a process focused on enhancing an entity by instigating significant changes to its attributes through the integration of information, computing, communication, and connectivity technologies. The terms "digitisation" and "digitalisation" are closely related and frequently interchangeable in various literature contexts. (Brennen, 2016).

Digitalisation or digital transformation necessitates decision-makers to develop a digital vision outlining the rationale, strategy, and desired outcomes of the digitalisation process (Westerman and MacAfee, 2012). As a result, decision-makers may encounter uncertainties and risks as challenging aspects (Hai et al., 2021). Digitalisation's influence or impact on organisational design elements and their performance due to the socio-technical nature of digitalisation. Digitalisation strategies and various urban elements are interconnected, highlighting that digitalisation alone may not comprehensively elucidate the intricate mechanisms through which it influences organizational performance (Park and Saraf, 2016).

There are several studies (Brunetti et al., 2020; Liu et al., 2019) that refer to digital performance from different perspectives. For instance, performance has been the focus of discussing the impact of digital solutions on corporate sustainability transformation (Vial, 2021). A study by Hai et al., (2021) assessed the role of market value as a factor to influence digitalisation. While Feroz and Chiravuri, (2021) discussed process performance that would need to be in place for a successful transition to digitalisation (Zaoui and Souissi et al., (2020). Also, other studies have focused on other factors namely financial performance (Brunetti et al., 2020; Liu et al., 2019), production performance (Vial, 2021), productivity (Hai et al., 2021) or

digitalisation investment (Westerman and MacAfee, 2012). Governments and public sector organizations are implementing digitalisation in their service delivery to reduce costs, enhance administrative efficiency, offer improved services to citizens and businesses, and enhance transparency in expenditure and decision-making processes (Ylinen, 2022). The benefits are outlined below:

### 2.3.1 Cost savings

Smart cities entail initial investment costs, yet their prime allure lies in long-term cost savings. By eradicating redundancies, identifying avenues for cost reduction, and optimizing workforce roles, municipalities can deliver superior services at reduced expenses, while addressing the unique needs of distinct groups within the population (Department of Cooperative Governance, 2021). Through the generation and analysis of vast quantities of citizen data, these emerging digital technologies have the capacity to establish public services characterized by simplicity, speed, security, and integrity, ensuring interactions between citizens and public authorities are devoid of corruption (Lindgren, 2019).

Cities need to implement measures of digitalisation which will help citizens access government in the comfort of their homes because travelling to municipal offices is costly. There is also a huge possibility that the offices might be offline due to load-shedding (temporary power outages) issues but a city that is digitalised will improve the lives of its citizens and save time and resources on travelling to city offices. Digitalisation works on a higher level than Digitisation; it enhances the competitiveness of an organisation through increased flexibility, wider market reach, transforming processes and products and lower operating costs (Low, Seah, Cham, & Teoh, 2022)

### 2.3.2 Increased transparency

According to Santiso (2022), e-government initiatives help to diminish corrupt practices by strengthening internal managerial controls, while e-participation fosters government transparency and accountability. Consequently, government digitalisation has facilitated and expedited efforts toward transparency, information accessibility, and open data. Notably, these factors have a more substantial impact on controlling corruption compared to bureaucratic professionalism, bureaucratic quality, and law enforcement measures. The advent of data mining, machine learning, sensor technology, and service automation presents new and forthcoming opportunities for

digitizing public service delivery. These technologies have the potential to reduce service lead times, enhance process transparency, and facilitate seamless service provision across organizations (Matheus et al., 2018). As per the World Bank, good governance encompasses two distinct roles: the economic function of the government in enacting policy reforms and the non-economic function, which includes aspects like transparency, accountability, and efficiency. (Nechba et al., 2022).

### 2.3.3 Accessibility and Efficiency

Citizens should have convenient access to government data and services, whether from their homes or elsewhere, using technology. Another impetus for the digitalisation of public services is the necessity to streamline internal processes within government organizations to enhance their efficiency (Lindgren, 2019). Prioritizing the significance of public service provision and accessibility is crucial in shaping government policies aimed at fostering social inclusion and ensuring social justice (Langford & Higgs, 2010).

### 2.3.4 Reduction in Corruption Activities

Digitalisation emerges as a powerful tool in addressing corruption, according to Santiso (2022). Moreover, Santiso suggests that digitalisation contributes to enhancing the global anti-corruption efforts through the strategic utilization of data and the emergence of integrity analytics by technologically adept integrity institutions and oversight bodies. Adam et al., (2019) state that the deployment of digital technologies and AI solutions can support the fight against corruption in public procurement. Adam and Fazekas (2021) emphasized that new technologies and AI solutions introduce novel corruption risks, such as data poisoning or challenging-to-detect attacks, which must be addressed during the design phase. Additionally, their potential contribution to anti-corruption efforts should be weighed carefully when deciding whether or not to implement them.

### 2.3.5 Citizens and Stakeholder Value Creation

Bernhard et al. (2018) suggest a correlation between the level of digitalisation within a municipality and the perceived satisfaction among its citizens. They argue that increased digitalisation should enhance administrative efficiency and promote democratic values while fostering citizen inclusion. Jacob (2019) emphasizes the

importance of placing citizens at the centre of public service development and provision, treating them as customers. User satisfaction, therefore, plays a pivotal role in driving the adoption and utilization of e-government services. Globally, socioeconomic status has a significant role in determining the adoption of emerging technologies. Socioeconomic status can be evaluated by income and what is purchased with it, making it easier to examine in high-income countries. Still, this idea is difficult to apply to low and middle-income nations. Wells et al. (2014) studied the needs and assets for building infrastructure to reduce ICT disparities. The ICT infrastructure must be adaptable to meet short-, medium-, and long-term functional and spatial demands. Modularity and adaptability are both examples of flexibility. It facilitates adjusting to technological and epidemiological changes; as a result, it is an essential factor to consider while designing a service delivery implementation plan.

Government facilities can improve efficiency by demonstrating the information types that must be handled and managed there. As a result, digitalisation can reduce the labour hours required to manually find the necessary information (Demirdöğen et al., 2021). Leveraging digital technologies has the potential to enhance information security and offer citizens a standardized and user-friendly communication platform, enabling them to more effectively engage with public authorities (Ylinen, 2022).

### 2.3.6 Improved decision making

The success of a digital city hinges on its ability to actively engage and involve members of the local communities in decision-making processes. Citizen engagement through digital platforms, social media, and mobile applications fosters a sense of ownership and empowers citizens to actively contribute to the development of their city. Numerous studies have explored the positive impact of citizen engagement on urban development and social cohesion (Mendhurwar, S. and Mishra, 2021).

## 2.4 Critical success factors for digitalisation.

Critical Success Factors (CSF), refers to a concise set of key areas where achieving satisfactory outcomes ensures successful competitive performance for an individual, department, or organization (Ashworth, 2020). Milosevic and Patanakul (2005, p. 183) later proposed that CSF could be perceived as attributes, circumstances, or factors

that can exert a substantial influence on project success when appropriately sustained, maintained, or managed.

### 2.4.1 ICT infrastructure

ICT infrastructure encompasses the presence of computers, internet access, and all other related facilities associated with the utilization of ICT (Lomos et al., 2023). In this context, infrastructure can also refer to physical network connections like fibre cable, Unshielded twisted pair (UTP) cables and radio signal equipment. Undoubtedly, technology and digital infrastructure have been instrumental in addressing the significant challenges of our era. They serve as transformative elements, altering the landscape in profound ways (Gili, 2022). The failure of certain smart governance programs or their implementation at the local government level may stem from several critical factors, as noted by Doorgapersad (2022). These factors include a deficiency in digitalized infrastructure, strategies that integrate ICT into programs, and aligning them with the vision and mission of the municipality. Ncamphalala and Doorgapersad (2022) argue that a significant ICT infrastructure initiative in the city can lead to economies of scale in delivering municipal services by leveraging smart solutions such as enhanced CCTV coverage for community safety.

### 2.4.2 Leadership

The transition in leadership from traditional to digital arises from the imperative digitalisation of the workplace. Technological advancements enable remote work, offering significant cost-saving benefits compared to traditional offline work environments (Erhan et al., 2022). The importance of leadership is also emphasised by Arumugam (2023) when he alluded that leadership is important in providing a structure to incorporate emerging technology's role in changing fundamental shifts in the organisation. Cities must invest or hire good leaders in ICT to drive digitalisation.

Doorgapersad (2022) highlights that inadequate leadership can foster unethical behaviour, which in turn hampers the smooth adoption and support of smart governance programs. Corruption and nepotism further exacerbate the situation, hindering the appointment of competent personnel to key positions responsible for driving ICT adoption and implementation. The influence of leadership is tied to a visionary outlook aimed at achieving improved future outcomes. Leaders serve as catalysts for change, promoting transparency and democracy within the organization,

fostering trust among employees, and fostering a sense of unity to drive company advancement (Pacolli, 2022). Leadership competencies are crucial in navigating digitalisation for successful transformation projects. As the public sector aims to transition towards a future digitized state, the objective of digitalisation is to achieve better outcomes with fewer resources and enhance resource productivity (Ruud, 2017).

### 2.4.3 Availability of skills and training

The Local Government Sector Education and Training Authority (LGSETA) states that South Africa has established multiple legislative and policy frameworks to regulate and enhance skills development, both at a general level and specifically within municipal domains, but the skills mismatch still exists. To effectively implement digitalisation, having individuals with the appropriate skills and capabilities in strategic positions is crucial. It's not solely about the technology; the people factor plays a significant role in making a city "smart." Thus, municipalities need to broaden their investments beyond technology and data to include investment in human resources. While it may be feasible to upskill or retrain existing staff in some cases, in others, hiring individuals with specific competencies may be necessary.

The possibility of certain skills becoming redundant because of the implementation of digitalisation should be carefully considered (Department of Cooperative Governance, 2021). Mittal (2020) emphasizes the importance for governments to effectively organize themselves and ensure they possess the necessary skills to leverage new digital tools. Collaboration and interaction with citizens, society, and businesses are crucial aspects. Digital transformation of governments is essential to cater to digital societies and economies. To achieve this objective, governments must view data capabilities and skills as strategic components in their endeavours to modernize public sector services.

### 2.4.4 Organisational Culture

As highlighted by Peter Drucker's "Culture Eats Strategy for Breakfast” this affirms the importance of culture in the public sector and private sector or any business. The organisation's performance is based upon the contribution of a strong culture which leads to a strong association between performance and management. Culture is reflected in the social behaviours and norms found in specific societies. As one of the

central concepts in management, culture encompasses a range of phenomena that are transmitted through social learning (Huang et al., 2019) furthermore Huang et., (2019) state that in the consideration of technology acceptance, culture should be highlighted as the most important factor.

As emphasised by Andriole (2020), the success of digital transformation hinges on a profound understanding of an organisation's culture. According to Ruud (2017), successful change and realization of expected benefits in the public sector hinge on utilizing technology, fostering innovation capabilities, and implementing digitalisation through digital transformation projects. However, the public sector's deep-rooted cultural and legacy structures pose significant challenges, as culture is often the most resistant to change. This complexity makes achieving success with digital transformation projects in the public sector particularly challenging. Fitzgerald et al. (2013) stress that deep-seated attitudes of fear and ignorance hinder digital transformation in organizational cultures.

### 2.4.5 Policy gap and frameworks

De Coning and Wissink (2011) stated that the distinction between policy and practice is a recurring theme in policy discussions, particularly in nations where implementation is a focal point in the literature. Madue (2000) points out that policy gaps in South Africa underscore the government's difficulty in aligning aim with outcome and rhetoric with practice. A policy gap occurs during the implementation phase when there is a discrepancy between the expected outcomes of a policy and the actual results perceived (Brynard, Cloete and de Coning, 2011). In a program titled "Closing the Gap between Policy and Implementation in South Africa," Khosa (2003:49) observes that disparities between public policy and implementation stem primarily from unrealistic policies and insufficient managerial skills. Additionally, the author identifies a dearth of people-driven processes and inadequate coordination across various government sectors, significantly impeding policy implementation and negatively impacting service delivery. Some challenges hinder the implementation of digital transformation in the city. Doorgapersad (2022) identifies various challenges hindering cities from fully transitioning into smart cities, including inadequate ICT policies, improper policy implementation, and a lack of capacity and skills for policy execution. Consequently, the implementation levels of ICT and smart governance in municipalities are deemed

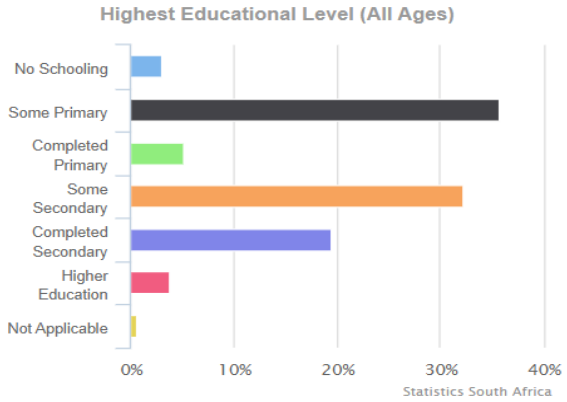
unsatisfactory. To address these issues and effectively achieve smart city status, policy recommendations are essential.

## 2.5 Challenges of Digitalisation.

The concept of smart cities has gained significant attention worldwide, including in South Africa. However, many developing countries, particularly those in the Global South like South Africa, face challenges in realizing the vision of smart cities. These challenges include financial constraints, lack of necessary skills, and inadequate infrastructure. As a result, achieving smart city status remains a distant goal for most developing countries in the South (Koekemoer, 2022). The following note several challenges highlighted in the literature about the challenges faced by the implementation of digitalisation.

### 2.5.1 Digital literacy

Digital literacy refers to an individual's capacity to locate, assess, and convey information through the use of typing or digital media platforms. Initially centred around basic digital skills and computer literacy, the concept has evolved to encompass networked devices such as the World Wide Web and social media platforms. Digital literacy encompasses the competencies necessary for active participation in a knowledge-based society. It involves proficiency in utilizing digital devices like smartphones, tablets, laptops, and desktop PCs for communication, expression, collaboration, and advocacy. This includes acquiring knowledge, skills, and behaviours essential for effective digital engagement (Mulla 2023). Despite having access to technology, individuals with poor general and technological literacy often face limitations in its use. This issue is exacerbated for women and the economically disadvantaged. In countries like India, a significant number of women rely on their husbands for technological tasks due to barriers in device and textual literacy (Balasubramanian et al. 2010).




| Group | Percentage |
|---|---|
| No Schooling | 3% |
| Some Primary | 35,8% |
| Completed Primary | 5,2% |
| Some Secondary | 32,3% |
| Completed Secondary | 19,4% |
| Higher Education | 3,8% |
| Not Applicable | 0,6% |

Figure 2.4: City of Ekurhuleni Levels of education
Source: Statistics South Africa 2022

Helena (2022) highlights that the state of infrastructures like ICTs and digital literacy skills poses a significant barrier to digital literacy, primarily due to insufficient funding for libraries. This lack of funding impacts the provision of ICTs and contributes to digital illiteracy within communities. Moreover, Helena emphasizes the crucial role of library services in fostering digital literacy and sustainable development. Ruud (2017) further emphasizes that inadequate access to computers and internet connectivity could undermine both digital literacy and sustainable development efforts.

### 2.5.2 Lack of Digital Infrastructure

Khisro (2021) emphasizes the public sector's tendency to under-invest in the modernization of digital infrastructure, which is a vital element for the development of smart cities. Digital infrastructure, referring to physical assets necessary for technologies like digital communication, computing, and data storage, plays a vital role in enabling smart city development. The Department of Cooperative Governance (2021) underscores the necessity of digital infrastructure for collecting, centralizing, and analysing data to derive actionable insights. However, Doorgapersad (2022) notes an existing gap in strategically implementing ICT policies and ensuring adequate ICT infrastructure and resources. Moreover, he stresses the importance of extending ICT infrastructure to reach residents in geographically remote or rural areas, enabling them to access smart services.

Access to technology and technological infrastructure is essential for ICT innovations in e-governance and service delivery, but many developing countries face challenges

with coverage and reliability. The integration of technology into education, especially in marginalized areas, is hindered by inadequate supporting infrastructure such as devices and connectivity, as noted by the Asian Development Bank (ADB) in 2012 and the World Bank in 2010. Even for those with access, limited general and technological literacy restrict usage. These challenges are exacerbated for women and the economically disadvantaged, particularly in countries like India, where many women rely on their husbands due to barriers in device and textual literacy (Balasubramanian et al. 2010).

### 2.5.3 Change management

Change management encompasses various approaches aimed at preparing and assisting individuals, teams, and organizations in navigating transitions or transformations in goals, processes, or technologies (Pacolli, 2022). It is an outcome-focused methodology designed to minimize resistance to organizational change (Malhotra, 2019). A change management model acts as a guiding framework to facilitate change efforts by outlining specific processes and steps to follow. It illustrates the various factors influencing change and identifies the levers used to succeed in the change management process (Errida, 2021). Pacolli (2022) states that in public institutions, organisational change is imperative for appreciating the benefits of digitalisation and change management is a substantial factor in the digitalisation journey.

Change management efforts often lack a leader who can effectively make sense of the change, communicate it, motivate the change team, empower individuals, and develop change management plans encompassing communication, resistance management, training, and coaching (Errida, 2021). The change management process refers to the sequence of steps or activities that a change management team or project leader follows to apply change management to a project or change (Kuzhda, 2016). Kuzhda further emphasises that managing resistance to change is an important part of the success of any change in any organisation. Diener et al. (2021) argue that employees need to be engaged in the change process and equipped to adapt to digitalisation and its associated innovations. Ruud (2017) asserts that digitalisation necessitates a reorganization of how public sectors function and provide services. To effectively navigate digital transformation, activities such as change management,

change initiatives, and transformation projects are essential, as emphasized by Ruud (2017).

### 2.5.4 Lack of funding.

Doorgapersa (2022) suggests that the city should prioritize ICT plans and programs more prominently when budgeting for its service delivery components. This approach entails municipalities giving equal and deserved importance to ICT initiatives, ensuring smooth implementation without resource-related challenges. In e-government implementation, particularly in service delivery sectors like health and education, the funding model and costs incurred throughout the process significantly impact sustainability levels, as noted by Bwalya and Mutula (2014). Insufficient financial resources and inadequate cost-benefit analysis can hinder investment flow at necessary levels, potentially derailing future e-government service delivery implementation and innovation efforts.

Numerous e-government projects in developing nations have faltered due to the replication of funding models from developed countries. To ensure sustainability, emerging funding models advocate for self-sustaining implementation through effective business models, incorporating a blend of public-private partnerships and diverse revenue sources. This perspective is supported by Bwalya and Mutula (2014), Lemaire (2011), and Shuvo et al. (2015). Furthermore, informed design strategies for monitoring and evaluation, as well as context awareness, are crucial complements to these funding models.

### 2.5.5 Digital divide

The digital divide represents the gap between those who have access to modern information and communication technology (ICT) and those who do not, encompassing individuals, households, businesses, and geographic areas. While affordability of technology is often a focus, the lack of skills, opportunities, and confidence can also widen this gap (Department of Cooperative Governance, 2021).

Digitalisation is reshaping culture, individuals, and society worldwide, impacting various aspects of human activity and creating new forms of interaction. However, there exists a generational gap in technology uptake, ease of use, and access, leading to a digital divide with further societal and cultural implications (Elena et al., 2020).

Access to Information and Communications Technologies (ICTs) and their potential benefits are unevenly distributed across different demographics and geographies, a phenomenon known as the digital divide. This disparity in digital access can lead to digital exclusion among certain groups (Otioma, 2019). The issue of the digital divide is not a new phenomenon.

The term "digital divide" originated in the 1990s to describe discrepancies in access to information and communication technology (ICT). Initially, it primarily concerned differences in computer access, but has evolved to encompass broader aspects beyond physical access. The focus has shifted to disparities in Internet access, recognizing its significance as a vital tool for human civilization (Fang, et al., 2022). There are many views of digital levels, (Lee, 2023). Armstrong and Lee further state that there are three levels which include access, usage and skills and outcomes. They cite Van Dijk (2005) who states that the first level of digital divide is access, and Van Dijk alludes that the first level focuses on the disparity in access to information technology.

### 2.5.6 Interoperability and Legacy Systems

Interoperability is a significant challenge in asset information management. It involves integrating and exchanging data between different systems, which can be complex and time-consuming. The lack of interoperability leads to fragmented data and hinders efficient asset management and decision-making processes. Challenges stemming from outdated systems are significant, particularly in the complexity of updating them, especially when integrating new technologies (Fitzgerald et al., 2013). Overcoming these challenges is crucial for cities to leverage digitalisation and achieve effective asset information management. Kawamoto et al. (2021) discuss the challenges of establishing interoperable electronic record innovations, emphasising the need for multidisciplinary collaboration.

However, there are gaps in research regarding the impact of information access and interoperability, cost-effectiveness, implementation challenges and best practices. Further research is needed to understand the benefits, challenges, and effective strategies related to interoperability of data. Facilitating seamless information exchange among disparate systems throughout the city is crucial for effectively designing e-government service delivery platforms, as emphasized by Bwalya and

Mutula (2014). Achieving this requires highly integrated and interoperable systems that are not only relevant but also feasible within the local context.

To ensure effective implementation, it is essential to establish and adhere to open standards, as advocated by Bwalya and Mutula (2014), Fishenden and Thompson (2013), and Haas (2016). Fishenden and Thompson (2013) propose that future public services will rely on global, internet-enabled digital platforms with two crucial technical and commercial characteristics. Firstly, the adoption of open standards and architectures will enable governments to remain technology- and vendor-neutral. Secondly, the proliferation of open standards and increased market options will drive innovation and gradual convergence towards more affordable, standardized "utility" public services.

The adoption of open standards could facilitate the dismantling of traditional siloed technologies and services, fostering an innovative and cost-effective marketplace for these services, as suggested by Estrin and Sim (2010), Fishenden and Thompson (2013), and Tomlinson et al. (2013). Bwalya and Mutula stress the pressing need for the development of context-aware interoperability frameworks, given the absence of globally agreed semantics to support such endeavours. However, despite this urgency, the literature on digital transformation in developing cities indicates a lack of concerted efforts to enable interoperability and establish a robust platform for the exchange of accurate and reliable information.

## 2.6 Global adoption of digitalisation

Studies indicate that while some cities recognize the value of ICT in e-governance and are open to its adoption, they may feel they lack the capacity and authority to address integration challenges. Conversely, other cities may resist ICT integration, perceiving it as increasing their workload. Bladergroen et al. (2012) found that both developed and developing countries face significant challenges due to a lack of trained employees, although developed countries tend to have more technical staff. Resistance to change and the absence of a cohesive organizational strategy are common challenges across countries regardless of economic status. Additionally, issues such as resistance to new technologies, the need for research on e-governance benefits, and incentives for enhancing use and compliance are crucial, as highlighted by Lluch (2011).

Globally, socioeconomic status has a significant role in determining the adoption of emerging technologies. Socioeconomic status can be evaluated by income and what is purchased with it, making it easier to examine in high-income countries. Still, this idea is difficult to apply to low- and middle-income nations. Wells et al. (2014) studied the needs and assets for building infrastructure to reduce ICT disparities. The research describes the participatory methods used to build and implement a needs and assets assessment and implementation plan, as well as the partnership activities that resulted in the infrastructure for the network. The network requires continued dedication from the institutions and institutional leaders, ongoing engagement and participation activities, and efficient coordination and communication centred on team science objectives.

This section demonstrates how the City of Ekurhuleni is positioned regarding digital adoption in comparison with other cities globally. We interrogate literature on three cities. City of Cape Town, Copenhagen in Denmark, and Kigali in Rwanda East Central Africa. The comparison seeks to show the digital maturity of the City of Ekurhuleni against the three other cities by using Westerman's representation of the digital maturity model. Westerman's Digital Maturity Model proposes a framework that comprises two dimensions, namely, Digital Capabilities, and Leadership Capabilities. Digital Capabilities relate primarily to the application of digital technologies in core organisational functions and processes and include the factors of digital transformation of the customer experience while Leadership capabilities focus on behavioural processes like ways of acting, feeling and thinking. There is also an emphasis on how leaders can develop their communication, negotiation, conflict resolution, and decision-making skills to forge an identity and accomplish organisational objectives.

### 2.6.1 City of Cape Town

The City of Cape Town metropolitan municipality is situated within Cape Town, which is in the Western Cape province of South Africa. Cape Town is the second-largest city in the country, with a population of 4.4 million people, and it serves as the legislative capital of South Africa, according to Stats SA (2011). The City of Cape Town is taking bold steps to transition its local government into the digital era, with Mayor Geordin Hill-Lewis expressing ambitious goals. Over the next decade, the city plans to allocate

nearly R15 billion to ensure that all aspects of government operations are digitally transformed, with a focus on prioritizing digital initiatives.

The mayor went on to declare that the allocation would ensure they could capitalise on their position as a tech capital (Mzekandaba, 2022). Cape Town, South Africa, is renowned for its easily accessible, dependable, and high-speed Wi-Fi, making it the second-ranked city in Africa for internet speeds. Cape Town's status as one of Africa's prominent digital cities has been widely recognized (Brandstories, 2021). According to the article, the City of Cape Town is consistently enhancing telecommunications and technology infrastructure in both provincial and local government areas.

### 2.6.2 Copenhagen (Denmark)

Copenhagen, the largest city in Denmark, boasts a population of around 600,000 within its city limits and nearly 2 million in its greater metropolitan area. Renowned for its technological advancements and high quality of life, the capital garnered global recognition in 2014 when it clinched the esteemed World Smart Cities Award in Barcelona for its innovative urban concept, "Copenhagen Connecting." This accolade underscores the city's commitment to leveraging technology to enhance its infrastructure and services, further solidifying its status as a pioneering smart city (Doody et al., n.d.). Sundsgaard, (2021) claims that Denmark is known for its level of progress in the digitalisation of public administration and ranks very high in European comparison (European Commission, 2020a).

Denmark stands out as a global leader in public sector digitalisation, consistently ranking at the forefront of various reports and surveys. Sundsgaard (2021) highlights Denmark's remarkable achievements in this area, noting that it boasts the highest utilization of digital services within the EU and enjoys some of the highest levels of citizen satisfaction with public services worldwide. The Danish Government serves as a prime example of successful public sector digital transformation, showcasing how embracing digitalisation can lead to significant advancements in service delivery and citizen engagement. An exemplary illustration of mobility-related innovation is the Copenhagen Intelligent Traffic Solutions (CITS) platform. CITS comprises a network of Wi-Fi access points capable of geolocating Wi-Fi-enabled devices on city streets while maintaining privacy safeguards.

The data collected by the system allows officials to monitor traffic conditions in real-time and inspires the development of transport-related tools and applications. Copenhagen Intelligent Traffic Solutions (CITS) exemplifies the Danish approach to tripartite collaboration among universities, businesses, and government entities. Furthermore, Copenhagen has emerged as a thriving hub in the high-tech startup ecosystem (*Copenhagen-Smartcities-the-Sustainable-Program-Six-Leading-Cities-Soreport-2021-2[4]*, n.d.). In Denmark, municipalities possess significant authority and resources to initiate smart city initiatives, backed by 50% of the national public budget. This has led to over half of Denmark's municipalities undertaking various smart city projects, with several earning international acclaim for their innovation and effectiveness (Doody et al., n.d.).

### 2.6.3 The City of Kigali (Rwanda)

Kigali, the capital of Rwanda and its economic centre, is determined to overcome economic and social challenges through innovative strategies. Nestled amidst rolling hills and valleys, Kigali has earned the nickname "The Silicon Valley of Africa," indicating its aspirations for technological advancement (Pelikh, 2022). However, the successful development of Kigali as a smart city hinge on essential factors such as connectivity infrastructure, private-sector investment, and expertise. Ensuring a high level of security throughout the digital transformation process is also crucial, given the sensitive nature of the information involved and its impact on city operations (Inmarsat, 2017). Rwanda's ambitious plans include the construction of a $420 million innovation park in Kigali, known as Kigali Innovation City (KIC), with the aim of establishing the country as East Africa's premier tech and business hub. This government-led initiative seeks to foster a high-tech ecosystem centred around innovation and talent. (Rwanda Cultivates Tech Credentials ProQuest Document Link, 2023).

### 2.6.4 City of Ekurhuleni (CoE)

The City of Ekurhuleni (CoE) was established in 2000 through the amalgamation of two prior regional entities: Kyalami Metropolitan and the Eastern Gauteng Services Council (Ncamphalala & Vyas-Doorgapersad, 2022a). As a Category A municipality, it is tasked with providing community services to the residents of Ekurhuleni and nearby areas. Renowned as the home of the Aerotropolis, it serves as a focal point for

manufacturing and industrial advancement in South Africa (Mahlaule & Maasdorp, 2022).

The integration of ICT in governance is pivotal for enhancing the exchange of information and knowledge among government, citizens, and businesses (Ncamphalala & Vyas-Doorgapersad, 2022). As part of the CoE Growth and Development Strategy 2025, emphasis is placed on establishing an ICT infrastructure and advocating for broadband provision in key high-tech hubs such as the OR Tambo International Airport area. Collaboration with neighboring cities like Tshwane and Johannesburg is envisioned to promote the concept of a smart province, attracting ICT investment and development to the region. South African municipalities are embracing ICT initiatives to streamline service delivery, necessitating the introduction of e-government services. With adequate resources and training, municipalities aspire to elevate their status as smart cities (Ncamphalala & Vyas-Doorgapersad, 2022b)

## 2.7 Implementation strategy

A strategic plan serves as a communication tool outlining an organization's goals and the necessary actions to achieve them. In public organizations, strategic planning facilitates timely decision-making, rational management of limited resources, improved service delivery, and enhanced customer satisfaction (Dlamini, 2019). Enterprises must go through two preceding processes while implementing digital transformation.

The first step in the Digitisation process is to convert all paper or analogue data within an enterprise into digital format. The second process is digitalisation, that is, to upgrade the digitalisation level of enterprises by fusing information technology with digital technology, then improve the operating performance of organisations, and heighten customer experience (Salazar-Arrieta et al., 2023). Despite the progress that has been made in digital strategy formulation, some obstacles remain: these include, for the most part, the reason for the new strategy for the development of digitalisation by 2025.

Key challenges in digital transformation include the absence of an integrated vision and regulatory limitations hindering effective implementation and widespread use of digital platforms (NechbAa, 2022). Digitalisation is a strategic imperative, yet many organizations and governments face significant hurdles in crafting their digital

strategies due to the lack of suitable approaches and methods for strategy development (Lipsmeier et al., 2020). Senyo et al., (2021) propose the following digital strategy for a successful implementation of a digital transformation process.

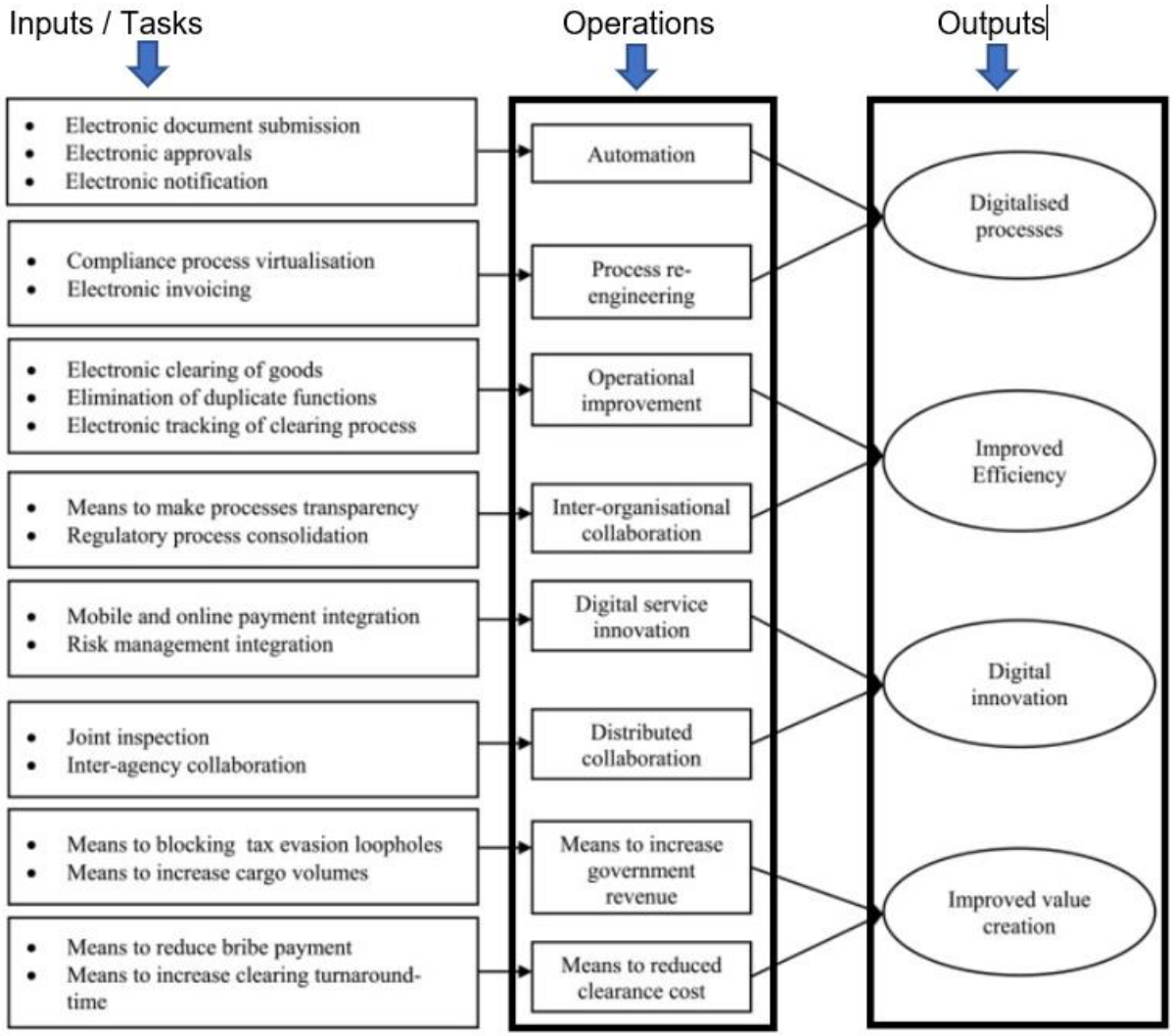



Figure 2.5 Digital strategy delivery: sourced from (Senyo et al., 2021)

## 2.8 Theoretical Framework

Grant and Osanloo (2014) describe the theoretical framework as the foundational blueprint for a dissertation inquiry. They emphasize its crucial role in guiding and supporting the study, providing structure for philosophical, epistemological, methodological, and analytical approaches throughout the dissertation process. Essentially, the theoretical framework acts as a roadmap for the entire research endeavour, shaping its conceptual underpinnings and guiding its execution.

Theoretical frameworks provide a structure for explaining and interpreting a studied phenomenon, whereas conceptual frameworks elucidate the underlying assumptions about the phenomenon being studied (Nwaiwu, 2018). Grant and Osanloo (2014) also emphasize that the theoretical framework is typically drawn from existing theories in the literature that have been previously tested and validated. These theories are considered generally acceptable within scholarly literature, providing a solid foundation for the research inquiry. By building upon established theories, researchers can leverage existing knowledge and insights to inform their own study, ensuring credibility and relevance within the academic community.

Identifying a theoretical framework begins with reflecting on the phenomenon under study and the associated assumptions. These assumptions pertain to how the phenomenon is expected to be impacted, influenced, changed, or represented. Ultimately, it is the researcher's assumptions about the phenomenon that align with a specific theoretical framework (Luft et al., 2022).

Various theories have been employed to explain digital transformation and technology adoption at both individual and organizational levels. At the individual level, widely used theories include Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), Theory of Reasoned Action (TRA), and Unified Theory of Acceptance and Use of Technology (UTAUT). Conversely, at the organizational level, two prominent theories stand out: Roger's Diffusion of Innovation (DOI) theory and the Technology-Organization-Environment (TOE) framework. These theories, either independently or in combination with others, are utilized to elucidate the adoption and utilization of technologies within organizations (Liu, 2019a).

Several theories were considered before selecting the TOE and DOI combination. Most of the theories mentioned above did not adequately address the environmental aspect necessary to understand the organization. We ultimately choose the TOE and DOI combination because they encompass all the factors relevant to a public sector context.

The following section of the study delves into two prominent theories utilized for the research: the Diffusion of Innovation theory (DOI) and the Technology, Organization, and Environment theory (TOE). These theories are adapted to provide a framework for understanding and analysing the adoption and implementation of technology within

the context of the study. DOI focuses on the process by which innovations are adopted and spread within a social system, while TOE examines the interplay between technological factors, organizational characteristics, and environmental influences in shaping technology adoption and utilization within organizations. By integrating these theories into the research framework, the study aims to gain comprehensive insights into the dynamics of technology adoption and usage.

### 2.8.1 Diffusion of innovation (DOI) theory

Everett Rogers, a sociology professor, introduced the Diffusion of Innovation theory in 1962, synthesizing over 508 diffusion studies to develop theories regarding the adoption of innovation by individuals and organizations. According to Rogers (1995), diffusion entails the communication of an innovation through specific channels over time among members of a social system. An innovation, according to Liu (2019a), innovation involves fresh concepts, methods, or items regarded as original by individuals or other entities adopting them.

The DOI theory posits that a firm's adoption and utilization of innovations are influenced by both innovation characteristics and organizational characteristics, as highlighted by Ilin et al. (2017). Lippert and Govindarajule (2006) critique the Diffusion of Innovation (DOI) theory, noting its failure to account for environmental factors in the business context, such as competitive dynamics. These environmental factors can serve as either barriers or motivations influencing technology acceptance and adoption within organizations. By overlooking these external influences, the DOI theory may offer an incomplete understanding of the complexities surrounding technology adoption processes (Ilin et al., 2017; Luft et al., 2022). The initial quadrant focuses on the leader's disposition towards change, while the second quadrant delves into internal aspects of organizational structure. Within this domain, centralization denotes the degree to which power and control are centralized among a select group of individuals (Oliveira & Fraga Martins, 2011). The elements influencing organizational structure begin with centralization, which examines the extent to which power and control within a system are centralized among a select few individuals. Complexity refers to the level of knowledge and expertise possessed by members of the organization, while formalization pertains to the emphasis placed by the organization on adhering to rules and procedures.

Interconnectedness measures the degree to which units within a social system are connected through interpersonal networks. Conversely, organizational slack refers to the number of uncommitted resources available to the organization, and size denotes the number of employees within the organization (Oliveira & Fraga Martins, 2011).

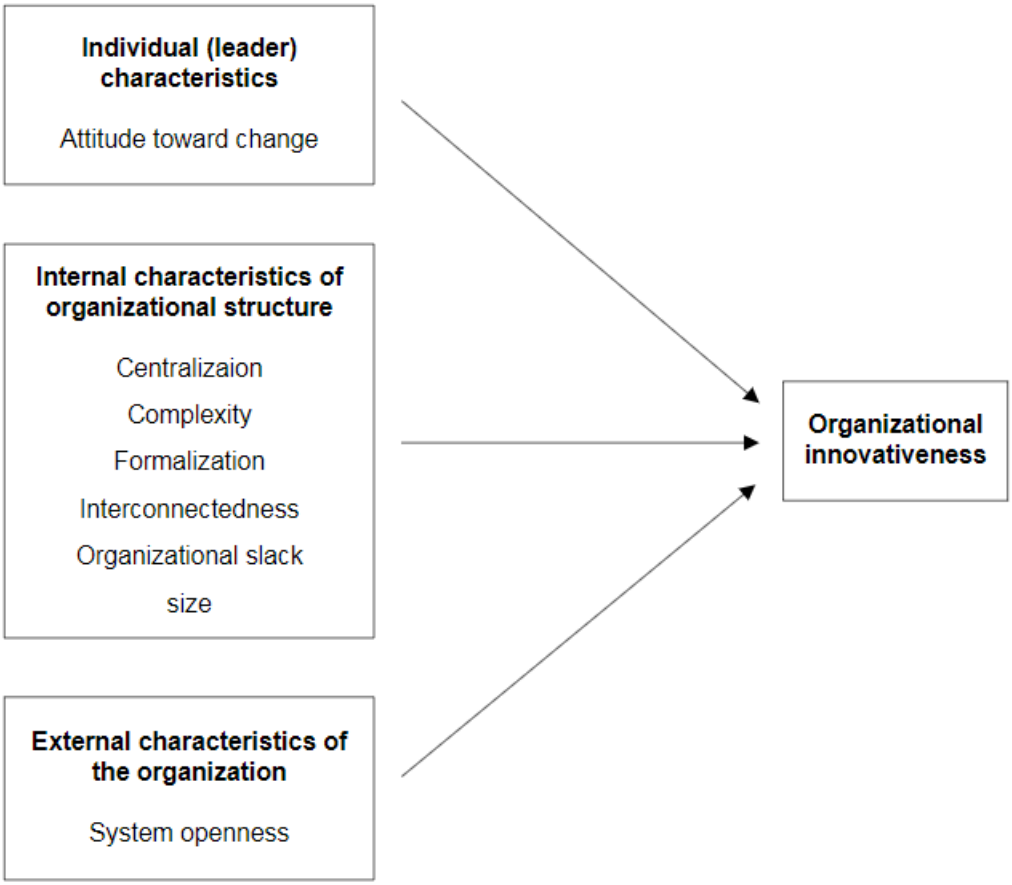



Figure 2.6. DOI Theory. Source: (Oliveira & Fraga Martins, 2011)

### 2.8.2 Technology, Organisation, and Environment (TOE) Theory

The Technology-Organization-Environment (TOE) framework, introduced by Tornatzky and Fleischer (1990), is a widely used model for studying the adoption of new technologies within organizations. This framework categorizes the factors influencing technology adoption into three main groups: technology, organization, and environment, as outlined by Liu (2019). Derived directly from the concept of Diffusion of Innovation (DOI), the TOE framework provides a

structured approach for understanding and analysing the complex dynamics surrounding technology adoption processes. This framework identifies three aspects that may influence the organisational usage of technological innovation: (1) the technological context describes the existing technologies that are in use and the relevant technical skills that are available in an organisation; (2) the organisational context refers to the internal measures of an organisation such as its size; and (3) the environmental context is the external arena in which a company conducts its business – its industry, competitors and trading partners (Ilin et al., 2017).

Technological competence and the quality of information technology (IT) infrastructure within an organization significantly impact management's decisions regarding the implementation of digital technologies. A robust IT infrastructure, along with effective team-sharing tools, facilitates rapid connectivity, typically in a top-down approach. Utilizing high-quality digitalisation and communication technology enhances both internal and external connections, as highlighted by Ng et al. (2022). Additionally, Oliveira & Fraga Martins (2011) emphasize that the technological context encompasses both internal and external technologies relevant to the firm.

According to Oliveira and Fraga Martins (2011), the organizational context pertains to descriptive aspects of the organization, including its scope, size, and managerial structure, this view is further stated by Ilin et al., (2017) when they opine that organisational context refers to the internal measures of an organisation such as its size, communication processes and the actual structure of the organisation.

The interactions between various external environments and organizations are driving the emergence of new models for regulating work, as discussed by Ng et al. (2022). Moreover, effective implementation of digitalisation relies on government support. According to Oliveira and Fraga Martins (2011), the environmental context encompasses the business arena, including the industry landscape, competitors, and interactions with governmental entities.

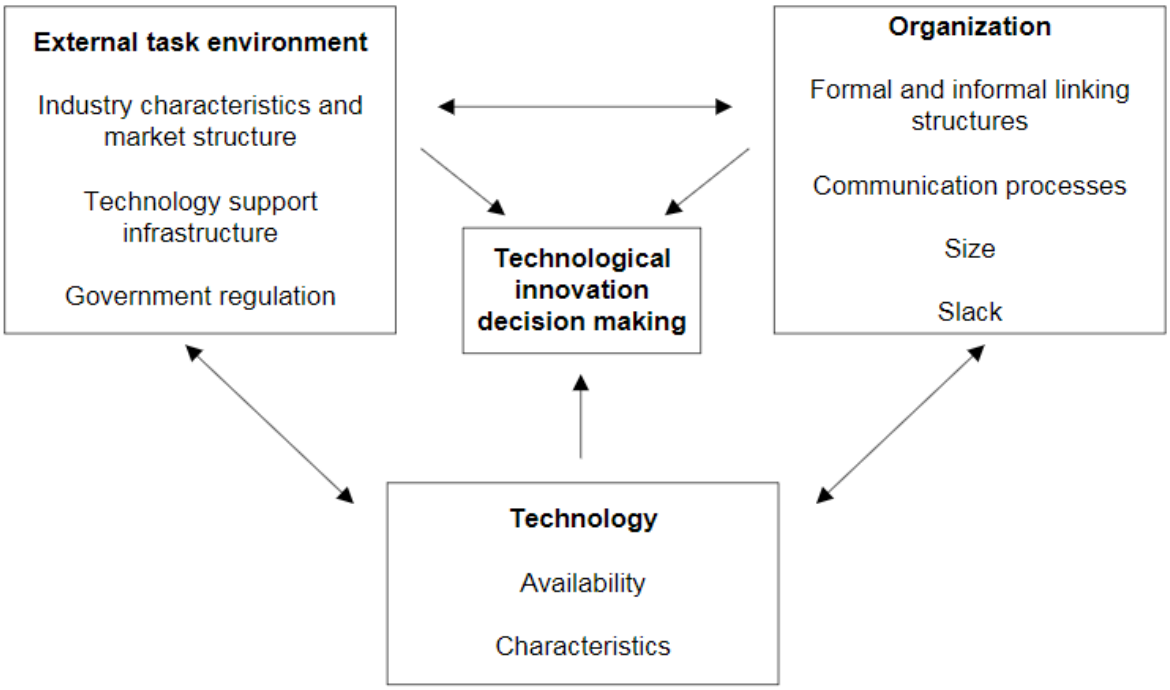



Figure 2.7. TOE Theory: source (Oliveira & Fraga Martins, 2011)

### 2.8.3 Integrating DOI and TOE

The TOE framework shares several similarities with the DOI theory, particularly concerning innovation characteristics and technological context, as well as organizational characteristics and organizational context. However, there are notable differences between the two theories (Ilin et al., 2017). Therefore, combining Roger's DOI theory with the TOE framework could offer a valuable model for elucidating an organization's adoption of initiatives overall (Liu, 2019). Figure 2.6 below shows the integration of the DOI theory and the TOE theory.

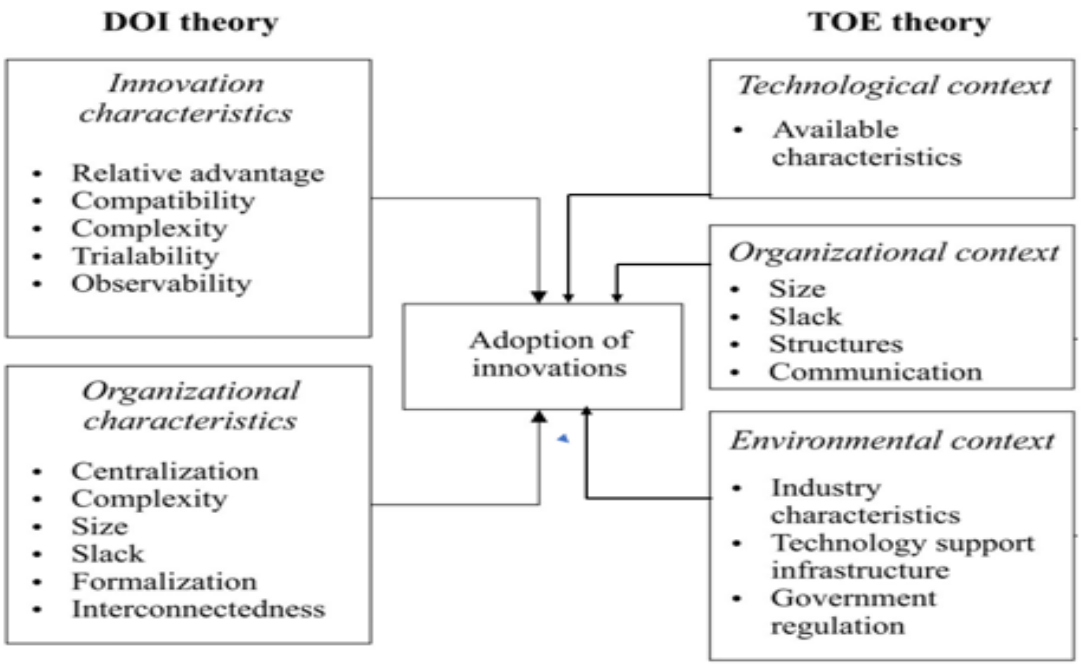



Figure 2.8. DOI and TOE Framework. Source :(Ilin et al., 2017)

### 2.8.4 Key Lessons from the Literature

A proposition is a declarative statement about a concept. A proposition is essentially a description of a notion that requires the same caution and precision as scientific inquiry. Identification of a proposition necessitates a thorough analysis of the literature (Avan & White, 2001).

As noted in the literature review, there are advantages to adopting digitalisation. However, there is a low rate of acceptance among South African municipalities. When comparing Ekurhuleni to other cities, we discovered that it lags behind in cities like Cape Town and other African cities like Kigali in Rwanda. There are still numerous infrastructure and skills concerns impeding the implementation of digitalisation. This study, which is qualitative in nature, did not seek to test hypotheses and causal relationships. The study sought to understand the complexities related to how digitalisation may support public service delivery in local government organisations such as the City of Ekurhuleni. The study's objectives together with the literature review and theoretical foundation informed the derived propositions and this research endeavour. Based on this, it was anticipated that effective digitalisation in the City of Ekurhuleni may result in various benefits for the organisation and service delivery. However, as per the lessons from the lessons from the literature the successful

implementation of digitalisation projects can face various challenges related to internal organisational constraints and characteristics, innovation characteristics, external factors in the wider business and social environment as well as challenges linked to technological factors. As such there are various critical success factors that government organisations should prioritise and focus on related to efficient technology, building key organisational characteristics, navigating influences from the external environment along with enhancing innovation characteristics for an efficacious digitalisation process that supports service delivery.

## 2.9 Chapter Summary

In this Chapter, we provided a review of the literature review to the study. We looked at the benefits of digitalisation and we also examined the challenges that affect the implementation of digitalisation in other cities. The adoption of digitalisation by other cities and comparing rates of adoption in different cities globally. An analysis of Critical success factors for digitalisation and how the cities can use strategy to implement digitalisation to improve service delivery was also offered in the chapter. Lastly the chapter highlighted the theoretical underpinning of the study through a review of the DOI and TOE frameworks.

# CHAPTER 3: RESEARCH METHODOLOGY

*This chapter covers various topics, including the research design, philosophy, and approach. It also explores and emphasizes the methods of data collection, sampling techniques, and data analysis. Lastly, ethical considerations during the data collection and analysis processes are discussed in this chapter.*

## 3.1 Introduction

Creswell (2014) argues that the methodology is a plan, process, structure, and procedure that should be followed in research to address the research question effectively. Alharahsheh and Pius (2020) allude that methodology in research refers to the overarching research strategy that outlines how a research project will be conducted. It encompasses various aspects, including the identification of methods to be employed. The methods detailed in the methodology section define how data will be collected or, in some cases, specify the procedures for calculating particular results. This section therefore focuses on the methodology that was utilised in the study.

## 3.2 Research approach

There are three approaches utilised in research which are the qualitative approach, quantitative approach, and mixed methodologies. The study employed the qualitative approach to inquiry. Qualitative research seeks to offer a nuanced understanding of a phenomenon based on the experiences of individuals involved, with a focus on generating specific insights rather than aiming for broad generalizations (Alharahsheh & Pius, 2020).

As noted also by Kumar (2014), the qualitative approach to inquiry focuses on the experiences, values, and norms of participants who are experiencing the phenomenon. The objective of this approach is to capture their experiences with the research problem which gives the research value. As noted by Flick (2016), the qualitative approach in research involves the collection and analysis of non-numerical data. This method prioritizes the exploration of in-depth, contextual information and insights rather than relying on numerical measurements to understand concepts, opinions, and values.

Qualitative research is often described in different terms, such as an approach or set of approaches, a practice, or a paradigm. This flexibility in terminology reflects the diverse nature of qualitative research methodologies and the various perspectives through which it can be conceptualized. Mays (2020) indicates that qualitative research is an interpretative approach to both data collection and analysis. This approach is focused on understanding the meanings individuals attribute to their experiences within the social world and exploring how people construct sense and meaning from their interactions with that world.

This approach is used in this paper because it offers a deep insight into the benefits and limitations of digitalisation and also the perceptions of participants towards a framework that can be enhanced for digitalisation to be effective for efficient service delivery.

### 3.3 Research design

Leedy and Ormrod (2015) are of the view that a research design is a blueprint of the study focusing on the methods of data collection, analysis, and interpretation to be used in the study. According to Yin (2017), a case study research design is an empirical inquiry that investigates the phenomenon in its real-life context, and these are based on the need to capture an in-depth investigation of the issue being studied.

This case study focuses on the City of Ekurhuleni and the researcher has drawn attention to and addressed the research's fundamental problem by conducting interviews with participants from the city's ICT department. A notable characteristic and strength of qualitative research is its suitability for studying individuals in their everyday settings rather than in artificial or experimental environments. This emphasis on real-world contexts allows for a more authentic exploration of people's experiences and behaviours (Mays, 2020).

This is further elucidated by Neuman (2014) who argues that a case study research design is an approach in which there is a need to capture in-depth information about the research problem in real time. The study adopted the case study research design because it ensures that information in its in-depth format is captured by gathering the values, opinions, experiences, and perceptions of the participants in their natural context.

## 3.4 Research paradigm

A research paradigm is defined as "a set of assumptions, concepts, practices, and values" that forms a framework for understanding reality for the group that shares them (Kankam, 2019). Creswell (2017) states that researchers recognize the need to investigate a particular topic based on certain assumptions about what and how they will learn throughout the study. These assumptions are referred to as paradigms. The four most widely utilized paradigms in research are pragmatism, interpretivism, positivism, and post-positivism (Kankam, 2019).

This study will use interpretivism because to achieve the objectives of the study. The interpretive paradigm asserts that there isn't a single, objective social reality independent of the observer; instead, there are multiple socially constructed realities (Sanchez et al., 2023). The interpretivism paradigm was deemed more appropriate for this study because it emphasizes understanding a concept. This research aims to comprehend how the city of Ekurhuleni could benefit from digitalisation. The study seeks to explore all potential advantages of adopting digitalisation in the city. This paradigm is well-suited to meet the objectives of outlining all the benefits of digitalisation, identifying the challenges of implementation, and pinpointing critical success factors within the city.

The table highlights the benefits of using interpretivism and explains why this approach was applied to achieve the study's objectives.

TABLE 3.1 INTERPRETIVISM BENEFITS

| | *Pragmatism* | *Interpretivism* |
|---|---|---|
| *Ontology* | Symbolic realism | Constructivism |
| *Empirical focus* | Actions and changes | Beliefs (socially constructed cognition) |
| *Type of knowledge* | Constructive knowledge | Understanding |
| *Role of knowledge* | Useful for action | Interesting |
| *Type of investigation* | Inquiry | Field study |
| *Data generation* | Data through assessment and intervention | Data through interpretation |
| *Role of researcher* | Engaged in change | Engaged in understanding |

*Source: Go ̈ran Goldkuhl*

## 3.5 Data collection methods

Data collection is primarily a process where information is gathered and recorded from varied sources. An integral part of the process includes conducting research, making

observations and ultimately extracting and analysing meaningful data to make informed and educated choices. This step is crucial in transforming raw data into valuable information that can contribute to the research objectives or questions. Babbie (2010) declares that data can be collected through two types which are primary data collection (interviews, experiments, surveys, and focus group discussions) and secondary means (published text, audio, or video format). The study employed semi-structured interviews as the data collection instrument. Qualitative research encompasses both qualitative methods of data collection and qualitative methods of analysis, involving the gathering of words, visuals, and descriptive forms of data. The analysis is carried out using text-based, interpretative analytical methods (Mays, 2020).

## 3.6 Population and sample

It is difficult to study the entire target population; therefore, researchers resort to studying samples that are representative of the target population (Kumar, 2014). When carefully selected, samples ensure that data collected can be accurate and represent the population, and in the process, address the research problem. The study therefore utilised a non-probability sampling technique which postulates that every unit in the target population does not stand an equal chance of being selected. The rationale of this approach is that it ensures that those selected understand the research problem, in the process, enhancing the quality and rigour of the data collected (Leedy & Ormrod, 2015).

### 3.6.1 Population

Creswell (2014) argues that the target population is a group of individuals that are to be studied with respect to the research problem. In the study, the target population is employees and management at the ICT department of the City of Ekurhuleni.

### 3.6.2 Sample and sampling method

The study used purposive sampling. This is a non-probability sampling technique in which participants selected are expected or required to have an in-depth understanding of the research matter based on their experiences and knowledge of what exactly is being studied (Flick, 2016). The study therefore selected participants from the Information and Communication Technology (ICT) Department as this

department has an in-depth understanding of the digitalisation of government services for service delivery in the City of Ekurhuleni. A sample of 10 participants was selected since Creswell (2014) argues that in qualitative studies, a sample size between 8 and 15 participants enhances the representation of the target population. In the end, the researcher managed to obtain 10 participants for the study.

### 3.7 Procedure for data collection and instrument

Data collection is the process of making sense of data collected. Babbie (2010) is of the view that data can be collected through two types which are primary data collection (interviews, experiments, surveys, and focus group discussions) and secondary means (published text, audio, or video format). The study however utilised semi-structured interviews as a data collection instrument. Flick (2016) argues that semi-structured interviews are a collection of structured and unstructured interviews where the research instrument has a structure of questions about the research question but also allows the researcher to follow up on issues that would have been discussed in the interview process. The rationale of utilising this approach is that it ensures probing where the researcher asks for further information about the research problem. This instrument was used in the study because it allows for in-depth information critical in the development of a framework for the effective digitalisation of government services for service delivery in the City of Ekurhuleni.

### 3.8 Data analysis strategies and interpretation

Creswell (2014) avers that data analysis is the process where information in its large format is grouped, structured, and prioritised to make meaning. It is a process where large forms of data collected are given meaning and, in the process, effectively address the research problem. In qualitative studies, data analysis can be done through thematic, narrative, and discourse analysis. The study however utilised thematic data analysis. According to Fraenkel (2014), thematic analysis is where data is reviewed and analysed in similar trends to core themes and the information critical to addressing the research problem. In this study, data was collected and coded in a way that represents the entire research setting. Questions asked therefore represented the themes that are utilised in addressing the research problem and the theory framework used. The questions list is included Appendix B.

Thematic Analysis is a method for systematically identifying, organizing, and interpreting patterns of meaning (themes) within a dataset. By focusing on meanings across the dataset, this technique allows researchers to understand and interpret shared or collective experiences (Braun & Clarke, n.d.). It is used to analyse qualitative data by identifying and reporting patterns within the dataset, which are then interpreted to uncover their underlying meanings (Naeem et al., 2023).

The table below outlines the six-step approach employed to conduct thematic analysis in this study.

TABLE: 3.2 THEMATIC ANALYSIS PROCESS.

| Phases | Description |
|---|---|
| **Step1**: Transcription, familiarization with data and selection of quotations | This is the first phase of the thematic analysis process. It involves transcribing the data and becoming familiar with it. |
| **Step 2**: Selection of keywords | This phase entails a thorough examination of the data, whether from interviews, focus groups, or visual content. Researchers identify recurring patterns and terms. |
| **Step 3**: Coding | During coding, brief phrases or words, referred to as codes, are assigned to segments of data to capture the core message, significance, or theme of the data. |
| **Step 4**: Theme development | This step involves grouping codes into meaningful categories to identify patterns and relationships, thereby providing insights into the research question. |
| **Step 5**: Conceptualization through interpretation of keywords, codes and themes | Conceptualization involves interpreting and defining the concepts that emerge from the data. |
| **Step 6**: development of conceptual model | The final step in thematic analysis is developing a conceptual model. This process involves creating a unique representation of the data, often guided by existing theories. |

Source: (Naeem et al., 2023)

## 3.9 Possible limitations and challenges of the study

Study limitations refer to the weaknesses present within a research design that have the potential to influence the outcomes and conclusions of the research. Identifying and acknowledging these limitations is essential for maintaining transparency and understanding the scope of the study (Zaidi, 2019). The researcher anticipated some limitations in this study.

Below are some limitations of the study:

Firstly, this study was conducted in only one municipality out of many in South Africa, hence may not be generalisable to other municipalities or other cities in other countries where technology adoption might be different.

Secondly, the research focused specifically on digitalisation implementation and did not look at other aspects of technology trends that are more off-premises like cloud adoption. Caution must be taken not to generalise the findings.

Thirdly, the limitation in the selection of participants only in the ICT department representatives may have caused the study to miss other factors and perspectives that could have been mentioned by other employees in other departments of the city.

## 3.10 Quality Assurance

Reliability and validity are foundational aspects of empirical research with roots in early scientific practices. Reliability pertains to the reproducibility of results, measuring the extent to which a study's findings can be consistently replicated. On the other hand, validity addresses the accuracy of a measure, indicating the degree to which it provides the correct or true answer. Both reliability and validity are critical considerations in ensuring the robustness and trustworthiness of research outcomes (McDonald et al., 2019). The researcher used the same set of questions for all the participants to ensure the reliability of the data collected. To safeguard the validity of the research, the researcher only asked questions from management and executives about the city of Ekurhuleni’s digitalisation.

## 3.11 Ethical considerations

The study ensured the following ethical issues:

3.11.1 Ensured that participants gave their informed consent:

The researcher sent a consent letter to participants asking them for their informed consent to be part of the study. The consent form detailed their roles in the study and explained the importance of the study. Permission to conduct interviews therefore was granted.

3.11.2 Ensured that anonymity and confidentiality were promoted:

The researcher ensured that participants were protected and that their anonymity and confidentiality were maintained. This was done by making sure that the researcher and the supervisor/s had access to original transcripts. These transcripts are kept under lock and key. The researcher also ensured confidentiality through the use of participant code names.

3.11.3 Ensured that permission was obtained:

The researcher made sure that permission to conduct the study was obtained from the City of Ekurhuleni. The study was also submitted to the WBS ethics committee for approval.

## 3.12 Summary of Research Methodology

The table below lists the methodology used in the chapter. The study is interpretive, and it follows the approach of qualitative research study.

TABLE 3.2 SUMMARY OF RESEARCH

| | Description |
|---|---|
| Philosophy | Interpretive, interpretivism |
| Approach | Qualitative, inductive |
| Strategy/design | Single case study |
| Population/sampling | City of Ekurhuleni ICT staff, managers/ non-probability |
| Data collection | Semi-structured- interaction and documents |
| Data analysis | Thematic analysis |

## 3.13 Chapter Summary

This chapter outlines the research methodology employed in the study, focusing on the qualitative approach used to investigate digitalisation in the city of Ekurhuleni. Data collection methods included Microsoft Teams meetings, sit-in interviews, and written responses to ensure the reliability and validity of findings. The chapter also covers sampling techniques, participants, and data analysis. For a comprehensive understanding of the research findings and discussions, the next chapter delves into detailed insights.

# CHAPTER 4: FINDINGS AND DISCUSSIONS

## 4.1 Introduction

The chapter's objective is to interpret, analyse, discuss, and identify the research findings. Data from the city's Information and Communication Technology (ICT) department members and managers across various levels was collected via interviews and utilized for interpretation. The research was supported by the Technology-Organisation-Environment (TOE) framework along with the Diffusion of Innovation (DOI) theories as a roadmap. The findings are substantiated by analysed data obtained through the interviews and literature review. The primary goal was to address the research questions outlined below.

The primary research question is as follows:

- ✓ How can digitalisation improve service delivery in the City of Ekurhuleni?

The secondary research questions are:

- ✓ What are the perceived benefits of digitalisation?
- ✓ What are the challenges of digitalisation in the City of Ekurhuleni?
- ✓ What are the critical success factors for digitalisation in the City of Ekurhuleni?

The study utilized a qualitative approach to investigate the factors influencing the adoption of digitalisation in the city of Ekurhuleni. Data was collected through interviews and a qualitative survey with ICT members and managers across different divisions. The data was analysed and categorized based on the adopted frameworks for the research. The focus was on identifying key factors and understanding their impact on the adoption of digitalisation in the specified context.

The data collected for the study on factors influencing digitalisation adoption in the city of Ekurhuleni was processed using Atlas. ti, a qualitative analysis tool. This software facilitated coding, identifying relationships, and revealing themes related to digitalisation adoption factors. It helped uncover hidden patterns systematically, aligning with the Technology-Organisation-Environment (TOE) and Diffusion of Innovation (DOI) theoretical frameworks applied in the research. The analysis

categorized themes and sub-themes into technological, organisational, and environmental factors which are themes from the TOE framework. The researcher also integrated the DOI framework to capture the innovation characteristics theme and discusses the sub-factors which are pertinent for the adoption of digitalisation in the city of Ekurhuleni which are compatibility, trialability, and relative advantage of being innovative. Participant codes were used as references to detail responses from interview answers.

## 4.2 DEMOGRAPHICS OF PARTICIPANTS

A total of 10 interviews were completed with diverse ICT department members, managers, and executives using Microsoft Teams and in-person interviews. Each interview lasted approximately 30 minutes. Participants received consent forms along with the interview questions. Demographic information, categorized into interviews, and overall participant characteristics, was collected. The research aimed to capture a comprehensive overview of the participant demographics to contribute to the depth and breadth of the study's findings.

The pie chart in Figure 4.1 illustrates the distribution of participants in the research interviews based on one-on-one sit-in interviews, email responses, and virtual meetings through Microsoft Teams. Figure 4.2 highlights the gender of the participants. This visual representation provides an overview of the varied participation methods employed in the study.

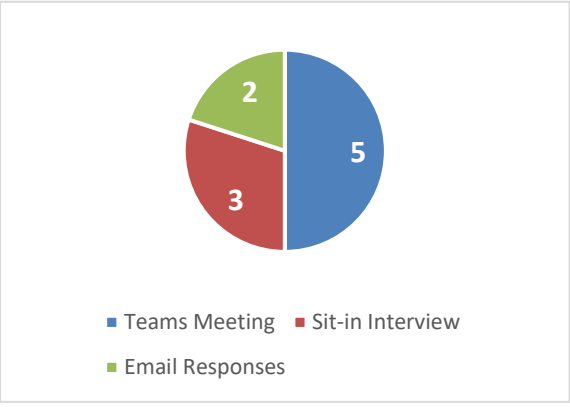



Figure 4.1: Methods of data collection

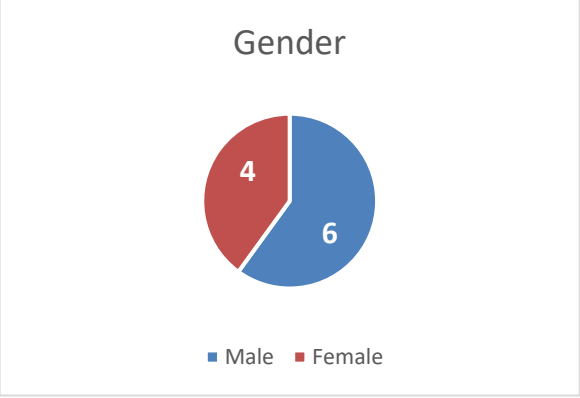



Figure 4.2: Gender of interviewee

The graph below shows the number of uninterrupted years of service each participant has worked for the city of Ekurhuleni. It indicates that the majority of the participants have extensive experience in the city spanning over 20 years.

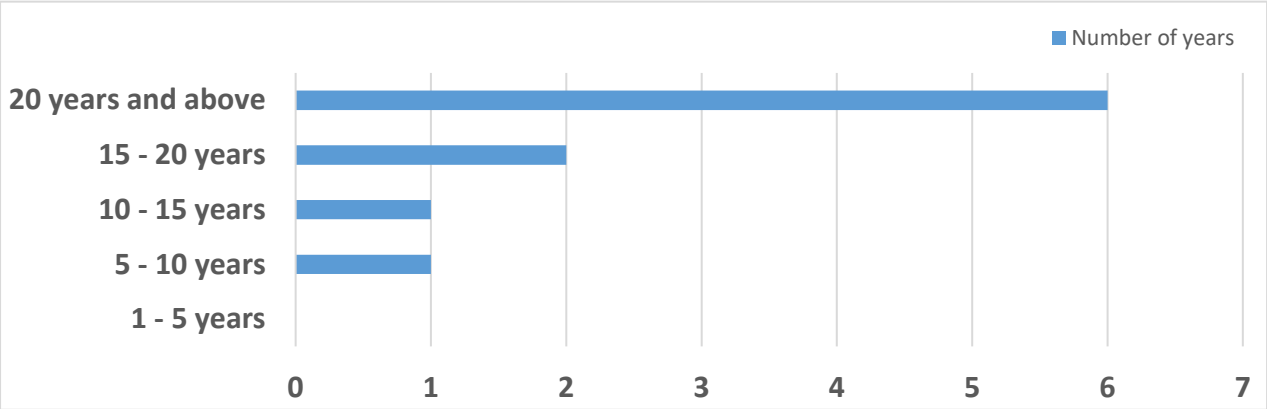



Figure 4.3: work experience of participants

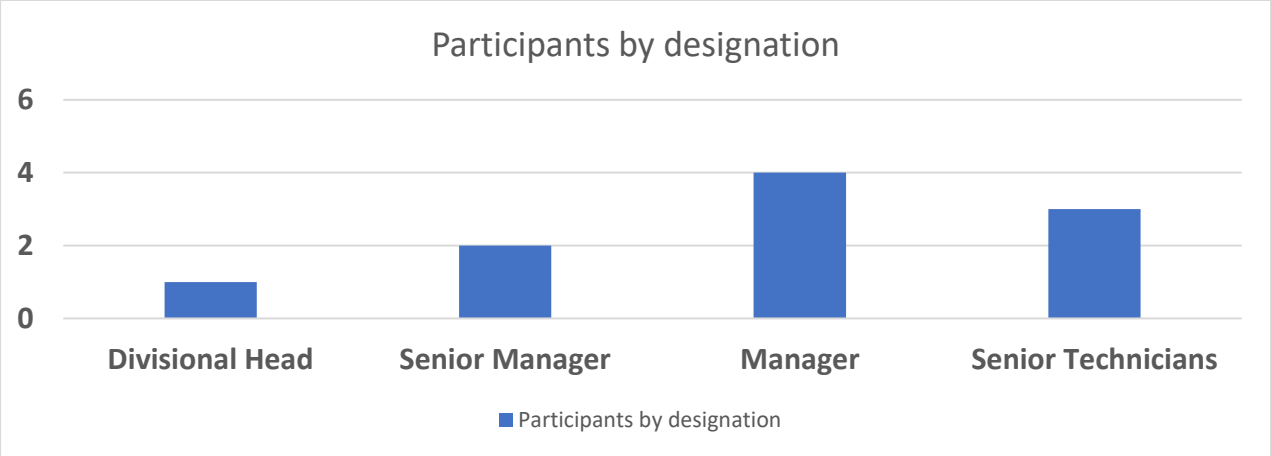



Figure 4.4 Participants by Designation

## 4.3 Analysis and interpretation of factors.

The following section offer insight into the perceived Benefits, challenges influencing digitalisation in the city of Ekurhuleni and the Critical Success Factors.

### 4.3.1 Perceived benefits of digitalisation

This section discusses the benefits of digitalisation, Undoubtedly, digitalisation plays a crucial role in permeating every aspect of government and organisational functions. Its pervasive presence is evident in its ability to provide solutions to challenges within e-government services, emphasising its paramount importance (Maremi et al., 2022). Figure 4.5 below highlights the perceived benefits of digitalisation as extracted from the data.

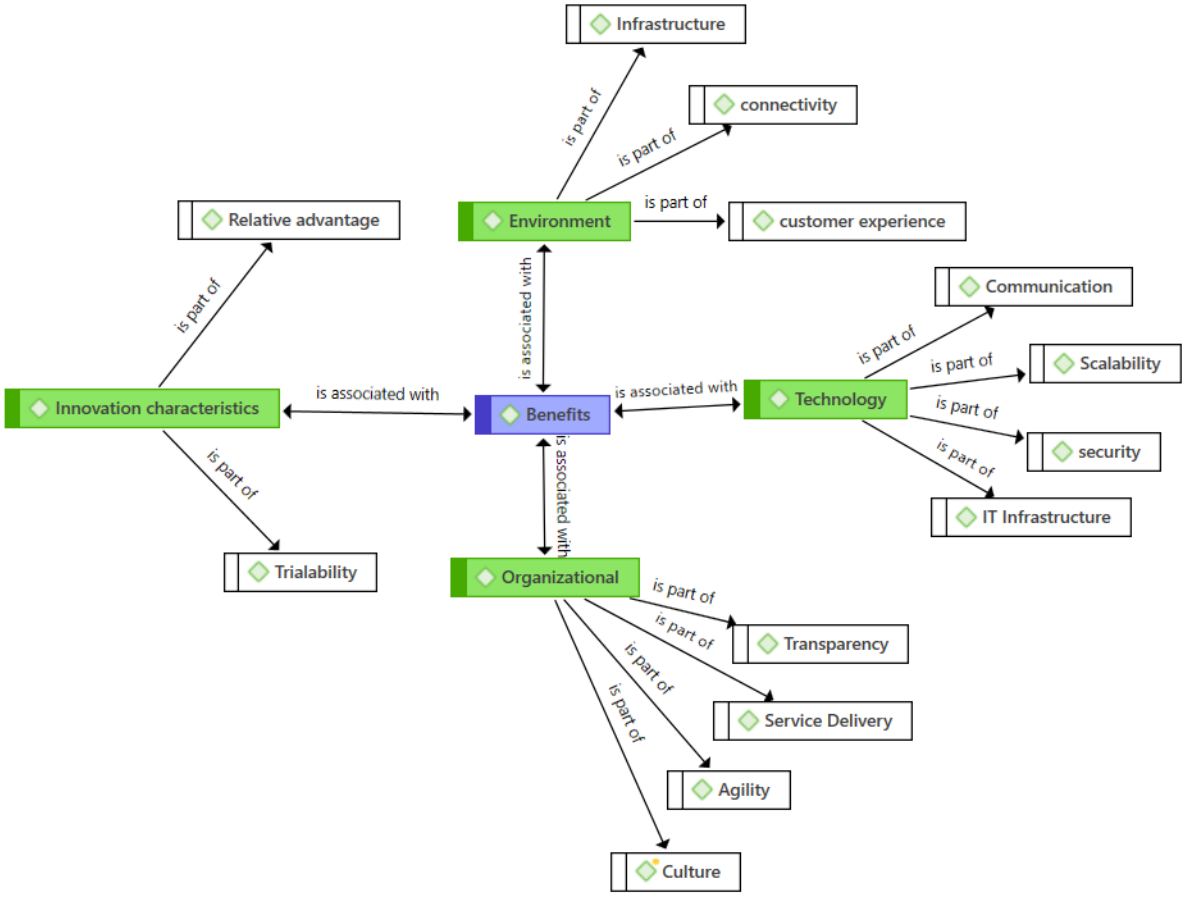



Figure 4.5 TOE and DOI, Perceived benefits of digitalisation

#### 4.3.1.1 Benefits related to Technological Factor

##### 4.3.1.1.1 Communication

Communication serves as a fundamental social element facilitating interaction between governments and citizens or residents. It enables the dissemination of

information on government issues, initiatives, achievements, and plans, fostering relationships and building connections with the community (Albuainain, 2022). More than half of the participants shared the same view that digitalisation enables communication which is a benefit for the city. They mentioned the improved ease of communication as the most important factor. Both Participant No.1 and Participant No.3 mentioned that "*these digital technologies are helping us in communicating with our colleagues in different service delivery centres, we no longer have to drive kilometres to sit in a meeting. We now use MS Teams which* saves us time." This factor was also supported by Participant No.5 when mentioning video conferencing "The *VC is the best tool that enables us to attend meetings virtually but seems like physical".* Participant No.9 elaborated by saying, "*There is a general ease of access to other team members making working on critical digitalisation projects easy".*

The views of the importance of communication were also highlighted by Participant No.3, *"Access to service providers and suppliers locally and internationally has been made easy, making the ordering of latest technologies efficient and minimizing delays of equipment delivery".* The views of the participants are substantiated by literature. Albuainain (2022) noted that efficient communication is crucial in addressing the ongoing challenge of delivering more public services with limited public spending. This is vital for enhancing people's welfare by expanding and improving government services. Effective communication plays a key role in finding solutions to optimize resource utilization and meet the increasing demands for public services.

#### 4.3.1.1.2 Scalability

Scaling is a strategic process focused on recognizing and capitalizing on economies of scale within an organisation. The goal is to enable the organisation to increase its revenue at a faster rate than its costs, resulting in sustainable growth. This perspective suggests that the definition of scaling should be distinct from mere growth, emphasising the strategic identification and utilization of economies of scale to achieve efficient and effective organisational development (Palmié et al., 2023). Participant No.4 stated the benefits of scaling through the use of cloud computing for storage and security. "*Moving to the cloud platform has enabled the city to have secure and reliable access to our data at any time and data storage can be increased without using Capital expenditure".* This view was also supported by Participant No.9 when highlighting the

benefits of accessing documents on the cloud during COVID-19 times. *"Technology has assisted the city by enabling us to work from home during the lockdown period".* Scalability also provides more than just scaling but also provides security. This view was affirmed by Participant No.2, *"scaling does not only provide space for growth but also security, enabling the safety and protection of customers' data on the cloud".* This finding was validated by the literature by Dolezsar (2020) who suggested that while having companies with innovative solutions is important, it is not sufficient for impact. The key lies in ensuring that innovations are not just novel one-off solutions but are also scalable, allowing them to be implemented on a larger scale for broader and more lasting effects.

#### 4.3.1.1.3 Security

In the realm of IoT security, two particularly concerning types of attacks are the man-in-the-middle (MITM) attack and the side-channel attack (SCA). These pose significant challenges, especially in applications dealing with highly sensitive data. The MiTM attack raises concerns due to the ease with which an attacker could intercept keys during their exchange between two devices. Digitalisation addresses this vulnerability by eliminating the man-in-the-middle, thereby enhancing security measures (Caraveo-Cacep et al., 2023).

This factor is the main driver for decision-making on the adoption of technology. A guarantee of data protection and availability can drive a positive adoption of technology. This factor was mentioned by almost all the participants. Participant No.4 highlighted the benefits of data security and the convenience of using cloud storage mainly for security, "*Since we adopted cloud computing, we have peace knowing that our data is safe and there is improved business continuity".* Participant No.8 supported the importance of security and stated how the city is benefiting from high levels of security on the cloud platform compared to on-premises, *"before hosting on the cloud platform, we had issues of backup, network failures, storage but now we are comfortable".* Participant No. 1 introduced a different context when discussing the "human-in-the-middle." This perspective suggests a unique viewpoint or interpretation regarding the role or impact of human intervention in the digitalisation process, "*my view is that with complete digitalisation adoption, we will have a more secure environment because most of the attacks come from inside the city. Minimizing the*

*interference from employees and automating more processes will enhance security".* This perspective is further supported by literature, which provides additional insights into the importance of ensuring the integrity of data. The emphasis on data integrity aligns with broader discussions in the field of information security, reinforcing its significance in maintaining the overall security posture. The confidentiality, integrity and availability (CIA) triad has been widely accepted as a model for developing information security policies within a specific security program. This model ensures a focus on maintaining data confidentiality, integrity, and availability. The CIA triad serves as a foundational framework for designing comprehensive and effective information security measures (Caraveo-Cacep et al., 2023)

#### 4.3.1.1.4 IT Infrastructure

There is a huge benefit in rolling out IT infrastructure not only in towns but also in the townships. This view was raised strongly by participant No.8 when mentioning that "*in townships, we have issues of skills or should I say digital divide, the infrastructure is slowly becoming available for the citizens which is a huge benefit for the community".* Participant No.9 also shared the same view about the benefits of available IT infrastructure, "*having available IT infrastructure ensures that all the departments are working, they've got connectivity, they've got network, and all applications are running"*. This observation is also covered by literature as stated by Acharya et al., (2022) when they stated that the implementation of public ICT infrastructure and services is not only a means to enhance government accountability to the public but also a key driver of government effectiveness, acknowledging the value of taxpayer contributions. Participant No.9 also shares the same view about the importance of rolling out IT infrastructure throughout the city, *"Having network connectivity throughout the city will improve the rate of technology adoption by citizens".* The efficient management and maintenance of digital communication infrastructure are emphasised to ensure accessibility, quality, and affordability. Governments are encouraged to create programs utilising digital technology to detect and prevent potential threats and attacks (Maremi et al., 2022).

#### 4.3.1.2 Benefits related to Organisational factors.

##### 4.3.1.2.1 Transparency

Transparency involves making relevant and usable information publicly available. This practice serves to reduce the risk of corruption by enabling scrutiny of public actors and their decisions. Essentially, transparency acts as a safeguard against corruption by promoting openness and accountability in the actions of public entities (Vian, 2020). The city in its efforts to curb corruption has benefitted immensely from being transparent. This view was emphasised by Participant No.10, *"Corrupt activities in the city are being identified due to the transparency of processes because of the digitalisation of some of these processes".* This opinion was upheld by Participant No.1. *"I think only corrupt individuals will have a pushback on technology because with manual operation there are a lot of gaps for unethical behaviour".* Participant No.7 expanded as follows, "*knowing who is doing what helps the department to allocate tasks efficiently to the correct people because everyone knows what is happening in the department and this, in turn, improves service delivery in the city".* Literature also confirms that transparency is deemed essential, though not alone adequate, for ensuring accountability and preventing corruption. While providing visibility into actions and decisions, transparency must be accompanied by additional measures to effectively promote accountability and combat corruption (Vian, 2020)

##### 4.3.1.2.2 Service delivery

The Digitisation of public services goes beyond changing the interaction between service providers and clients; it also involves transforming the nature of work within public administration (Andersson et al., 2022). The majority of participants in the study held a consistent view regarding enhanced service delivery as a significant benefit achievable through digitalisation. The analysis and interpretation of their responses highlighted that most participants identified improved service delivery as a key advantage resulting from the process of digitalisation in the city.

Automation of services in the government space has improved the way services are accessible. These views were highlighted by participant No.8 saying that: "*the implementation of the Siyakhokha system has improved the way we serve our communities, customers do not have to queue in long lines just to get their account*

*statement, but they can do all that online*". Participant No.6 expanded as follows: "*the introduction of automated services especially in the finance department has changed the rendering of basic services and interaction between the front-line agents and the public has improved, all because of the digitalisation of some services in the city".* The viewpoints expressed are substantiated by relevant literature, indicating that existing research aligns with and supports the perspectives shared by the participants. This suggests a scholarly basis for the belief in the benefits of enhanced service delivery through digitalisation.

Andersson et al, (2022) supported this view when stating that, the government, through the proactive use of information communication technology, monitored city dynamics, instigated positive changes, and improved residents' quality of life. *"This technology is making a huge difference*" These were insights shared by Participant No.1 when asked what would happen if the city did not adopt the new technologies.

#### 4.3.1.2.3 Agility

According to Mrugalska and Ahmed, (2021), agility is the capability of an organisation to effectively navigate and manage changes and uncertainties in its environment. It involves the ability to adapt, innovate, and respond quickly to emerging technologies. The concept of agility has come out as an important benefit from the adoption and implementation of digitalisation in the city of Ekurhuleni. When asked about the benefits of digitalisation, Participant No.4 mentioned, "*As a city, we find it easy to adapt to the changes that are at play even though there are still processes that need to be changed for other decisions to be taken promptly"*. The agility nature of the city which was brought about by digitalisation was also alluded to by Participant 9 who said, "*If we don't adapt or adopt these technologies, the city will remain the same*". Participant No.4 also added that the state of the city's rate of technology adoption is due to its agility she mentioned that "*we are agile, you know, because of this new technology adoption, we can implement technologies as soon as they become available. There might be issues with our change control process, but we are looking at it because we must comply with our processes"*. This observation is also confirmed by Participant No.6 when asked what is different about the city's approach to digitalisation adoption when compared with other municipalities or cities. The participant said, *"The city is agile in their decision making and approach to digitisation because the city's vision is*

*to be a smart city"* The views shared by most participants align with the existing literature on the subject.

This convergence between participant perspectives and established literature indicates consistency and agreement regarding agility concepts. Benefits realization is an integral aspect of Agile methodologies, as the delivery of benefits to customers occurs frequently, contributing to higher success rates. The iterative and incremental nature of Agile approaches allows for the continuous realization of value, aligning with the principles of customer-centricity and adaptability inherent in Agile practices (Marnewick & Marnewick, 2022)

#### 4.3.1.2.4 Culture change

Ongoing technological progress and the increasing adoption of digitalisation are fundamentally altering the resources and capabilities of organisations. Studies underscore the importance of establishing and disseminating a digital culture across the entire organisation for successfully navigating the journey of digital transformation (Leal-Rodríguez et al., 2023). Participant No.5 also reinforced this view and expanded as follows: "*Even other departments are training their employees to use these technologies because IT is forcing applications on them".* COVID-19 also fast-tracked this culture of embracing technology.

Participant No.6 buttresses Participant No. 5's observation and goes on to add that *"more and more employees are embracing the availability of network resources to execute their daily task instead of using the old traditional manual operation".* Participant No. 1 provided insights specifically related to the context of service delivery. These insights likely contribute a unique perspective or additional details to the discussion about service delivery in the city, "*Citizens are now getting a quick response on their application done in various departments like building control and town planning, with digitalisation there are fewer incidents of mistakes made by an individual during the processes. Most government offices are always closed due to offline systems or will have long queues, but digitalisation has brought about efficiency and in the process improving the culture of serving".* The literature confirms that a positive organisational culture contributes to fostering good working relationships within the workplace.

This acknowledgement underscores the crucial role that organisational culture plays in shaping the dynamics and interactions among employees, ultimately influencing the overall work environment. Olsen et al., (2023) indicate that robust organisational culture is marked by shared purpose, a trusting environment, active participation, collective responsibility, open information exchange, and strong relationships among employees and leaders. These traits mirror an organisation with high social capital and a robust organisational culture. Social capital, encompassing trust, norms, and networks, plays a pivotal role in fostering collaboration and cooperation within the organisation.

#### 4.3.1.3 Benefits related to environmental factors.

##### 4.3.1.3.1 Network Connectivity

Network availability has been identified as one of the most important factors. There are several benefits to having a stable and always available network. This aspect of network availability was shared by Participant No.9 when she pointed out that "*applications cannot run, or the users cannot use them if they don't have network connectivity problems".* This view was also reinforced by participant No.7 who when asked about involvement in any projects, mentioned the fibre rollout project and said, "*The fibre network is running smoothly so that the phones, computers, everything that's linked with it, work consecutively OK, all public facing applications must always be online".* This point by participant No.7 is supported by literature, Adaramola (2023) stated that in the realm of network communication, a reliable and robust foundation in the form of dependable network architecture is considered crucial. Such a foundation is essential to facilitate efficient data distribution among the numerous connected devices within the network and benefits the city.

##### 4.3.1.3.2 Infrastructure

Environmental considerations are significantly driving the adoption of digitalisation. Several private sector companies, including as Telkom, Vuma tell, DFA, RAIN, and others, are undertaking a significant infrastructure deployment. All these factors contribute to the accessibility of internet connectivity, which facilitates the adoption of digitalisation. The city strategically manages the need for Information and Communication Technology (ICT) infrastructure through economic planning.

However, the significant hindrance to infrastructure development is the financial constraint faced by the city (Acharya et al., 2022b). The issue of infrastructure came out from more than two participants with participant No.5 emphasising that "*the city however with the minimal financial resources has been able to roll out a huge wi-fi project to all libraries across the city and all the city's buildings".* The participant further adds that *"in all libraries in the city we have installed computers and printers that are dedicated to public use"*. This view was also upheld by participant No.1, "*the city has tried, we have now IOT devices in our network like security cameras managed by the command centre in Kempton Park and Bedford view".*

#### 4.3.1.4 DOI Factors on Benefits of Digitalisation

The Diffusion of Innovation (DOI) is primarily reliant on the characteristics of the technology and users' perceptions of the innovation (Amini & Bakri, 2015). The two variables below from the DOI framework were mentioned as benefits of digitalisation.

##### 4.3.1.4.1 Trialability

According to Amini & and Bakri (2015), trialability refers to the extent to which an innovation can be experimented on a limited basis. Participant No.1 elaborated on this matter when stating that, "*the culture of the city is changing towards a learning organisation, when we first implemented the ERP modules no one knew what was happening, but we tried the system with the help of consultants and today we understand it clearly".* The view was also backed by participant No.4 when stating that *"the ability of the city to test new technologies has improved the rate of technology and innovation adoption".* Perceived benefits of digitalisation for a city encompass opportunities to boost improved service delivery and enhance operational quality. The research indicates that the relative advantage, particularly the potential to improve operational efficiency and scalability, plays a crucial role in the city's willingness to adopt digital technologies (Amini & Bakri, 2015).

##### 4.3.1.4.2 Relative advantage

The concept of Relative Advantage" underscores the extent to which an innovation is considered superior to the idea it replaces. It emphasises the importance of subjective advantages, particularly in terms of social indicators such as satisfaction and convenience, when evaluating the success and adoption of an innovation (Dixit et al.,

2023). This view by literature was seconded by participant No. 9, "*I have been to the licensing department in Edenvale, there was a long queue and when I asked around why it is that people travelled from outside the city just to renew their licenses, they stated that Edenvale has the best customer service".* The improved efficiency in managing long queues at the centre is attributed to the digitised booking system and the ease at which the digital queuing system operates. Participant No.1 had a slightly different view about relative advantage saying, "*There is no clear tool to quantify the rate of relative advantage because the city is not in a competitive market where speed, responses, and first to market are considered. Only one element is observed and that is the one of satisfaction and general customer centricity".*

### 4.3.2 Challenges of digitalisation in the city of Ekurhuleni

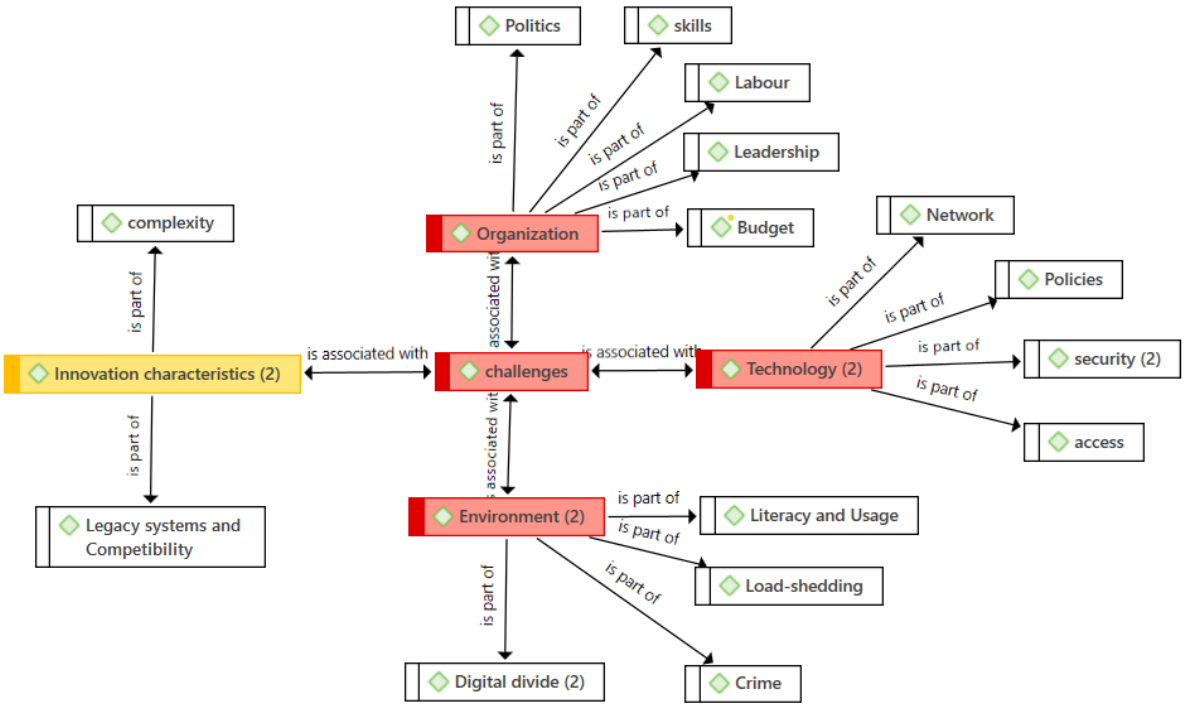



Figure 4.6 DOI and TOE challenges of digitalisation

#### 4.3.2.1 Challenges related to technological factors.

##### 4.3.2.1.1 Network

The unavailability of a consistent network outside of office hours appears to be the most challenging factor for digitalisation. Most participants raised this factor, Participant No.9 indicated that *"most of our technicians cannot receive calls allocated*

*to them when they are not in the office, they are always offline, meaning they have to waste time driving to the office to get their allocation before they can attend to users' complaints".* These views were also seconded by Participant No.5 who recounts that, *"lots of our issues in rolling out technology has to do with the availability of network infrastructure".* Participant No.8 added that, "*the digital divide between urban areas and township still exists, and it is an issue, yes, the city is trying to close the gap but vandalism and crime are reversing all the efforts. Fibre cables are stolen daily and damaged by construction work".*

The network unavailability stems from the unequal development of communication network infrastructure and laws across different regions. Disparities in computer and internet access between urban and non-urban areas contribute to varying connectivity issues. Additionally, the digital divide is exacerbated by factors such as insufficient skills, motivation, and resistance to adopting technology among certain populations (Aditya et al., 2023). This observation by Aditya and colleagues confirms the view of participant No.8 who points out that the "*Digital divide between urban areas and township still exists".*

#### 4.3.2.1.2 Policies

Aziz (2020) suggests that policies related to digitalisation are often unclear, focused heavily on technology, and lack a broad perspective on digital inclusion issues. There is a need for policies to be consistent, relevant to individuals' daily lives, and designed to empower users with the necessary skills for effective participation in the digital realm. This view was elaborated on by Participant No.4, *"policies are a big hindrance to the implementation of digitalisation, MFMA, and PFMA make it difficult for executives to be agile in decision-making that involves finance because of the policies. Procedures to approve any budget needs to be followed".* Participant No.6 seconded this view, *"The change control process is a problem, a committee needs to sit and approve any changes that need to be done on the network infrastructure and this committee only sits once a week".* Participants felt this factor is a major hindrance in the adoption of digitalisation to improve service delivery. Participant No.2 also shared insights on the internet use perspective, *"the policy guiding the use of the internet and the access to the internet is not done properly, some users have their access to*

*internet capped resulting in limited access to the internet and ending up not performing their duties fully".*

#### 4.3.2.1.3 Security

The main worries regarding digitalisation revolve around the security of the physical sites within the city where essential data is stored. There is a particular focus on whether hosting data on platforms such as Cloud storage or On-Premises could potentially lead to serious security vulnerabilities. Additionally, the issue of vendor locking emerged as a notable challenge in the adoption of any technologies hosted in the cloud. These views were listed as concerns by participant No.3, "*I think hosting our data on the cloud is much better than hosting on-premises because one, financial implication of buying expensive servers and you know some of our data centres does not have sufficient security. People just walk in the server room and start working without permission".* Participant No.1 also expanded as follows: "*These multiple contractors without identification cards must not be allowed to enter our environment without being vetted and they must come by appointment".* Mijwil et al (2022) state that there exists a crucial relationship between cybersecurity and the development of smart cities. Establishing smart cities requires creating robust electronic and physical security measures to safeguard against unauthorized access and potential attacks by unknown individuals. This view by Mijwil et al (2022) further emphasises the point raised by Participant No.1, *"We must not allow people we don't know into our data centres".*

#### 4.3.2.1.4 Access

Defining digital inclusion can be challenging due to variations in socio-economic conditions and types of technology, especially when comparing developed and developing countries. Developed nations prioritize high-speed internet access while developing countries primarily seek basic physical access (Aziz, 2020). The literature corresponds with the view of Participant No.8, "*there is a digital divide between the towns and the townships in terms of access to technology, I mean in the location there is no access to the infrastructure and some people do not even have access to physical equipment's like cell phones, laptops to access the internet*". This view was also seconded by participant No.10 who stated that, "*some sites can be down for months, and the executive does not have a sense of urgency if the site affected is in*

*the township, but other sites are given priority because of political affiliation".* There was a general agreement from the participants that some areas have more internet access than others. This view was highlighted by participant No.7, *"in my view, there is still a long way to go until the whole city can be digitalised, there are areas within the city that does not have even LTE network coverage".*

#### 4.3.2.2 Challenges related to organisational factors.

##### 4.3.2.2.1 Skills

The factor of skill was pointed out by almost all the participants. Some scholars have used technological skills interchangeably with other words like digital divide, 21st-century skill, or even digital literacy. According to Aziz (2022), digital exclusion can occur when individuals lack training and hands-on experience with digital technologies. Participant No.10 reveals, *"I don't remember the last time I went for training; my staff also has not been trained. When you ask the executives, they always say there is no budget".* Participant No.7 also supported this view saying, *"Some departments when they have new application rolled out, they organise their training and invite us because the ICT department is supposed to support that application".* Some participants argued that executives are not honest about the issue of training.

Participant further said, "*When we want to go for training, they tell us there is no money, but they will take their friends for training. They will also hire professional services to do our job, but they are also not competent, again we have come in and help them".* Participant No.3 affirmed this view, "*the leadership of the department is not serious about skills transfer, we ask ourselves how professional services can come into the environment and leave without training and transferring the skills to the staff?".* There was only one view from Participant No.4 which suggest that they do have programmes to train employees, "*I make sure that I set aside enough budget to send my staff to acquire the most needed skills to run the division".*

##### 4.3.2.2.2 Leadership

Van Wart et al. (2017) suggest that leaders should embrace ICTs not only to demonstrate proficiency in e-leadership but also to actively endorse, recommend, and facilitate the implementation of ICTs for organizational/unit use. Additionally, leaders are expected to adeptly navigate the challenges inherent in leading within the digital

realm. The aspect of leadership was raised by most of the participants. Participant No.5 acknowledged that leadership might not be technically knowledgeable as he asserts that, "*Executives are academics, but they do not have the technical knowledge of implementing technologies, theirs is to take decisions, support the projects, and provide leadership".* Participant No.10 however had a different view of leadership, he expanded as follows: "*These people do not know what they are doing. Under this leadership the department is on autopilot".* Participant No.3 also upheld the view that leadership was not doing a good job, *"Leadership is trying too hard to please politicians and, in the process, they mess up projects that might have produced value for the city".*

#### 4.3.2.2.3 Politics

Politics serve as a mechanism for determining the distribution of resources, specifying who receives what, when, and in what manner (Robert Garner, 2020). Under the limitations of this study, I have highlighted politics as one factor that will not be covered by this report. However, during the interviews, this subject came out very strongly with almost all the participants mentioning it as a challenge for digitalisation. Participant No.3 highlighted that "*politics are a major problem because of this coalition arrangement, there are executives that are politically affiliated to a certain party refusing to adopt innovation or technology sighting that, they do not want to create a good legacy for the current administration because they are not affiliated to it".*

These views were also reiterated by Participant No.9*, "I think all executives are appointed politically, there are some executives that do not want to approve budgets for critical digital transformation projects because the projects were suggested by a different political party.* Participant No.8 expanded as follows: "*These politicians lack political leadership because they only want to service their township first and move to other towns later, but their time is limited to five years in office hence they never seem to get anything done".* The time factor aspect is also confirmed by Mawela et al (2017) when mentioning that political and executive management often adopt a short-term perspective, given the uncertainty of remaining in their positions beyond five years.

#### 4.3.2.2.4 Labour

The COVID-19 crisis has expedited an existing trend of substantial digitalisation in economic production and services. Historically, labour unions have been the primary advocates for employees. However, the increasing likelihood of human replacement by intelligent machines raises doubts about the effectiveness of labour unions' policies in the face of technological advancements. Their opposition to the adoption of digital technology stems from the belief that it will lead to job losses among employees (Nissim & Simon, 2021).

The factor of organised labour for the city is a huge challenge, this factor was also mentioned by all participants. Participant No.2 indicated that "*the environment is so political, all employees belong to unions (IMATU, SAMWU) which are also affiliates of political parties. They think digitalisation might take their jobs".* Participant No.10 mentioned the aspect of skilled labour and training, "*the city struggles to implement most of the digitalisation initiatives because of the lack of competent employees. Digitalisation projects are outsourced to professional services contractors which again causes problems with labour because they are against any form of outsourcing".*

Participant No.1 also commented on issues of affiliations saying, *"Some employees do not even come to work, I know people that never came to work since COVID-19 because they are friends with executives. This attitude makes deployment of any technology difficult because the department only involves people with less knowledge on critical projects".* Participant No.6 expanded as follows: "*Skilled labour in the city is leaving for greener pastures leaving the city with employees that are of less experience and knowledge about digital transformation, I can mention 4 colleagues that resigned in the past two years for better jobs in the banking sector*".

#### 4.3.2.2.3 Budget

The aspect of insufficient financial resources emerged as one of the most challenging factors in the city. Most participants mentioned this factor especially participants that are involved in project management. Participant No.8 indicated that "*the city always fails to maintain its budget availability towards financial year-end. The budget always gets depleted before the year's end and that caused a lot of project failure. Projects are not completed on time, within the allocated budget and they fail to deliver the expected results".* Participants when asked about their main concerns about

implementing projects, Participant No.3 mentioned that *"the level of service delivery is linked to the availability of finance to fix and repair fibre links and radio links, both these infrastructures are a core factor if any department wants to digitize".*

Participant No.10 restated this view by adding an element of corruption, "*I do not think the city has an insufficient budget, just at the beginning of the financial year we had over a billion-rand budget for multiple projects, fast forward 5 months down the line the department does not have money. I mean it can only be corruption. Not even one project that you point out and say yes this is where the money went to".* There is also a view submitted by participant No.7 which spoke to a private partnership*, "the city will never achieve full digitalisation working in isolation, they will need to invite investors to roll out these technologies because they can be very costly".* The view by participant No.7 is also seconded by Acharya et al (2022b) when suggesting that employing the Public-Private Partnership (PPP) mechanism involves leveraging private sector resources, including finance and managerial and technical capabilities, to improve public infrastructure. The objective is to alleviate government budgetary pressures associated with infrastructure development. Haug et al. (2023) emphasized this point noting that, the process of implementing digital change necessitates collaboration among agencies as well as with external stakeholders.

#### 4.3.2.3 Challenges related to environmental factors.

##### 4.3.2.3.1 Literacy and Usage

The issue of technology adoption and usage remains a huge challenge in the communities. Data indicates that public agencies recognize the low levels of digital literacy and market readiness for the introduction of new IT services (Acharya et al., 2022b). Participants acknowledge this factor with Participant No. 8 strongly suggesting that *"people in the township still lack the ability to utilize technology, they always prefer the old traditional way of doing things like querying statements and paying for their services. They will prefer taking a taxi to a municipal building just to get a statement and paying for their services instead of doing all that online because the online platform is available for everyone".*

Participant No.5 sustains the assertion and adds that "*We have rolled out Wi-Fi in most of the city's buildings, libraries, civic centres, and clinics but only the millennials can utilize technology. There is a general fear that when they use this technology their identity would be stolen by the younger generation is comfortable with technology as they engage more on social media platforms".* Participant No.6 further added that, "*literacy also affects the use of technology especially for generation Z, the generation that was born before technology".* As informatics and technology rapidly advance, the expectations placed on individuals have also evolved. Today, it's not just a privilege but a necessity to utilize available technologies for accessing and adapting to constantly changing and expanding information (Topaloglu & Tekkanat, 2015).

#### 4.3.2.3.2 Load-shedding

While load-shedding and power outages may not have been extensively studied by researchers, they emerged as significant concerns among participants, garnering considerable attention and emphasis in their perspectives. This suggests that the impact of these issues is noteworthy, even if it hasn't been thoroughly explored in academic research. Electricity is a fundamental aspect of modern life, serving as a key input for both production processes and overall quality of life. However, electricity outages have become a common occurrence in many African countries, posing challenges to economic activities and daily living (Mensah, 2024)

Electricity plays a critical role in both private and public sectors, serving as a fundamental resource for manufacturing and service delivery. Its importance is evident in powering various industries and essential services, highlighting its indispensable role in sustaining public functions. Load-shedding in South Africa can be either planned or unplanned. Planned load-shedding is scheduled in advance. This approach enables the cities to plan for alternative power sources, ensuring continuity of operational activities during the scheduled load-shedding periods. Unplanned load-shedding occurs at an unpredictable and undefined time (Mago & F Olajuyin, 2022).

This view was also confirmed by Participant No.10, *"there is planned load-shedding and there is sporadic power loss almost every day, one can plan for the scheduled load-shedding and then you are told power won't be restored because a cable has been stolen. It's just a never-ending story".* Participant No.3 also expanded as follows: "*Lots of our equipment have been stolen because of load-shedding, criminals rush to*

*our towers to steal the backup batteries and routing equipment during load-shedding. Moving the equipment to the customer care centres also does not help since backup generators are not serviced or there is no diesel to power them, it's tough".*

Participant No.1 also added that "*the city will have to invest in solar energy to keep all the ICT equipment powered at all times. The application team is more affected by this load-shedding because sometimes power just goes off whilst you are in the middle of an important installation then everything booms out".* Participant No.4 stated that, "*we can somewhat avoid the full impact of load-shedding if we can invest in laptops and replace all the desktops. In this way we could access the cloud and continue working at least in the lower stages of load-shedding".* Participant No.7 stated that "*with digitalisation fully implemented, the city will have to invest in a backup generation or else we will lose all the investments made in this technology".*

#### 4.3.2.3.3 Digital divide

The digital divide assumption suggests that insufficient broadband access may hinder the effectiveness and profitability of digitalisation efforts. This limitation is believed to impede the success of government in rendering efficient and quality service delivery. In essence, the lack of widespread and reliable broadband infrastructure is seen as a barrier to fully realizing the benefits of digital technologies in various economic sectors (Han et al., 2023). This view was supported by participant No.8, who added that *"the lack of infrastructure in the township is contributing to the wide gap between the haves and the have not. The first and big issue is the infrastructure that can provide internet access and the devices to access the internet. There is another factor of skills and usage that goes with that".*

Participant No.6 added a view of level of education saying that, "*the city is divided in terms of levels of education. Mostly in the informal settlements, you find people who migrated from rural areas to the city and the majority of them are in the lower LSM with very little education. This does not help in improving the technology adoption rate".* These comments were also backed by Participant No.1 when stating that, "*municipalities, in general, are trying their best to digitize the way they render services, but communities have issues of level three digital divide which is the actual use of technology".* Aditya et al. (2023) supports the statements made by most of the participants, they state that the digital divide poses a notable challenge for local

governments aiming to achieve equitable and inclusive access to sufficient public services across the entire community (Aditya et al., 2023).

#### 4.3.2.3.4 Crime

The word crime can be viewed from more than one perspective. One can be cybercrime, and the next context could be the one appropriate for the environmental factors where the environment is a negative factor in the promotion of digitalisation. Crime poses one of the most formidable challenges for South Africa in the post-apartheid era. The country's crime rates rank among the highest globally, impacting the lives of all South Africans without exception (Demombynes & Özler, 2005) Participant No.3 highlighted the issue of crime as one of the major problems working against digitalisation adoption in the city. *"The theft of ICT infrastructure equipment in remote sites delays progress, I think the deployment of full-time security in the problematic sites will help and I know we once suggested that all high sites be moved from remote sites and be built in customer care centres because there is security 24/7 there".* This was further confirmed by the CEO of corridor Africa Technology, Matone Ditlhake when stating that telecoms infrastructure theft and vandalism pose significant obstacles to the government's objective of achieving universal, affordable internet access by 2030. Recent incidents, including the collapse of a power line in Tshwane, the destruction of 900 cell towers by floods in KwaZulu-Natal, and the vandalism of over 100 towers during recent unrest, underscore the pressing nature of this issue These views were also affirmed by Participant No.1, *"our community does not seem to be responsible when coming to the infrastructure that the government is rolling out to help improve their lives, imagine having to view your statement on your phone instead of paying lots of money going to a customer care centre".*

Cybercrime, on the other hand, is also another issue that is a big challenge for digitalisation, most of the participants highlighted this factor, participant No.6 indicated that "*this year alone has been tough with over five attempted penetrations in the environment even though they were not successful but now it makes reluctant to continue with our digitalisation projects. We need to tighten our security first before we can continue with these projects".* Participant No.5 expanded as follows, *"most of these attempts are from inside, maybe not intentional but through negligence because of the lack of training on cyber security. Users use weak passwords, and they leave*

*their laptops for hours unattended. This cause for an enforcement of network use policy and strong password policy".* Experts emphasise that investing in cybersecurity is primarily driven by the need to comply with laws and regulations, as well as to prevent fraud and theft. The most prevalent cybersecurity threats include phishing, viruses, and unauthorized use of computers, networks, or servers by staff. Addressing these issues is crucial to safeguarding against potential cyber threats and ensuring the integrity and security of digital systems (Timofeyev & Dremova, 2022).

#### 4.3.2.4 DOI related challenges

##### 4.3.2.4.1 Compatibility and Legacy Systems

Most participants expressed the opinion that compatibility issues posed a notable challenge to the adoption of digitalisation. The challenges predominantly revolve around compatibility issues related to legacy systems and transversal systems, which struggle to meet the requirements of digitalisation due to their outdated nature. This underscores the impediments posed by existing systems in aligning with the advancements and demands of digital technologies. This perspective was supported by Participant No.7 who indicated that *"we have an issue of speed and capacity, it was better when we were still using Cisco. All the blades were upgradable and hot-swappable instead of changing the whole router. These new ones don't talk to the old core routers".*

Participant No.1 maintains that "*we should have removed the legacy systems before attempting to roll out digitalisation because now we have issues of compatibility".* There are different perspectives on this issue, some participants gave server context, some software, physical handheld communication devices, and others network and routing context. Participant No.5 shared insights on Wi-Fi and IP phones, "*Technology lifespan is too short, in three years the city will be required to upgrade the Wi-Fi units. Each time we change to a new product, like moving from Cisco to Huawei we also must change the backend because of incompatibility issues. One brand product does not work with the other. Compatibility issues make planning and implementing digitalisation a bit difficult when one considers the cost".*

Participant No.2 noted that the "*CDM (customer data management) system needs an urgent update otherwise I won't be able to extract data from the current Microsoft platform".* The viewpoints expressed are substantiated by relevant literature, indicating

that existing research aligns with and supports the perspectives shared by the participants. Legacy systems remain a significant obstacle to the advancement of digital transformation initiatives within public administration (Irani et al., 2023).

#### 4.3.2.4.2 Complexity

Complexity is a pervasive challenge, requiring significant efforts to manage, a substantial budget, and often leading to an escalating failure rate. The inherent difficulties associated with complex systems contribute to the demand for considerable resources and increase the likelihood of encountering obstacles and setbacks (Ghasemi et al., 2023). This aspect was not that popular with the participants, however enough responses highlighted this factor as a challenge in different contexts. Participant No.10 elaborated on the issue of training saying, "*The systems become so complex for my staff because of lack of training. The department does not train us anymore maybe because they want to outsource these functions".* This point was supported by participant No.7, "*We are short-staffed, there are a few numbers of technicians that are knowledgeable about most of these technologies. We have students who are helping us, but they are not well-equipped to work with these new technologies. The city is big with over 10,000 white-collar employees, and we have few personnel to support them".* Participant No.1 expanded as follows, *"it's been 5 years now, and the city is complaining about not having the budget to fill in vacant positions in the ICT department. Human capital is a serious matter that needs attention. We cannot deploy new technologies with no one to support".*

### 4.3.3 Critical success factors for digitalisation in the city of Ekurhuleni

Critical success factors (CSF) are pivotal elements that can facilitate the smooth implementation of a project when properly addressed. Conversely, neglecting these factors has the potential to impede or hinder the success of the project. Recognizing and incorporating these key elements are crucial for project success (Alreemy et al., 2016). Figure 4.7 below provides an overview of the critical success factors that were gained from the literature and primary data.

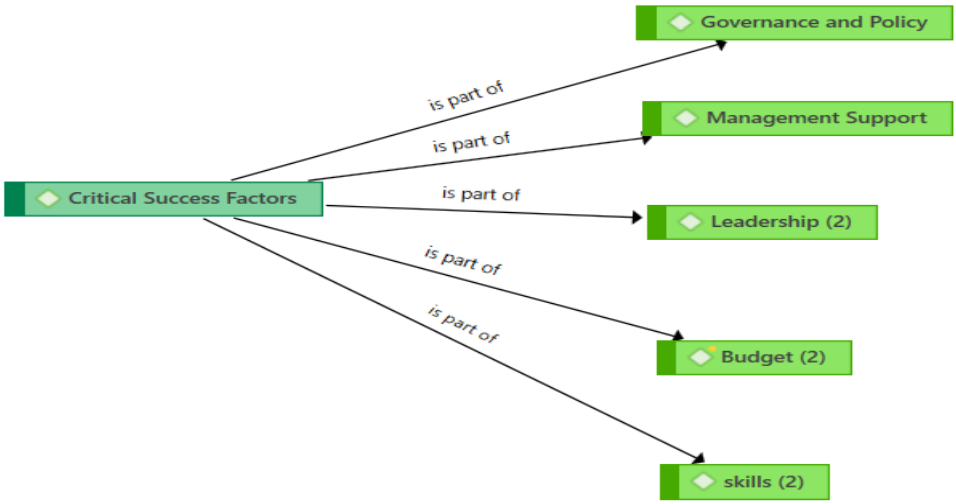



Figure 4.7 Critical Success Factors

#### 4.3.3.1 Skill

According to Van Wart et al (2017), weak technological skills are identified as a factor that can significantly increase the likelihood of reduced satisfaction with ICT implementation or even result in outright implementation failure. This highlights the critical importance of having a workforce with adequate technological skills to ensure the success of ICT initiatives within an organisation. This view was shared by many of the participants with participant No.2 noting that *"Skills are the most crucial success factor in the context of digitalisation. The presence of knowledgeable staff for implementing digitalisation is considered paramount for the city".* This observation was also reinforced by Participant No.10, *projects are going to collapse because we do not have skilled personnel for implementing digitalisation and the outsourcing is also not helping because even some of these professionals don't know what they are doing".*

In today's world, there is a growing demand for individuals with lifelong learning skills. These individuals possess the ability to continuously update their knowledge, adapt to changes, stay abreast of new trends, and actively engage in knowledge acquisition while being discerning consumers of information (Topaloglu & Tekkanat, 2015).

#### 4.3.3.2 Budget

Expanding the budget for digitalisation initiatives is portrayed as a crucial step, signifying a necessary investment that can propel a city into the league of smart cities in the 21st century (Ncamphalala & Vyas-Doorgapersad, 2022a). This suggests that allocating sufficient financial resources is instrumental in enabling cities to embrace and thrive in the era of advanced digital technologies. Participant No.7 elaborated on this aspect of the budget, "*there is always not enough budget for implementation, even after we implemented there will be no money available for maintenance. For us to be successful in these projects the ICT department must avail enough budget"*. Participants also emphasised the issue of corrupt officials, expressing concern that these individuals might be mismanaging the budget allocated for digitalisation initiatives. This highlights the potential challenge of corruption within the system and the need for transparency and accountability in budget management for successful digitalisation efforts. Participant No.10 elaborated, "*As long as we have corrupt leadership we won't win, how can the budget be exhausted in the first month of allocation".*

#### 4.3.3.3 Leadership and Management Support

The acquisition of skills for adopting new technology, both for personal use and organisational purposes, is deemed crucial. Leaders who exhibit proficiency in adopting new technologies are more effective and serve as positive role models. In the organisational context, leadership entails the ability to discern when and how to adopt new technologies and successfully implement them (Van Wart et al., 2017). This underscores the importance of technological adaptability and leadership in navigating the ever-evolving landscape of technology adoption. The digital proficiency of leadership is a significant advantage for the success of any organisation. It is considered one of the most crucial success factors for the effective implementation of digitalisation initiatives.

Having leaders who are adept at navigating and leveraging digital technologies is instrumental in steering the organisation toward a successful digital transformation. Participants affirmed the perspective presented in current literature that leaders should possess knowledge in relevant domains. This consensus underscores the importance of leadership expertise in guiding and facilitating various aspects of organisational

functions, including those related to digitalisation. Participant No. 1 indicated that *"leadership expertise is more than ever crucial for leading a successful digitalisation strategy and its implementation you cannot have the blind leading the blind*". Participant No.5 had a different view saying, *"All our leaders are very knowledgeable that is why most of our projects are successful. I think the e-left application is one example".* There was a conflicting view on the importance of this success factor, as some participants expressed the opinion that it was not adequately addressed. This suggests a divergence of opinions or dissatisfaction among participants regarding the attention or emphasis given to a specific factor in the context of the study. Participant No.3 expanded as follows, *"management is quick to outsource because they don't have enough knowledge about digitalisation".*

#### 4.3.3.4 Governance and Policy

In the contemporary business environment, IT governance (ITG) is deemed imperative for organisations to effectively address and meet the challenges they encounter (Alreemy et al., 2016). This accentuates the crucial role of IT governance in navigating and managing the complexities of the modern business landscape. This is a critical factor as, in all technology deployments, departments must adhere to the policies and frameworks set by SITA and ICASA, the IT governing bodies. It is therefore crucial that technological initiatives are aligned with established governance structures and regulations to ensure compliance and effective implementation. Most participants had limited insights on this success factor, except Participant No.3 who provided more detailed information. The lack of insight from participants about how successful governance policies have been seems to be indicative of a varying level of understanding and awareness among the participants about what should be considered a benchmark for success as it relates to the implementation of the governance policies. Participant No.3 highlighted that *"ICASA is very strict when coming to compliance with the use of licensed bandwidth and not so much on the open frequencies".*

## 4.4 Findings

The interviews for this study were carried out in the Information and Communication Technology (ICT) department of the city. There were ten respondents. Among these

individuals, two of them hold senior executive management positions. There is a distinct disparity in the middle management's response to the interview questions between the two management groups. While executives and managers appear to have a shared perspective on the advantages of digitalisation, there is a significant disparity in their views regarding the obstacles associated with this phenomenon.

Senior executives are cognizant that the city will greatly benefit from digitalisation. Requests will receive a prompt answer. Automation will enhance the efficiency of service delivery, and with digitalisation, opportunities for corrupt actions will be significantly reduced. All 10 participants hold these opinions in common.

The challenges facing digitalisation efforts in the city stem from various sources, including disagreements between senior leaders and management regarding problem assessment. Management identifies the labour force's reluctance to embrace digitalisation as a major hurdle, citing insufficient skills and training as contributing factors. Moreover, an overreliance on professional services and a lack of digital leadership dampens employee engagement in digital initiatives. The absence of a coherent policy framework further complicates the situation. Additionally, budget constraints emerge as the primary obstacle to implementing digitalisation strategies effectively.

In addressing the implementation of digitalisation, it has been discovered that relying solely on one framework is insufficient. This is because one framework may not adequately cover all relevant factors. Therefore, it has been recommended to utilize both the DOI (Diffusion of Innovations) and TOE (Technology-Organization-Environment) frameworks in tandem. This combined approach is deemed suitable for ensuring comprehensive coverage of the various factors involved in digitalisation implementation.

### 4.4.3 CHAPTER SUMMARY.

The chapter delves into the findings related to the factors impacting the adoption of digitalisation in the city of Ekurhuleni. Employing the TOE (Technology-Organisation-Environment) perspectives and DOI (Diffusion of Innovation) theory, the study reveals insights into the benefits, challenges, and critical success factors of digitalisation.

These findings, derived from both literature review and participant responses to research questions, are organised around themes extracted from the collected data, establishing a comprehensive understanding of the digitalisation landscape in the city.

# CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

*This chapter serves as an interpretation of the findings derived from the data analysis in the previous section. It delves into the implications of the identified factors concerning both theoretical frameworks and practical applications. Additionally, the chapter addresses the study's set of questions and objectives, detailing how they were answered and achieved, respectively. The conclusions drawn from the study are presented, along with recommendations for future research in the realm of digitalisation adoption. The chapter acknowledges limitations and proposes areas for further investigation to enhance our understanding of the subject.*

## 5.1 Introduction

This section provides an overview of the study, discussing the relevance of the methodology employed in generating the findings. It reflects on the lessons learned during the research process and outlines the new knowledge generated. Additionally, the section emphasises the general contribution of the study to the understanding of digitalisation adoption within the city of Ekurhuleni. It serves as a reflective summary. It provides a clear definition of the key findings and guidelines for digitalisation in the city. It delves into the researcher's contributions, both theoretically and practically, as well as methodologically. The chapter also outlines potential areas for future research stemming from the study's findings. It serves as a comprehensive reflection on the study's outcomes, emphasising its contributions and setting the stage for future research endeavours in the domain of digitalisation.

## 5.2 Summary of the key findings

### 5.2.1 Benefits

Table 5.1 perceived benefits

| Benefits | Main Findings |
|---|---|
| Communication | Participants in the study emphasised the significance of communication as a crucial factor with notable benefits for the city. Improved communication was seen as enhancing coordination among various departments spread across different towns, enabling ICT technicians to attend to users more efficiently, and improving the overall handling of tasks. |
| Scalability | Scalability emerged as a notable benefit in the adoption of digitalisation in the city, supported by both respondent feedback and existing literature. The research revealed that digitalisation not only enhances efficiency but also enables the city to scale its operations to meet growing demands while accessing highly skilled resources. |
| Security | The findings from both respondents and existing literature highlight that digitalisation provides advanced security features, controls, and protection by reducing opportunities for manual manipulation of transactions by unethical individuals in the city. Additionally, correctly implemented digitalisation projects have the potential to mitigate the spread of corruption activities. Furthermore, digitizing access to data centres is noted as a means to enhance physical security. |

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| IT Infrastructure | The comprehensive implementation of infrastructure in the city, facilitated by government organisations such as Gauteng Broadband and private entities like Vuma Tel, Vodacom, MTN, and Telkom, plays a pivotal role in granting citizens access to the internet. The city has undertaken substantial efforts, including laying over 800 kilometres of fibre to support the deployment of Wi-Fi infrastructure. These initiatives are considered significant benefits for the citizens, serving as the foundational basis for the widespread implementation of digitalisation across areas with internet coverage. |
| Transparency | Participants and findings from the literature emphasised the issue of corruption in government, viewing the implementation of digitalisation as a crucial step in mitigating corrupt activities. The Digitisation of processes is seen as reducing opportunities for corruption, promoting transparency, and acting as a deterrent for corrupt officials. The transparency brought about by digitalisation is perceived as a significant factor in improving service delivery, as it ensures that every employee is aware of and accountable for the processes being followed. |
| Service delivery | The concept of improved service delivery through digitalisation is supported by both existing literature and the analysis of collected data. The study suggests that the full implementation of digitalisation in the city can lead to the automation of processes and a reduction in queues, contributing to enhanced service delivery and improved quality of life for the citizens. |
| Agility | Agility emerged as a crucial benefit of digitalisation implementation in the city, as noted by participants. To realise agility as a benefit, acknowledging critical success factors is essential. Leadership, particularly with management support, plays a critical role in the digitalisation process, influencing the organisational culture to embrace agility. This cultural shift, in turn, affects the way business is conducted in the city, enabling quicker decision-making and changes without compromising governance standards, ultimately improving accountability. |
| Culture change | In departments where digitalisation has been implemented, respondents observed a notable culture change. Employees exhibit prompt responses to issues, facilitated by monitoring projects and self-service initiatives designed to reduce incident response times. Front desk operators are reported to be friendlier and |

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| | more knowledgeable, indicating a positive impact on the overall work environment and customer interactions resulting from the integration of digitalisation initiatives. |
| Network connectivity | Participants identified a reliable and stable network as one of the most crucial benefits in the context of digitalisation. The consensus is that a robust network infrastructure is essential to support various digitalisation projects. Whether it involves deploying radio links, fibre links, or 3G networks, the widespread availability of these networks is seen as massively beneficial for both users and citizens, allowing broader access to the digital infrastructure. |
| Trialability | Participants noted a cultural shift towards agility in the city, fostering openness to trying innovations. More systems are being adopted and experimented with, reflecting a willingness to explore new ideas. While the culture is not completely accepting of failure yet, there is a gradual movement in that direction. Participants emphasised the importance of incorporating a "fail fast" mentality into the city's culture, asserting that management should encourage experimentation and learning from failures to improve trialability and foster the adoption of more innovations. |
| Relative Advantage | Both literature and participant responses emphasise that being at the forefront of digitalisation is a significant benefit. If the city does not implement digitalisation, it is perceived as falling behind. The consensus is that digitalisation places the city in a better position to deliver quick and efficient services to its citizens. Transitioning from manual operations to digital operations gives the city a competitive advantage, enabling it to serve citizens more effectively than cities that have not embraced digital advancements. |

### 5.2.2 Challenges

Table 5.2 challenges of digitalisation

| Challenges | Main Findings |
|---|---|
| Network | One major challenge identified in the implementation of digitalisation is the lack of network availability, as participants cited issues related to the absence of network infrastructure. Specifically, cable theft was highlighted as a significant cause of network availability problems, posing obstacles to the seamless execution of digitalisation initiatives. |
| Policies | Non-compliance with legal requirements emerged as a challenge for the adoption of certain digitalisation projects. Participants identified this lack of adherence to legal prescripts as a hurdle, suggesting that it poses barriers to the successful implementation of specific digital initiatives. The introduction of the POPI Act poses a significant challenge, as it necessitates the protection of customer identity, while the inherent transparency of digitalisation may conflict with the requirements of this act. Balancing the transparency goals of digitalisation with the privacy and data protection mandates of the POPI Act becomes a complex challenge in this context. |
| Security | Security emerged as a significant challenge for the adoption of digitalisation in the city, a finding supported by both literature and the results of the study. Various security concerns were identified, including data security, data sovereignty, security breaches, and data protection. Notably, physical access to data centres raised primary security concerns, such as controlling who has access to these facilities. Additionally, challenges like vendor locking were highlighted, particularly in the context of cloud computing, where issues may arise when contracts with service providers expire. |
| Access | Respondents identified the factor of access as a significant concern, a finding supported by existing literature. Limited access to the internet posed challenges for people in adopting technology. Participants noted that certain areas within the city lack access to ICT infrastructure, and even in areas with internet coverage, there's a need for improved internet speed or bandwidth to enhance digital access and usability. |
| Skills | The lack of skills, understanding, and knowledge emerged as a significant challenge for the city in the |

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| | implementation of digitalisation. Participants identified a deficiency in technical skills required for managing and administering digitalisation initiatives as a notable hurdle. Additionally, the lack of understanding and knowledge among managers and executives was recognized as an impediment to the successful implementation of digitalisation projects. |
| Leadership | A lack of leadership in the field of digitalisation was identified as a challenge for its implementation in the city. Participants and literature both underscored the importance of knowledgeable leaders, emphasising that without effective leadership, digitalisation projects are likely to be less successful, and the associated benefits may not be fully realised. |
| Politics | Politics was identified as a significant challenge for the adoption of digitalisation in the city. The presence of political instability and frequent changes in political leadership were noted to disrupt the implementation of digital projects. The ever-changing nature of the digital implementation strategy, influenced by political factors, was highlighted, indicating a potential hindrance to the stability and continuity of digital initiatives in the city. |
| Labour | Organised labour movements in the city were identified as a challenge, with the finding that these groups often view digitalisation as a means of replacing employees with technology. The resistance from labour to most digitalisation initiatives was highlighted as a significant obstacle in the implementation of digital projects in the city. |
| Budget | The lack of a sufficient budget for digitalisation projects was recognized as a key challenge in the adoption of digitalisation in the city. Participants largely attributed failures in digitalisation implementations to the inadequacy of financial support. This finding was further supported by existing literature, underscoring the crucial role of budgetary allocations in the success of digitalisation initiatives. |
| Literacy and usage | Literacy and technology usage were identified as challenges in the adoption of digitalisation. Participants noted that many elderly citizens lack digital skills, a sentiment supported by literature suggesting that the younger generation is more likely to adopt technology than the older population. The findings further confirm that the older generation may be hesitant or apprehensive about using technology, underscoring a digital literacy gap that needs to be addressed for more inclusive digitalisation. |

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| Load-shedding | Consistent power cuts were identified as a significant challenge for digitalisation. Participants emphasised that a stable energy supply is crucial for successful digitalisation, and many projects face obstacles and failures due to the lack of a reliable power supply. This highlights the critical dependence of digital initiatives on consistent and uninterrupted electrical power. |
| Digital divide | The digital divide poses a significant challenge to the adoption of digitalisation in the city. Participants highlighted that some citizens lack access to the internet, and even among those with coverage, there is a notable absence of skills to effectively use the technology. This finding underscores the importance of addressing both access and digital literacy to ensure more inclusive and successful digitalisation initiatives in the city. |
| Crime | Crime was identified as a factor that undermines the benefits of digitalisation. Specifically, the theft of ICT infrastructure was highlighted as a challenge, hindering the city's efforts to provide access and close the digital gap between citizens who have access and those who do not. This underscores the impact of criminal activities on the progress and inclusivity of digital initiatives in the city. |
| Compatibility and legacy systems | Compatibility emerged as a challenge to some extent in the adoption of digitalisation. The finding is substantiated by both literature and participant responses in the study. A specific compatibility issue was identified concerning the transition from Cisco IP phones to Yealink phones. The incompatibility stemmed from the Cisco call manager's inability to work with the new Yealink phones, particularly due to outdated systems in the Cisco legacy infrastructure. Participants emphasised the urgent need to upgrade these legacy systems to fully leverage the benefits of digitalisation. |
| Complexity | Complexity has been identified as a challenge for digitalisation, primarily attributed to a lack of training and a shortage of skilled individuals in the city. Respondents pointed out that the implementation of new technologies can be intricate, requiring experts to assist in the process. This underlines the importance of addressing skill gaps and providing adequate training to navigate the complexities associated with adopting new technologies. |

### 5.2.3 Critical Success Factors

Table 5.3 Critical Success Factors Findings

| CRITICAL SUCCESS FACTORS | |
|---|---|
| **Factor** | **Findings** |
| **Skills** | The observation is that possessing the correct skills for digitalisation minimizes the likelihood of project implementation failure. Additionally, having knowledgeable employees in the ICT department is seen as crucial for ensuring the efficiency of digitalisation implementation. This highlights the fact that there is a direct correlation between skills, expertise, and the success of digital initiatives. |
| **Budget** | Findings regarding budget allocation for digitalisation present divergent perspectives. Some participants strongly believe that having enough capital (CAPEX) budget would enhance the benefits, while others suggest a need for more operational (OPEX) budget to maintain existing implementations. Interestingly, literature tends to address the budget as a whole without distinct categorization into the operational or capital budget. This reveals varying opinions on the specific aspects of budgeting for digitalisation initiatives**.** |
| **Leadership/Management Support** | Leadership and management support emerged as a success factor, supported by literature indicating that knowledgeable leadership is crucial for the success of digitalisation projects. However, there was a contradiction among participants, with some expressing the view that leadership lacks knowledge and tends to outsource digitalisation initiatives quickly. Conversely, other participants believed that leadership and management are actively supporting all digitalisation projects. This reflects varying perspectives on the effectiveness and knowledge of leadership in driving digital initiatives in the city. |
| **Governance and Policy** | Adhering to IT policies and governance was identified as a critical success factor in digitalisation implementation, a finding supported by existing literature. Participants underscored the importance of following the guidelines established by governing bodies such as ICASA and SITA. This highlights the significance of aligning digital initiatives with established policies and regulatory frameworks for successful implementation. |

## 5.3 Addressing the research question.

The primary research question, "How can digitalisation improve service delivery in the City of Ekurhuleni?" is addressed through the examination of three secondary questions. Table 4.1 presents a list of perceived benefits of digitalisation. Table 4.2 acknowledges various challenges encountered during implementation. In Table 4.3, a compilation of critical success factors is provided, offering measures for a successful digitalisation implementation. The factors derived from the benefits, such as scalability, transparency, agility, culture change, service delivery, and relative advantage, are anticipated to enhance service delivery in the city.

This paper focuses on the prominent factors identified by the majority of respondents and supported by relevant literature regarding the implementation of digitalisation. The key challenges highlighted are load-shedding, the digital divide, skills, budget constraints, labour/unions, and political influences. While these factors were clearly emphasised by participants, literature support is present for most except load-shedding, which lacks extensive coverage. The study finds that the City of Ekurhuleni is in the early stages of digitalisation, having implemented some projects and deployed significant ICT infrastructure to support this process.

## 5.4 Recommendations

The recommendations provided in this study are intended to serve as guiding principles for the implementation of digitalisation in the local government context. Aligned with the research questions, TOE, and DOI theories, these guidelines are offered as a resource for scholars, research practitioners, and public sector managers responsible for digitalisation. The recommendations are intended to be utilized as a reference for conducting future studies in the field.

Table 5.4 guidelines for digitalisation implementation

| Focus area | Guiding Principles |
|---|---|
| Skill | The upskilling of resources involved in digitalisation implementation is deemed essential. The approach to raising awareness and empowering staff, management, and executives is crucial. Enforcing policies that mandate professional services and consultants working in the city to impart skills to employees is recommended. This emphasises the significance of continuous training |

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| | and development to enhance the digital capabilities of individuals within the organisation. |
| Budget | The high cost of implementing digital projects necessitates an increase in capital budget allocation by the treasury department. The city can leverage revenue collection to establish an efficient framework for supporting projects once they are handed over to the operations division of the ICT department. This underscores the importance of enhanced skills in budget allocation and utilization to ensure effective financial management throughout the digitalisation process. Exploring alternative avenues for enhancing financial support for projects, such as forming partnerships with private entities, presents a viable option. Increased implementation of digitisation initiatives could be achieved through the involvement of private stakeholders. |
| Leadership | Employing professionals with expertise in digitalisation is crucial for the effective implementation of digital projects in the city. The recommendation includes a shift away from hiring leaders based on political affiliations, emphasising the importance of qualifications and experience in leadership roles. This underscores the need for a skilled workforce and competent leadership to drive successful digital initiatives. |
| Policy/ Governance | Aligning policies and selecting the appropriate framework for the implementation of digitalisation is emphasised as a crucial factor. This strategic approach is seen as instrumental in enabling the city to achieve sustainable benefits that are delivered within budget, on time, and meet the required standards. This recommendation underscores the importance of careful planning and policy alignment for successful and sustainable digitalisation initiatives. |
| Training and Awareness | To foster a positive environment for digitalisation, it is recommended to provide training to the labour force in the city, especially for the use of digital tools. Many blue-collar employees express concerns about being replaced by digitalisation, but proper training can transform them into supporters of digital initiatives. Making the workforce well-informed about digitalisation can enhance their understanding and value in the process, turning potential resistance into collaboration. Training and awareness efforts should extend beyond just ICT departments to include other departments within the organization. It is also crucial to involve consumers, including the general public, in training |

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| | initiatives to ensure they are equipped with the necessary knowledge about technology usage. |

## 5.4 Research contributions

### 5.4.1 Researcher’s Contributions

The researcher's contribution to this study involves highlighting the challenges that need addressing for the realization of digitalisation in the city. Additionally, critical success factors necessary for the successful implementation of digitalisation projects are outlined, including skills, budget, leadership, policy, training, and awareness. Factors such as load-shedding, digital divide, skills, budget constraints, labour/unions, and political influences were identified as hindrances to the city's digitalisation adoption efforts. Municipalities are perceived to be in the early stages of digitalisation, primarily due to the factors elucidated above. The benefits of implementing digitalisation are deemed critical for enhancing efficient and effective service delivery in the city. However, hindrance factors such as budget constraints, IT infrastructure limitations, and power issues, especially load-shedding, were identified by most participants. While load shedding may not be extensively supported in existing literature, it emerged strongly as a major challenge for digitalisation according to participant perspectives. These factors collectively underscore the complexities and challenges associated with the adoption of technologies in the city.

### 5.4.2 Theoretical Contributions

A common criticism of the DOI theory is its alleged oversight of environmental factors influencing technology adoption within an organisation. However, the combination of the DOI theory with the TOE (Technology-Organisation-Environment) framework is highlighted as a valuable model that can comprehensively explain the adoption of digitalisation in organisations, accounting for both internal and external factors (Liu, 2019b).

This study makes a theoretical contribution by applying the DOI (Diffusion of Innovations) and TOE (Technology-Organisation-Environment) theories. The joint application of these theories addresses various aspects, encompassing technological, organisational, and environmental factors. DOI covers the adoption of technologies,

including aspects such as complexity, compatibility, relative advantage, legacy systems, and trialability. The combination of these two theories enables the researcher to comprehensively explore all factors influencing digitalisation in the city, whether positive or negative.

### 5.4.3 Methodological contributions

The methodological contributions of the study involve employing the qualitative research approach and utilising the city of Ekurhuleni as a case study, incorporating multiple sources for data collection. The data was gathered from ICT department management and senior management, including one divisional head. Various methods, such as one-on-one interviews, Microsoft Teams meetings, and one email response to research questions, were employed for data collection.

### 5.4.4 Practical contributions

This study contributes significantly to the subject of digitalisation by identifying and resolving important adoption challenges in the city of Ekurhuleni. The research finds that a limited budget, a shortage of skills, poor leadership, and political obstacles are the key impediments to successful digitalisation activities in the city, based on an in-depth qualitative examination. These findings offer policymakers, organisational leaders, and researcher's significant insights into the specific constraints experienced in the implementation of digital technology within a local government environment.

Furthermore, the report presents focused tactics and recommendations to overcome these limitations, setting the framework by combining the DOI and the TOE for more effective digitalisation efforts and adding to the broader conversation about the application of digital solutions in the metropolitan context. The practical contribution of the research also involves the implementation of critical success factors identified in the study which are skills, budget, leadership, governance, and policy. By addressing these factors, there is potential to enhance the rate of digitalisation adoption not only in the city under study but also in other cities across the country. This contribution aims to provide actionable insights and strategies for improving the effectiveness of digitalisation initiatives in metropolitan cities.

## 5.5 Limitations and Future Research

The study primarily focuses on the city of Ekurhuleni, with data predominantly collected from 10 ICT department's middle and senior management in various sections. This number could be increased to encompass a wider range of perspectives and insights regarding digitalisation. While this scope provides valuable insights, it limits the study by not including perspectives from other departments that directly experience the benefits of digitalisation initiatives. Future research could be expanded by gathering data from additional departments within organizations and conducting interviews with consumers of the service. This broader approach would provide a more comprehensive understanding of the impact and effectiveness of digitalisation initiatives. An opportunity for expanding the study is suggested, potentially including the province, as the city is directly linked to it. The Integrated Development Planning (IDP) and the Service Delivery and Budget Implementation Plan (SDBIP) are highlighted as direct links to the province, as they provide funding for associated projects. For studies with a larger population focus, a mixed research method could be beneficial. Additionally, future research may explore the phenomenon of coalitions in municipalities, an aspect not deeply addressed in this study**.**

## 5.6 Conclusion

This study focuses on assessing the extent of digitalisation adoption in the city of Ekurhuleni, examining both its benefits and the obstacles it faces. The investigation delves into the advantages brought about by digitalisation in the city, while also addressing significant challenges such as IT infrastructure readiness, budget constraints, skills gaps, load-shedding, and leadership issues within the context of digital leadership and management support. Additionally, the study explores critical success factors whose implementation could potentially enhance the rate of technology adoption in the city. The qualitative primary data was thematically analysed to identify challenges for digitalisation adoption in the city. The study's participants emphasised critical issues, such as challenges associated with a coalition government and broader political obstacles.

Given its semi-urban location, the city should be capable of overcoming the challenges highlighted by some study participants. However, concerns about political stability,

which were also raised, remain real issues that were not fully addressed in this study. Future researchers have the opportunity to explore this context further.

The challenges for digitalisation encompass a broad range of factors, including skills, labour movements, leadership, budget constraints, network availability, policy issues, security concerns, access limitations, digital literacy, and usage barriers, challenges related to load-shedding, crime, digital divide, legacy systems, and issues of compatibility and complexity. On the positive side, the benefits identified for digitalisation adoption centre around improved IT infrastructure availability, enhanced connectivity, improved customer experience, better communication, scalability, heightened security, increased transparency, improved service delivery, enhanced agility, cultural change, trialability, and relative advantage. The city is not fully prepared for complete digitalisation adoption, particularly in townships where infrastructure is prone to vandalism and theft. This poses a significant obstacle to the seamless implementation of digital technologies across the city.

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Appendix A

## APPENDIX A: CONSENT TO TAKE PART IN RESEARCH







**Digitalization of government services for service delivery: Case of The City of Ekurhuleni**

**Name of researcher: Luke Mhlonishwa Dhlamini**

**Student number: 2505222**

**Supervisor: Tendani Mawela**

**Consent to take part in research**

(Please circle the relevant option below)

| | | |
|---|---|---|
| I agree that I have received participants information. | Yes | No |
| I agree that my participation will remain anonymous | Yes | No |
| I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind | Yes | No |
| I agree that the researcher may use anonymous quotes in his or her research report | Yes | No |
| I understand that all information I provide for the study will be treated confidentially | 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.....

Place.....

Date.....

Signature.....

Name of researcher...Luke Mhlonishwa Dhlamini.....

APPENDIX B

**Digitalisation of government services for service delivery: Case of The City of Ekurhuleni**

**Name of researcher: Luke Mhlonishwa Dhlamini**

**Student number: 2505222**

**INTERVIEW SCHEDULE**

The questions included in this interview primarily address aspects pertaining to the implementation of digitalisation in Municipalities in South Africa. Written consent must be provided by you (participant) that you voluntarily took part in the interviews. The following questions will be asked during the interview conducted with you. The interview consists of three sections and all questions will be asked during the interview that will take between 30 minutes to an hour.

**SECTION 1: BACKGROUND OF THE CITY**

1.1 What is the background of your company?
1.2 What is the departments staff complement? Discuss the high-level organisational structure.
1.3 What is the role of your department?
1.4 How is the ICT department involved digitalisation or digital transformation decisions and initiatives?

**SECTION 2: PARTICIPANT'S BACKGROUND**

2.1 What is your role and related responsibilities?
2.2 What is your tenure in the city and in the ICT department?
2.3 What is your understanding of digital transformation and digitalisation in the public sector?
2.4 Were you ever involved in any digitalisation projects in the city?

**SECTION 3: INTERVIEW QUESTIONS**

| NO | INTERVIEW QUESTION | THEORY | FACTOR |
|---|---|---|---|
| 3.1 | What is the view of the city on digitalisation? | DOI | Environment/ complexity |
| 3.2 | Are there any projects that are digitalisation or digital transformation related if so, which departments benefited from them? | TOE | Technology/ available characteristics |
| 3.3 | What are the key considerations for digitalisation adoption? | DOI | Innovation/ compatibility |
| 3.4 | In the last 12 months, has there been a digitalisation project financed by the city and what was the outcome | DOI/ TOE | Environmental/ Technology support |
| 3.5 | Were you involved in any of those projects and what was your contribution? | TOE | Environment/ Technology support |
| 3.6 | Did you at any point have some concern about the implementation of the technology and why? | DOI | Innovation/ Compatibility |
| 3.7 | What do you believe is top management's role and view of digitalisation? (Leadership) | TOE | Environmental/ Technology support |
| 3.8 | In your view how knowledgeable is top management in terms of the benefits and barriers of digitalisation | DOI | Innovation/ trialability |
| 3.9 | How does the city ensure that digital solution is consistent with the city's existing processes, systems, and skills? | DOI | Organizational/ interconnectedness |
| 3.10 | What do you think are the key benefits of digitalisation adoption? | DOI | Innovation/ relative advantage |
| 3.11 | What would you say are the advantages and disadvantages for the city in adoption of digitalisation? | DOI | Innovation/ relative advantage |
| 3.12 | What interventions are utilised to train and upskill employees for digitalisation adoption and implementation? | TOE | Environment/Technology support/ |
| 3.13 | What are the external factors (including stakeholders) that lead to a decision to adopt or not to adopt digitalisation initiatives? | TOE | Environment/Technology support/ |
| 3.14 | What are the key issues that the city has encountered with digitalisation adoption if any? | DOI | Innovation/ compatibility |
| 3.15 | How did the encountered issues influence or hinder the decision to adopt or not to adopt digital transformation projects | DOI | Innovation/ relative advantage |
| 3.16 | What would you say are the key lessons you or the company has learnt from digitalisation adoption decisions? | DOI | Innovation/ observability |
| 3.17 | What is the extent of digitalisation adoption by other municipalities | TOE | Environment/industry characteristics |
| 3.18 | What is different about the city's approach to digitalisation adoption when compared with other municipalities or city's | TOE | Environment/industry characteristics |

| | | | |
|---|---|---|---|
| 3.19 | To what extent is digitalisation adopted by the city's clients? | TOE | Technology/ available characteristics |
| 3.20 | What would happen if the city does not adopt digitalisation | | |

APPENDIX C

## APPENDIX C: INTERVIEW TRANSCRIPT







**Digitalization of government services for service delivery: Case of The City of Ekurhuleni**

**Name of researcher: Luke Mhlonishwa Dhlamini**

**Student number: 2505222**

**INTERVIEW TRANSCRIPT**

| **Name of interviewee** | **Participant: XXX**<br>**Interviewer: Luke Dhlamini**<br>**Date of Interview: ddmmyyyy**<br>**Location of Interview: XXX** | **Time: hh/mm** |
|---|---|---|
| Interviewer | | |
| Participants | | |
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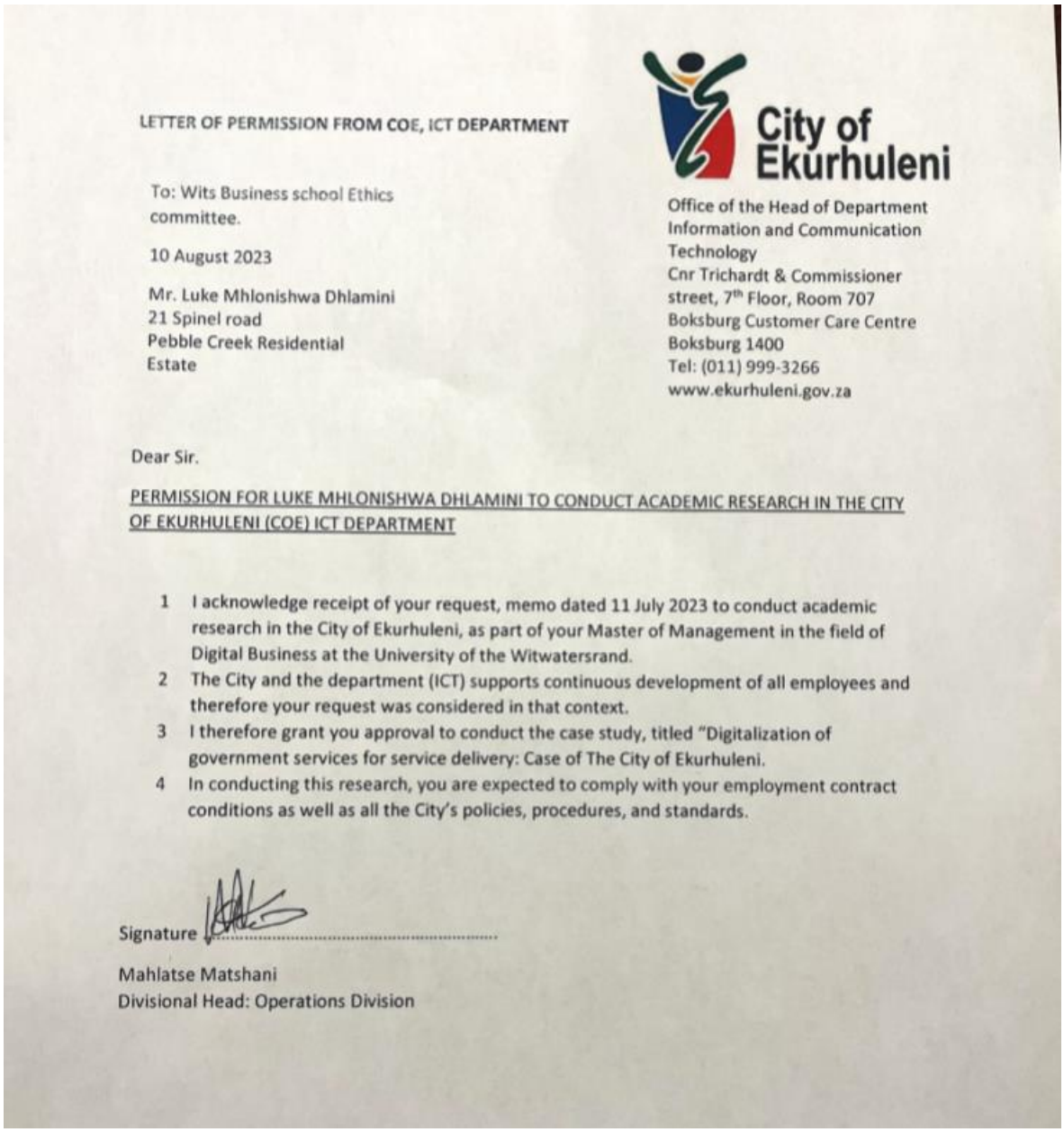
# APPENDIX D: LETTER OF PERMISSION FROM THE ICT DEPARTMENT



LETTER OF PERMISSION FROM COE, ICT DEPARTMENT

City of Ekurhuleni

To: Wits Business school Ethics committee.

10 August 2023

Mr. Luke Mhlonishwa Dhlamini
21 Spinel road
Pebble Creek Residential Estate

Office of the Head of Department
Information and Communication Technology
Cnr Trichardt & Commissioner street, 7th Floor, Room 707
Boksburg Customer Care Centre
Boksburg 1400
Tel: (011) 999-3266
www.ekurhuleni.gov.za

Dear Sir.

PERMISSION FOR LUKE MHLONISHWA DHLAMINI TO CONDUCT ACADEMIC RESEARCH IN THE CITY OF EKURHULENI (COE) ICT DEPARTMENT

1 I acknowledge receipt of your request, memo dated 11 July 2023 to conduct academic research in the City of Ekurhuleni, as part of your Master of Management in the field of Digital Business at the University of the Witwatersrand.
2 The City and the department (ICT) supports continuous development of all employees and therefore your request was considered in that context.
3 I therefore grant you approval to conduct the case study, titled "Digitalization of government services for service delivery: Case of The City of Ekurhuleni.
4 In conducting this research, you are expected to comply with your employment contract conditions as well as all the City's policies, procedures, and standards.

Signature .....

Mahlatse Matshani
Divisional Head: Operations Division

**Graduate School of Business Administration**
**University of the Witwatersrand, Johannesburg**

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

## Ethics Clearance Certificate

**Ethics protocol number:** WBS/DB2505222/596
*This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below)*

| | |
|---|---|
| **Project title** | Digitalization of service delivery at Ekurhuleni Municipality |
| **Investigator / Researcher** | Mr Luke Dhlamini |
| **Nature of Project** | MM (Digital Business) |
| **Decision of the Committee** | Approved, provided stakeholders and participants are guaranteed confidentialty. |
| **Issue Date of Certificate** | 2023/10/13 |
| **Expiry date** | Date of submission of the project / research report |
| **Chairperson** | Dr Pius Oba<br>☎ +27 11 717 3976<br>+27 82 733 6587<br>✉ pius.oba@wits.ac.za |

**Declaration by Researcher**

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

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

Signature

16/10/2023
Date: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Improved service delivery
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Power Loadshedding
Business continuity
communications
customer facing
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transformation
Organizational
incompetance
legacy system
Collaboration
Digital Divide
Infrastructure
compatibility
Transparency
coordination
Cost savings
Governance
outsourcing
optimal use
automation
Technology
community
Leadership
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Politics
Labour
Access
Agility
Policy
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Skills
IOT
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