



**The Impact of the Acceleration of Innovation Strategies in Service Delivery
Performance Within the Fourth Industrial Revolution Era: A Case of a
Provincial Public Institution**

Lonwabo Mzileni

220019204

**A dissertation submitted in fulfilment of the requirements for the degree of
Master of Business Administration**

**Graduate School of Business & Leadership
College of Law and Management Studies**


Supervisor: Dr Tony Ngwenya

2022

College of Law and Management Studies

Graduate School of Business & Leadership

Supervisors Permission to Submit Thesis/ Dissertation for Examination

Name: Lonwabo Mzileni	No: 220010904	
Title: The Impact of Acceleration of Innovation Strategies In Service Delivery Performance Within Fourth Industrial Revolution Era: A Case Of Provincial Public Institution		
Qualification: Master of Business Administration Research Project (MBA)	School: Graduate School of Business and Leadership	
	Yes	No
To the best of my knowledge, the thesis/dissertation is primarily the student's own work and the student has acknowledged all reference sources	X	
The English language is of a suitable standard for examination without going for professional editing.	X	
Turnitin Report %	6%	
Comment if % is over 10%:		
I agree to the submission of this thesis/dissertation for examination	Yes	
Supervisors Name: Dr T Ngwenya		
Supervisors Signature: 		
Date: 18 July 2022		
Co- Supervisors Name:		
Co- Supervisors Signature:		
Date:		

DECLARATION

I, Lonwabo Mzileni, declare that:

- I. The research reported in this dissertation, except where otherwise indicated, is my original research.
- II. This dissertation has not been submitted for any degree or examination at any other university.
- III. This dissertation does not contain other persons' data, pictures, graphs, or other information unless specifically acknowledged as being sourced from other persons.
- IV. This dissertation does not contain other persons' writing unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:
 - a. Their words have been re-written, but the general information attributed to them has been referenced.
 - b. Where their exact words have been used, their writing has been placed inside quotation marks and referenced.
- V. Where I have reproduced a publication of which I am author, co-author, or editor, I have indicated in detail which part of the publication was written by myself alone and have fully referenced such publications.
- VI. This dissertation does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the dissertation and the References sections.

Signed: _____

Date: 18 July 2022

ACKNOWLEDGEMENTS

I would like to thank the following people who effortlessly supported, assisted and encouraged me throughout the journey of this study:

- My entire family for the love and support,
- My Supervisor Dr. Tony Ngwenya for being patient with me and constructively guiding me to the completion of this study, I am beyond grateful, and
- All the interview respondents who took the time to participate in this study.

ABSTRACT

The world is currently in the Fourth Industrial Revolution, characterised by fast-advancing digital technologies. Digital technologies such as the internet of things, artificial intelligence, robotics, automation, 3D printing, cloud computing, nanotechnology, and many other similar technologies, directly and indirectly affect the way of life. This direct and indirect effect is proliferated by the ability of digital technologies to influence communication, information, knowledge and daily operations in all aspects of life at home, in society and at the workplace level. The growth or advances of digital technologies is said to be at an unprecedented speed. It comes with rapid changes that have made the 21st-century global economy and environment volatile, uncertain, complex and ambiguous. This complex nature of the modern environment presents uncertainties, and amid it, organisations must deal with the changes and continue to operate efficiently and effectively. As a result, there has been an observed paradigm shift in public service delivery and administration where governments across the world utilise information and communication technology, digital technologies and the Internet to improve operations and service delivery. For instance, innovation strategies such as e-Government exemplify the adoption and utilisation of technologies in state services. This study aimed to investigate the impact of the accelerating innovation strategies in service delivery within this Fourth Industrial Revolution era. A qualitative approach to best respond to the research questions and used purposive sampling to identify the most relevant participants. The population of this study was KwaZulu Natal Treasury employees and study size and sample was eight staff members from the IT and Systems Units within Treasury. Data was collected through open-ended semi-structured interviews. The collected data was reviewed, synthesised and interpreted through thematic analysis. A rigorous analysis of primary data led to the findings of unequal levels of innovation within Treasury. Implying that some units or departments invest in innovations more than others. Further findings showed that the adopted innovations proved to be beneficial in terms of improving service delivery. Leading to the conclusion that taking full advantage of innovation technologies and systems could be advantageous for the department. Additionally, this study found that adopting 4IR technologies, digital services, ICT infrastructure, and innovation strategies relies on budget sufficiency. Therefore, accelerating innovation systems and processes in service delivery requires the department, its leaders, and management to embrace and invest in innovation.

TABLE OF CONTENTS

DECLARATION.....	iii
ACKNOWLEDGEMENTS	iv
ABSTRACT.....	v
TABLE OF CONTENTS	vi
ABBREVIATIONS AND ACRONYMS.....	x
LIST OF FIGURES	xi
LIST OF TABLES	xii
LIST OF APPENDICES	xii
1. CHAPTER ONE: INTRODUCTION.....	1
1.1. Introduction	1
1.2. Background to the Research.....	2
1.3. Problem Statement	8
1.4. Aim of the Research	9
1.5. Research Objectives	9
1.6. Research Questions	9
1.7. Justification for the Study	10
1.8. Overview of Research Methodology.....	11
1.9. Scope of Study	12
1.10. Limitations of the Study	13
1.11. Outline of the Dissertation.....	14
1.12. Chapter Summary	14
2. CHAPTER TWO: LITERATURE REVIEW	15
2.1. Introduction	15
2.2. Definition of key concepts	15
2.2.1. Technological Revolution	15
2.2.2. The Fourth Industrial Revolution (4IR).....	18
2.2.3. Change	19
2.2.4. Innovation	21
2.2.5. Strategy	23

2.2.6.	Digital Technology.....	23
2.2.7.	Service Delivery.....	30
2.2.8.	Leadership.....	30
2.3.	Theoretical Underpinnings	32
2.3.1.	Sociotechnical Systems Theory.....	32
2.3.2.	Change Management Theories.....	34
2.3.3.	Transformational Leadership Theory.....	37
2.4.	International Overview of 4IR and innovation in the public sector	39
2.4.1.	The Fourth Industrial Revolution	39
2.4.2.	The Re-evaluation of Public Service Policies.....	41
2.4.3.	Innovation in Public Services: From Traditional to New Operations	46
2.4.4.	Leadership Capacity	49
2.4.5.	Examples Showing Impact of innovation in the public sector	51
2.4.6.	Developing Countries 4IR Experience	53
2.5.	Overview of 4IR and Innovation in the South African Public Sector	56
2.5.1.	The Socioeconomic Context of South Africa.....	56
2.5.2.	South African Legislative Frameworks Guiding Innovation	59
2.5.3.	Service Delivery in South Africa	61
2.5.3.1.	Traces of Innovation in Service Delivery	62
2.5.4.	Lessons learned.....	66
2.6.	Chapter Summary.....	68
3.	CHAPTER THREE: RESEARCH METHODOLOGY	70
3.1.	Introduction	70
3.2.	Research Paradigm.....	70
3.3.	Research Design.....	72
3.3.1.	Quantitative Research.....	72
3.3.2.	Qualitative Research	73
3.3.3.	Mixed Methods	75
3.4.	The Study Population and Sampling.....	75
3.6.	Data Collection Techniques	78
3.6.1.	Secondary Data Sources.....	78

3.6.2.	Primary Data Sources	78
3.7.	Data analysis	78
3.8.	Research Approach	79
3.9.	Ethical Considerations.....	80
3.10.	COVID-19 Protocol Compliance	80
3.11.	Trustworthiness and Credibility	80
3.12.	Limitations.....	81
3.13.	Chapter Summary	82
4.	CHAPTER FOUR: PRESENTATION AND DISCUSSION OF RESULTS	83
4.1.	Introduction	83
4.2.	Profile of Participants.....	83
4.3.	Innovations within the KZN Treasury	84
4.4.	Identification of Themes and Link to Objectives.....	86
4.5.	Discussion and Analysis of Results	87
4.5.1.	Objective One.....	87
4.5.2.	Objectives Two and Three	93
4.5.3.	Objective Four	100
4.6.	Chapter Summary.....	102
5.	CHAPTER FIVE: DISCUSSION OF CONCLUSIONS AND RECOMMENDATIONS	103
5.1.	Introduction	103
5.2.	Review of the Objectives of The Study	103
5.3.	Summary of Research Findings	103
5.3.1.	Objective One.....	103
5.3.2.	Objective Two	106
5.3.3.	Objective Three	110
5.3.4.	Objective Four	111
5.4.	Recommendations	111
5.4.1.	Objective One.....	111
5.4.2.	Objective Two	112
5.4.3.	Objective Three	113

5.4.4. Objective Four	113
5.5. Recommendations for Future Studies	114
5.6. Chapter Summary	114
Bibliography	115
APPENDIX A: INTERVIEW QUESTIONS.....	132
APPENDIX B: INFORMED CONSENT	134
APPENDIX C: GATEKEEPERS LETTER	137
APPENDIX C: ETHICAL CLEARANCE.....	139
APPENDIX C: TURNITIN REPORT	140

ABBREVIATIONS AND ACRONYMS

4IR	Fourth Industrial Revolution
AI	Artificial Intelligence
ARPANET	Advanced Research Projects Agency Network
C4IR South Africa	South African Centre for the Fourth Industrial Revolution
COVID-19	Coronavirus
CPSI	Centre for Public Service Innovation
CSIR	Council for Scientific and Industrial Research
DHA	National Department of Home Affairs
Dig Economy	Digital (Dig) Economy
DoH	National Department of Health
DPSA	Public Service and Administration
eFiling	Electronic Filing
E-Government	Electronic Governance
G2B	Government-to-Business
G2C	Government-to-Customer
G2E	Government-to-Employee
G2G	Government-to-Government
ICT	Information and Communications Technology [or Technologies]
ID	Identity Document
IIR	First Industrial Revolution
IoT	Internet of Things
IT	Information Technology
KZN	KwaZulu-Natal Province
KZN DoE	KZN Department of Education
KZN DoH	KZN Department of Health
KZN Treasury	KwaZulu-Natal Provincial Treasury Department
MTSF	Medium-Term Strategic Framework
NDP	National Development Plan
NDP	South African National Development Plan
OECD	Economic Co-operation and Development
PC4IR	Presidential Commission on the 4IR
SA	South Africa
SITA	State Information Technology Agency
SMS	Short Text Message
SONA	State of the Nation Address
UIF	Unemployment Insurance Fund
VUCA	Volatility, Uncertainty, Complexity, And Ambiguity
WEF	World Economic Forum

LIST OF FIGURES

Table 1: Purpose and Focus areas of the SA Centre for the Fourth Industrial Revolution.....	3
Table 2: Examples of the Impact of Innovation in Development	7
Figure 1: Study Outline	14
Figure 2: Industrial revolutions - Historical Timeline	16
Figure 3: Some Impacts/Outcomes of 4IR on Communities	18
Figure 4: Megatrends - Technology Developments.....	19
Table 3: Change Triggers.....	20
Table 4: Defining Innovation.....	21
Figure 5: Sectoral Characterisation of Innovation Drivers	23
Table 5: Positive Impacts of Blockchain	26
Figure 6: Categories of e-Government.....	28
Table 6: Global examples of e-Government	29
Figure 7: 3 Stages of Lewin's Change Model.....	34
Figure 8: 4 Phases of Change Through Persuasion.....	35
Figure 9: Leavitt's Diamond Organisational System Model.....	36
Figure 10: 6 Leadership Perspectives Characterised in Transformational Leadership	38
Figure 11: Four Aspects of the Fourth Industrial Revolution	40
Table 7: 4IR Influence on Service Delivery Public Policy	42
Figure 12: Development of ICT Application in Public Service Administration and Delivery in China	43
Figure 13: 6 Leadership Dimensions for the 4IR	50
Table 8: Innovation Initiatives in Kenya	55
Figure 14: Factors That Hinder Innovation in The Public Sector	55
Figure 15: Income and Literacy Function Profile.....	57
Table 9: Socioeconomic Indicators Profile	58
Table 10: South African Strategic Frameworks Guiding Innovation	59
Table 11: Sector Specific 4IR Technologies Utilisation Projections.....	60
Figure 16: South African e-Government Evolution Profile.....	60
Figure 17: The Innovation Pyramid	62
Figure 18: Evolution of SARS eFiling	63
Table 12: KZN Province SWOT Analysis for Innovation	66
Figure 19: OECD Going Digital Integrated Policy Framework.....	67
Figure 20: Key Mechanisms that Should Drive e-Government Policies	68
Figure 21: Research Paradigms.....	71
Table 13: Quantitative and Qualitative Research Characteristics	75
Table 14: Participants Profile	76
Figure 22: Purposive Sampling	77
Table 15: Qualitative Research Sampling Strategies	77
Figure 23: Data Analysis	79
Table 16: Ethical Considerations	80
Table 17: Synchronising Trustworthiness with the Six Phases of Thematic Analysis	81
Table 18: Participants Profile	84
Table 19: Categorisation of Innovations in the KZN Treasury	84
Table 20: Identified Themes and Sub Themes	86

<i>Appendix 1: Interview Questions</i>	132
<i>Appendix 2: Informed Consent</i>	134
<i>Appendix 3: Gatekeepers Letter</i>	137
<i>Appendix 4: Ethical Clearance</i>	139
<i>Appendix 5: Turnitin Report</i>	140

LIST OF TABLES

<i>Table 1: Purpose and Focus areas of the SA Centre for the Fourth Industrial Revolution</i>	3
<i>Table 2: Examples of the Impact of Innovation in Development</i>	7
<i>Table 3: Change Triggers</i>	20
<i>Table 4: Defining Innovation</i>	21
<i>Table 5: Positive Impacts of Blockchain</i>	26
<i>Table 6: Global examples of e-Government</i>	29
<i>Table 7: 4IR Influence on Service Delivery Public Policy</i>	42
<i>Table 8: Innovation Initiatives in Kenya</i>	55
<i>Table 9: Socioeconomic Indicators Profile</i>	58
<i>Table 10: South African Strategic Frameworks Guiding Innovation</i>	59
<i>Table 11: Sector Specific 4IR Technologies Utilisation Projections</i>	60
<i>Table 12: KZN Province SWOT Analysis for Innovation</i>	66
<i>Table 13: Quantitative and Qualitative Research Characteristics</i>	75
<i>Table 14: Participants Profile</i>	76
<i>Table 15: Qualitative Research Sampling Strategies</i>	77
<i>Table 16: Ethical Considerations</i>	80
<i>Table 17: Synchronising Trustworthiness with the Six Phases of Thematic Analysis</i>	81
<i>Table 18: Participants Profile</i>	84
<i>Table 19: Categorisation of Innovations in the KZN Treasury</i>	84
<i>Table 20: Identified Themes and Sub Themes</i>	86

LIST OF APPENDICES

<i>Appendix 1: Interview Questions</i>	132
<i>Appendix 2: Informed Consent</i>	134
<i>Appendix 3: Gatekeepers Letter</i>	137
<i>Appendix 4: Ethical Clearance</i>	139
<i>Appendix 5: Turnitin Report</i>	140

1. CHAPTER ONE: INTRODUCTION

1.1. Introduction

Over the years, the world has evolved significantly. The various experienced waves of change have affected global economies, business environments, civic societies, operations, and the overall way of life. The world has experienced four industrial revolutions; currently, it is the era of the fourth industrial revolution (4IR). The 4IR was preceded by the first industrial revolution that began in 1760, the second industrial revolution from 1870 onwards and the third industrial revolution from 1960 onwards (Schwab, 2016). All these historical changes were accompanied by uncertainty and complexities.

The 4IR is not a mere new industrial revolution; it stands out from the previous industrial revolutions. Klaus Schwab, the founder of the term 4IR, cautioned that based on the scope, scale, and complex nature of the 4IR, this “industrial revolution is unlike anything humankind has experienced before” (Schwab, 2016, p. 1). Therefore, it is important for various organisations and institutions, especially governments, to understand the impact and connotations of the 4IR and to know the pressures, opportunities, and approaches warranted by this industrial revolution era. Technological innovation, reforms, progress and its constant changes likely add a toll to the already burdened and constrained economic environment. Therefore, studies need to assess the effects and impacts of these changes in government adaptations specifically from the Information and Communications Technology [or Technologies] (ICT) perspective.

Studies have shown that the 4IR is the age of technological innovation that introduced advancements in digitalisation, robotics, artificial intelligence, automation, nanotechnology, and many other innovative functions (Younus, 2017; World Economic Forum, 2019). These advances in technology, directly and indirectly, affect government operations. Layton-Matthews and Landsberg, (2022) argued that South Africa (SA) continued lack of innovative and creative responsiveness to the technological advancements brought by the 4IR. Undoubtedly, constant changes, technological developments, and growing innovation change the status quo, which bears consequences for institutions and organisations, especially in public sector policies, processes, systems and procedures. This study aimed to investigate the impact

of the 4IR on public sector service delivery, with a primary focus on the innovation strategies of the KwaZulu-Natal Provincial Treasury Department (KZN Treasury) and the cognate sustainable improvements and reforms within the context of 4IR.

1.2. Background to the Research

The South African government structure comprises of three distinctive, interdependent and interrelated government spheres, local, provincial and national (The Constitution of the Republic of South Africa, 1996, p. 1267). Within the provincial government sphere, there are various departments and public entities. The KZN Treasury is one of the Provincial Department mandated to allocate, facilitate, and distribute financial resources to the various government departments in the KwaZulu-Natal Province (KZN). These distributed funds are channelled towards government service delivery and operations rendered by the departments to affected stakeholders including the communities. Driven by the vision of aspiring to be at the centre of excellence in financial and fiscal management in the country, the KZN Treasury is committed to being the key driver of the KZN provincial government service delivery (Kwa-Zulu Natal Treasury, 2020).

The KZN Treasury operates in conjunction with other key strategic frameworks such as the National Development Plan (NDP) or the Medium-Term Strategic Framework (MTSF) 2020-2024 (Kwa-Zulu Natal Treasury, 2020) and the Provincial Growth Development Strategy under the auspice on the Provincial Planning Commission of KZN. Therefore, KZN Treasury plays a crucial role in building a capable state with enhanced socio-economic opportunities, eradicating poverty and inequalities, and supporting skills and efficient systems development by assisting provincial departments, public entities, and municipalities (Kwa-Zulu Natal Treasury, 2020, p. 2). Across the government's future and strategic plans, the 4IR, innovation and fast-growing technological advancements have been acknowledged and considered as development priorities for both Provincial and National interests. According to Sutherland, (2019), South African President Cyril Ramaphosa put the 4IR into the country's national economic strategy. In the 2019 State of the Nation Address (SONA), the President raised the importance of equipping SA with the necessary skills and resources so that the nation can be agile and nimble enough to adapt to and exploit opportunities presented by the digitization endeavours packaged within the 4IR (Sutherland, 2019; Makamase, 2018; Olaitan, et al., 2021).

The 2019 SONA declarations on the 4IR gave the economic, social and political agendas a strategic direction. For instance, the development of the South African Centre for the Fourth Industrial Revolution (C4IR South Africa), which started operating in 2021 and is hosted by the Council for Scientific and Industrial Research (CSIR) and the Presidential Commission on the 4IR (PC4IR) are the primary outcomes emanating from the 2019 SONA directions on the 4IR. Table 1 presents the purpose and focus area of the centre for the 4IR. Based on the characterised focus of this centre, the authors argue that the C4IR South Africa has the potential to influence the South African 4IR strategies strategically. Additionally, it can point the country towards suitable policy frameworks that can work based on informed insights gained from research and best practices learnt from other governments.

Table 1: Purpose and Focus areas of the SA Centre for the Fourth Industrial Revolution

The purpose of the centre is to:
Create a collaborative platform for its business partners to work with government and academia to co-design, prototype, test and refine various enablers for the adoption of 4IR technologies;
Build a national capability in technology governance with a focus on accelerating the adoption of converging and transformative technologies' effective regulation in the 4IR era;
Showcase inclusive digital transformation through <u>providing assistance</u> and advice to small, medium and micro enterprises on their digital transformation, and act as a platform to facilitate experimentation with processes and technologies to inform manufacturing strategies and business models; and
Catalyse industry transformation through its business and government fellowships provides learning opportunities for employees, clients and the general public.
The focus areas of the centre are in the strategic use of data to:
Boost Industry 4.0 in South Africa and the implementation of emerging technologies in industrial production and supply chains, aiming at the sustainable industrial development of South Africa, the region and the continent; and
Transition South Africa towards a data-based digital economy to improve its competitiveness, become a relevant global player, and accelerate the digitalisation of government.

Table 1 Source: (CSIR, 2022)

The modern era is radically diverse and complex; its changes affect societies, business environments, economies, and markets, causing opportunities and disruptions. Lyton-Matthews and Landsberg, (2022) argued that the 4IR introduced a new dimension to change, and this change has been exponentially developing. Therefore, it is important for organisations, especially those in the public sector, to understand the effects of 4IR in different environments.

Arguing further, Lyton-Matthews and Landsberg, (2022, p. 55) contend that better understanding can give public sector functioning a sense of opportunities or threats presented by the 4IR, enabling an informed direction towards innovative service delivery matching the modern era phase and demands.

From an African outlook, Layton-Matthews and Landsberg, (2022) argued that South Africa (SA) lacks innovative and creative responsiveness to the technological advancements brought by the 4IR. Moreover, Lyton-Matthews and Landsberg (2022, p. 56) further added that most public sector environments in many developing countries are overwhelmed by socio-economic challenges such as critical resource shortages, high unemployment and poverty, and illiteracy, skills shortages, and limited access to technology. These realities make it foreseeable that innovation and technological demands introduced by the 4IR may cause threats more than opportunities in a developing economy such as SA. It calls for developing countries to learn about innovation and its impacts and find strategic or creative ways of introducing the *new* into *known or normal* systems.

Authors such as Younus, (2017) cautioned that the 4IR is problematic, arguing that it marginalises those who lack education, literacy, numeracy and those who reside in less developed regions. According to Schwab, (2016, p. 66) governments are among the most impacted by this industrial revolution and its increasingly transient and ephemeral nature of power which is characterised by its transitory nature and effects. Hence the World Economic Forum (WEF) urged governments to start changing their policies to create feasible migration approaches to innovative and technological advancements and to avoid adverse socio-economic challenges such as job losses due to skills mismatch or shortages (World Economic Forum, 2019). Mkansi and Landman, (2021) argued that studies have projected that 4IR aspects, such as automation, will reconfigure the labour markets. Adding more concerns, Rapanyane and Sethole, (2020) have concluded that SA will be negatively and adversely affected by the impact of the 4IR in future jobs, and employability will be a challenge in instances of human positions being replaced by intelligent machines such as robots, drones and other highly Information Technology (IT) oriented mobile gadgets . Given these concerns, it can be argued that it is crucial for the government, in the case of this study, the KZN Treasury, to have awareness and understanding of the impacts and effects of 4IR in various contexts and environments.

To minimise drastic risks or uncertainties associated with the change from innovation, the Organisation for Economic Co-operation and Development (OECD) advises that: “in this time of increasing complexity, rapidly changing demands and considerable fiscal pressures, governments need to understand, test and embed new ways of doing things” (OECD, 2019, p. 15). In this way, policy makers and public authorities can understand that innovation is about employing new approaches to create public value as innovation outcomes can be improve public operations, efficient public resources, openness and many other economic and social aspects that are important to people and associated stakeholders including communities in this fast-paced and high velocity era of digitization within the 4IR environment (OECD, 2017, p. 10).

Schwab, (2016, p. 27) recommended that governments allocate more aggressive financial resources towards ambitious research initiatives on innovation and technical adaptations to forefront 4IR demands. Argued that building knowledge and human capital can be beneficial. In SA, “4IR requires government action in various areas, including cybersecurity, data protection, education, infrastructure and skills” (Sutherland, 2019, p. 3). Additional to these areas, the government should note that the SA *“economy is still rooted in farming, mining and the informal sector, and burdened with high levels of unemployment, while the vast majority of its citizens lack modern day advanced and, often, basic skills”* (Sutherland, 2019, p. 2). One can argue that the 4IR considerations, innovation, and introduction of 4IR technology and skills will require significant restructuring and a positive attitude from the State, free of the ordinary lack of efficient policy implementation.

Schwab, (2016, p. 67) called for agile governance because *“ultimately, it is the ability of governments to adopt that will determine their survival. If they embrace a world of exponentially disruptive change, and if they subject their structures to the levels of transparency and efficiency that can help them maintain their competitive edge, they will endure”*. The optimism shown by the SA government towards the 4IR resonates with Schwab’s recommendations. If similar efforts were to be translated into implementing the identified strategic approaches to the 4IR, the country would be better positioned to adapt and maintain efficient service delivery despite changes and uncertainties.

There has been growing attention from academics and practitioners on using technology resources to implement innovative strategies in the political and administrative agenda to improve public service delivery and quality (OECD, 2019). Supporting this assertion, Pratama, (2020, p. 26) stated that “the importance and virtues of public sector innovation have pushed national governments globally to implement innovation policy for improved public services”. Indeed, it is observed that factors such as the Internet have laid the foundation for many technological advancements. They have also bridged the gap between people, government, special interest groupings, civic societies and businesses in providing services or products. Private companies and the public sector or government have evolved and changed how they do business or operate by being innovative during this 4IR era. According to Urbancová, (2013) private sector innovation is driven by the attainment of competitive advantage, and profit maximisation, whilst public sector innovation is centred on public values where governments want to improve service performance and efficiencies. However, Akileswaran and Hutchinson (2019) raised that governments have been lagging in taking advantage of advances that have come with 4IR, especially in Africa. Technological advancements have pressured governments to improve and change how they do things to keep up with the evolution of technology and the revolution. Perhaps, some governments have focused on adopting ICT in service delivery due to the positive impacts and observed successes without first questioning how will innovation deliver positive change in their countries and how will they measure or ascertain the success of these innovations.

Mariani, et al., (2021, p. 1) gave some insights on the reasons behind the failure of the government to exploit the 4IR imperatives and its technological advances and argued that: *“the clash of new technologies and old business models is exactly the challenge facing many government leaders today. The confluence of technologies such as artificial intelligence (AI), cloud, blockchain, quantum computing, and more can open up new possibilities for government to deliver services to citizens in entirely new and more effective ways. But these transformative results may only be possible if government agencies can break free from traditional ways of doing business and explore new models of service delivery”*.

Private sector organisations prioritise increasing competitiveness and being the best when compared to competitors, and they hold the view that “if an organisation is not capable of introducing innovations on an ongoing basis, it risks that it will lag behind and the initiative will be

taken over by other entities” (Urbancová, 2013, p. 84). Selected government institutions have moved to offer government services online to what we call an e-Government; many have embraced innovations within and gradually evolved; some global examples are presented in Table 2. Locally, the government has seen the need for and importance of innovation. Hence in 2001, the Minister of Public Service and Administration (DPSA) established The Centre for Public Service Innovation (CPSI) to promote and focus on innovation in the public sector.

KZN Treasury strategically deploys its resources to the needs of communities through enhanced support to departments, municipalities, and public entities. This study looked at the state of innovation in the South African public sector. It focused on KZN Treasury, particularly enquired on how service delivery has been affected by innovation and the strategies implemented by this provincial department.

Table 2: Examples of the Impact of Innovation in Development

Country		Innovation	Impact
Socio-Economic Development	India	Green Revolution in the 1960s introduced high-yield varieties and seeds and increased fertiliser use and irrigation.	Efficiency in agricultural production affected agricultural products' availability and prices and decreased food scarcity, especially for the less fortunate.
	Indonesia	Indonesia National Competition for Public Service Innovation.	These recognition awards resulted in competitive public service delivery, improved employee service and increased good practices of high performance.
	China	Dematerialised innovation in manufacturing and product design.	Exploiting IT systems, limited physical or paper operations, improved efficiency and performance of the manufacturing systems and processes faster, lighter or easy to use. Increased productivity and economic growth.
Citizen Empowerment	Columbia	Blockchain Voting in the 2016 elections was implemented by the Democracy Earth Foundation, a non-profit organisation aiming to increase voting access or opportunity.	This experiment positively impacted citizen empowerment and inclusion.

	Canada	The State collaborated with the private sector and developed the Carrot Rewards Application (App).	The app was developed as means of enticing public engagement and participation of citizens in matters of public services. Empowering and improving public trust in government and promoting people-centred governance. Additionally, the app promoted collaborative development and strong ties between the public and private sector.
--	--------	----------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Table 2 Adapted from: (OECD, 2017, p. 9; OECD, 2019, p. 10; Pratama, 2020).

1.3. Problem Statement

Despite the trends and magnitude of change and complexity experienced in the modern-day, the operations, especially government systems and actions in SA, have been slow in keeping up with the 4IR and its advances. Today's world is knowledge economy driven; it has long passed the era of buildings, real estate or machinery being the central business enterprises as intelligence, skills, and technology are the important factors of this time. Given the importance of human intelligence and knowledge of workers, management, innovation and strategic leadership, SA government systems should be levelling up to the knowledge economy thinking. However, literature shows that most developing economies remain in the industrial age thinking and processing (Manville & Ober, 2003, p. 48). Furthermore, studies show that Africa is seriously lagging on the digital front. For example, internet penetration, quality, and affordability are significantly low compared to the rest of the developed and world and high-income economies (Ndung'u & Signé, 2020, p. 67).

SA have demonstrated awareness and commitment to moving towards innovation and technological factors introduced by the 4IR. This commitment is necessary because government departments deliver and provide a service to the public; not limited to that, some tasks take place in the background. These background services are rendered internally to staff within that department and in this study the KZN Treasury. For a government department to be offering services to the public, it must be functioning efficiently internally. Despite showing acknowledgement of the 4IR and making some efforts and commitment to innovating some public services, limited efforts have been made to investigate the impact of innovative strategies or initiatives in service delivery. As a department that channels financial resources in implementing these innovative strategies or practices by various provincial departments, the

KZN Treasury needs to understand the occurrences and landscape of innovation to draw characteristics of its impacts on service delivery. Therefore, this study's investigation is on innovation with the endeavours for seamless services delivery reforms and improvements. It looks at how the KZN Treasury has performed in terms of innovation, examines the use of innovation or technologies in service delivery, and will attempt to determine how service delivery has been affected by innovation within the department.

1.4. Aim of the Research

This study aimed to investigate innovation in the KZN Treasury achieved by consideration of fourth industrial revolution technologies in service delivery. This study looked at policies, strategies and practices that change the current systems status quo of service delivery to determine the impact of driving innovative strategies in service delivery processes.

1.5. Research Objectives

The objectives of this study were:

- To investigate the innovation culture within the institution
- To determine the importance of innovation in improving the institution's internal processes and service delivery
- To investigate the innovative systems and processes and how users within the institution perceive the systems and policies in place within the institution
- To examine current systems in place and look at innovative ways that could be improved in terms of the 4IR

1.6. Research Questions

- 1) How is the innovation culture within the institution?
- 2) What Is the importance of innovation, and is it vital in improving processes in the institution and service delivery?
- 3) What factors and obstacles are hampering innovation within the institution?
- 4) Are there current policies and systems in institutions supporting innovation, and is innovation accepted from all levels?
- 5) The current digital technological systems and policies that have been implemented internally and externally are they working and serving their purpose?

- 6) How can the current systems be improved considering current digital technological advancements and trends?

1.7. Justification for the Study

Today, the world is in the “midst of an unprecedented digital technological revolution that is transforming economies, governments and societies in complex and unpredictable ways” (OECD, 2019, p. 4). This digital technological revolution, directly and indirectly, impacts how people leave, work and interact, which makes it difficult to ignore the effects of this technological revolution as it inevitably demands transformation and adaptation.

Several studies on the experience and impact of innovation in the public sector service have examined the characteristics, outcomes, efficiency and effectiveness of innovation in public sector service quality (Urbancová, 2013; OECD, 2017; OECD, 2019; Pratama, 2020). These studies have painted a picture of the existence, depth and extent of innovation within government. Moreover, these studies show how government institutions have embraced this technological evolution and used it to their advantage in public service delivery. This study aimed to unveil and unpack the innovation practices of the KZN Treasury that have taken place in this 4IR era to pinpoint their impact. Understanding that there has been a slow implementation and migration to services such as E-Government and using it to render services, this study also looked at other departments that have fully utilised these E-services in SA.

Countries such as Estonia have become dynamos in using digital technology in service delivery, thus establishing themselves as leaders in E-Government services (Fabian, 2018). The study should assist KZN Treasury, more specifically unit leaders, in seeing the benefits of innovation in the departmental operations or enable the department to learn of innovative processes occurring in other departments or countries for knowledge and learning purposes. Based on what is happening in the private sector and other countries, some of these innovations could be implemented in the department in assistance to improve service delivery and the contemplated operations deliverables for the benefit of the intended primary and secondary stakeholders. Currently, there is limited academic data on the public sector innovation strategies and their monitored performance especially within the emerging markets such as RSA. Yet, innovation is at the centre of all the short-and long-term strategic plans of SA. This study comprehensively examined the implemented innovation strategies and their impact on

service delivery in selected local and international government operations. Theoretically, the results of this study can inform the KZN Treasury or any other government department about the innovation landscape and its link to the performance in public administration operations, office or work operations or service delivery and provide lessons and recommendations thereof.

1.8. Overview of Research Methodology

As research is a systematic quest into a specific topic to discover new and valuable information by questioning the how and what and presenting a logical analysis, the methodology aspect of research is concerned with the actual process of the research, its collection and analysis methods (Saunders, et al., 2003; Creswell, 2007; Goundar, 2012). Giving a comprehensive description of the research methodology, Rajeskar, et al., (2013, p. 1) stated that *“research methodology is a systematic way to solve a problem. It is the science of studying how research is to be carried out. Essentially, the procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology. It is also defined as the study of methods by which knowledge is gained”*.

Additional the above, these authors explained that research methods refer to the different procedures and schemes that can be used in research to collect and analyse samples and data, which can be: qualitative (*non-numerical, applies reasoning and uses words meaning, analysis ordinarily descriptive and exploratory*), quantitative (*numerical, non-descriptive, statistical, analysis ordinarily in tables and graphs*) or both (*mixed-method*) (Rajasekar, et al., 2013, pp. 8-9). Qualitative research, in particular, is non-numerical and is concerned with a deep understanding of the problem and not with a representation of numbers. It is more concerned with the data that cannot be quantified and aims to produce instructive in-depth information (Queirós, et al., 2017). In a qualitative research approach, the researcher may conduct the study using interviews, which may be open-ended or semi-structured (Lowhorn, 2007). On the opposite end, data in quantitative research can be quantified, with the sample size being generally large. Quantitative research utilises structured procedures and formal instruments such as questionnaires for data collection (Queirós, et al., 2017). Therefore, the researcher may conduct the study using surveys or questionnaires in quantitative research within the auspices of the quantitative methodology (Lowhorn, 2007).

The nature of this study warranted a descriptive and exploratory approach within the context of the interpretivist paradigm. Qualitative methods were used to best respond to this study's aim, objectives and research questions. A qualitative approach enabled a more interactive system and engagement with the participants. Moreover, this approach allowed for more quality answers and reasoning from responses as the data in this study was collected through a semi-structured interview. DeJonckheere and Vaughn (2019, p. 2), stated that semi-structured interviews effectively manage the data needed to gather open-ended qualitative data and explore the participants' thoughts. The open-ended questions encapsulated within the interview schedule were constructed to allow the researcher to extract as much information as possible.

In addition to open-ended questions, the interview process allowed follow-up questions during the interviews. In selecting participants, this study targeted employees of the KZN Treasury who have implemented innovative strategies or technological-led operations. The paradigmatic assumptions of this study were further contextualised within social constructivism, because the study enabled an inductive research process. This process was informed by the world view of the study's participants' understanding, lived realities and subjective views on the impact of driving innovation strategies on service delivery performance within the KZN Treasury.

1.9. Scope of Study

Ordinarily, governments are the primary institution responsible for service delivery and development. As governments operate in today's same complex and constantly changing environment Schwab, (2016, p. 66) cautioned that governments are amongst the most impacted by the increasingly transient and evanescent nature of power brought by technologies of the 4IR. Therefore, governments must also adapt to the power shifts because it can help modernise and improve public administrations (Schwab, 2016, p. 66). Following Schwab's prescriptions, the South African government has shown awareness and recognition of 4IR and the innovative technologies accompanying this era. This is reflected in this country's strategic plans. For instance, the South African National Development Plan (NDP), which is a national plan targeting to eradicate poverty and reduce inequality by 2030, mentioned innovation as one of the elements alongside education and training that the government intends to tap into in the battle against poverty and inequality (National Science and Technology Forum, 2019). Some of the strategic promises that the state announced in the PC4IR was the proclamation of the

NDP as the foundation and guide to South Africa's approach to the 4IR, which should inform policies, strategies and plans to accelerate and take advantage of 4IR to advance inclusive and shared growth (Marwala, 2020). Like other forms of transformation, the policy route towards 4IR and innovation strategies will be costly. Therefore, resourcing and budget allocation will need to be aligned and in sync with the government's standpoint of utilising 4IR digital technologies to improve the country's competitiveness, efficiency and service delivery (Marwala, 2020).

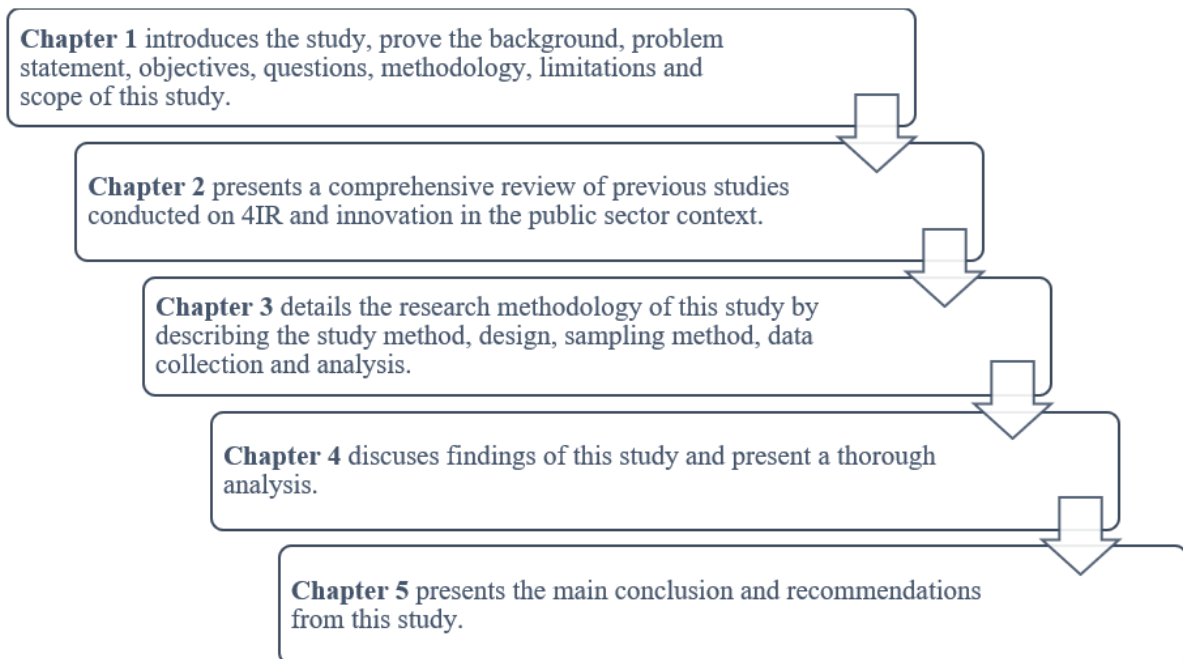
The study focuses on innovation within the public sector looking more particular at KZN Treasury as a base case. The study looks at how innovation is dealt with within the department. It enquired about the types of innovations that have been borne within the department's specific units in this current age of digital technological change. The scope of this study is limited to the KZN Treasury. Within the organisation, (fifteen) 15 individuals were targeted for the interview process from the Systems and IT units and (eight) 8 out of the 15 participated in the study. The study did not include the State Information Technology Agency (SITA), even though this organisation is responsible for coordinating and consolidating IT resources throughout the government departments in SA.

1.10. Limitations of the Study

This study focused on tracing the impact of implementing innovative strategies in services limited to only one department, KZN Treasury. The premise was on finding the use of technologies, ICT to administrate, manage, deliver and monitor services to citizens services to the citizen within (two) 2 specific units of the KZN Treasury. In SA, the SITA is responsible for facilitating and servicing technological systems and applications in government departments. However, the investigation of this study did not include the SITA despite being the government entity that manages the procurement and delivery of IT in government departments which is a considerable limitation. However, this reported exclusion of SITA was purposeful given that the study intended to solely focus on internal operations, which was best to be drawn from the KZN Treasury participants.

1.11. Outline of the Dissertation

Figure 1: Study Outline



1.12. Chapter Summary

This chapter introduced the study into the impact of the acceleration of innovation strategies in service delivery performance within the fourth industrial revolution era by looking at a provincial public institution in KZN as a case study. It presented a background of the KZN Treasury and the state policy standpoint on the 4IR and innovation in SA. Discussions on the industrial revolution showcased how the world has transformed over the years. Arguments from this chapter have shown that the transformation of the world from one industrial era to the next has been driven by knowledge. In fact, new knowledge sparks creativity, leading to innovative technologies, systems or inventions whose introduction or knowledge cyclically triggers creativity to advance the new inventions further. Evidently, the introduced 4IR in this chapter marks the world with complexities and constant change that directly affect individuals, businesses and governments. The direct effect of 4IR calls for understanding and forces organisations to strategically align with the directions of this revolution to take advantage of its opportunities or threats. Having presented these discussions, this chapter leads to the second chapter, which unpacks existing literature on the 4IR technologies and their impact on public service delivery.

2. CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

When conducting research, it is essential to reflect and review previous literature. The rationale is to attain informed scholastic perspective on the subject matter so that the research can be informed by existing knowledge in a subject area (Rowley & Slack, 2004). As a section that carries in-depth information on the study focus area, Rowley and Slack, state that a literature review is typically undertaken in the early stages of research development with the objective of drawing meaning from early and recent work on the subject field and draw summary or analysis and identify existing gaps (2004, p. 31). This chapter analyses, synthesizes and evaluates the literature from journal articles, books and financial reports on the industrial revolutions, focusing on the 4IR and its effect on public institutions. The chapter begins with a comprehensive description of concepts, factors and assumptions and then followed by literature on theories relevant to this study. It further presents an international and local literature viewpoint on digital technological revolution, 4IR and innovation in the public sector service delivery.

2.2. Definition of key concepts

2.2.1. Technological Revolution

Currently, the world is said to be in the most complex technological revolution age, far more complex than the previous revolutions (Valenduc, 2018). Technological revolution can be defined as a dramatic change caused by the quick and frequent introduction of new technology (Bostrom, 2007, p. 129). Similarly, Schwab, (2016, p. 11) defined a technological revolution as strategic disruptor and radical change force in the socio-economic systems that have occurred throughout history triggered by new technologies, new perceptions and ways of doing things. Evidently, technological revolutions are one of the most consequential factors affecting humanity exceedingly as they come with digital technological changes affecting how people live and the world operates (Bostrom, 2007). Today the world is in the 4IR, preceded by the first, second and third industrial revolutions. Figure 2 presents a historical timeline of the revolutions up to date.

Figure 2: Industrial revolutions - Historical Timeline

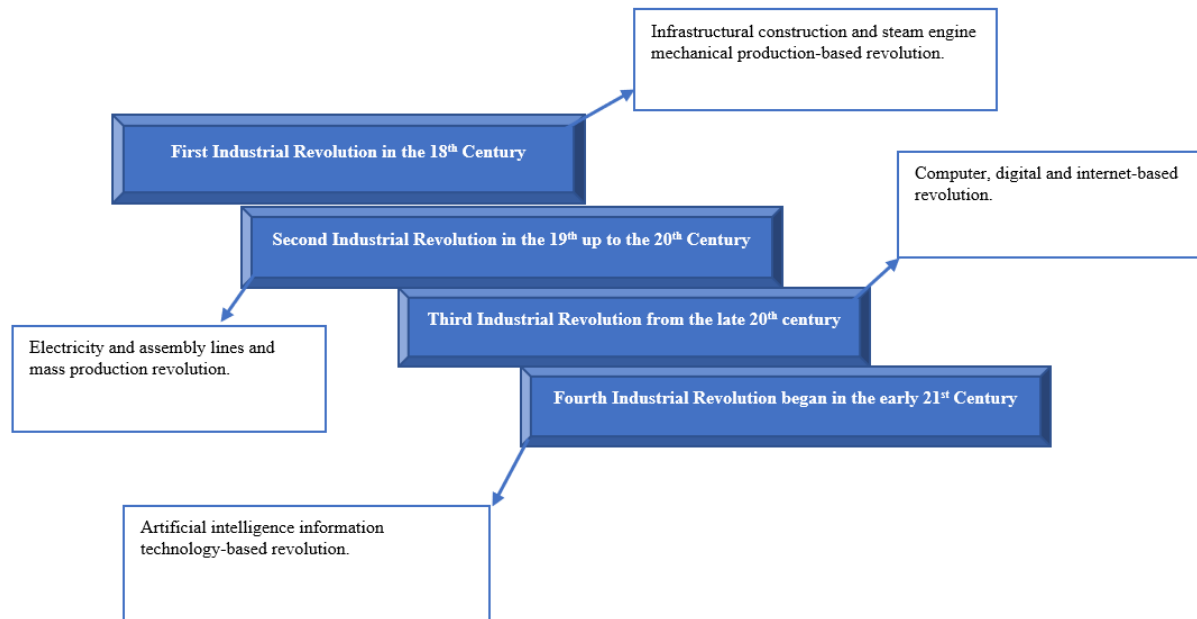


Figure 2 Adapted from (Schwab, 2016, p. 11).

The First Industrial Revolution (IIR) was the discovery and mechanisation of factories, such as the invention of steam engines and the production of iron and steel (Mohajan, 2019). At the time, this was a significant transformation in the forms of production methods shifting from hand to machinery powered by steam, coal, and water (Schwab, 2016). Progressively, the Second Industrial Revolution advanced to automation and the discovery of novel powers or energy sources, resulting in inventions such as electricity, the internal combustion engine, petroleum, and electrical communication (Mohajan, 2020). Moving forward, the Third Industrial Revolution built on the predeceasing revolution's advances and triggered the digital revolution, which resulted in innovations such as information technology, electronics, robotics, and automation (Klaus, 2016). Taking the digital revolution further, the 4IR expanded the computer and Internet, resulting in computer-engendered product designs, computing power, faster internet speeds, 3D printing, biotechnology and countless other things available today in this era (Xu, et al., 2018).

It should be noted that the industrial revolutions and technological advancements that introduced the Internet have evolved over the years since their inception. They have expanded to further digital technological advances, communication, and innovation (Schwab, 2016). The

Advanced Research Projects Agency Network (ARPANET) was the beginning of it all and was the precursor to what is known today as the Internet (Leiner, et al., 2009). For instance, there have been significant advancements in computing power and the developments in Internet speeds. Improvements range from wired connections copper cables to fibre connections to wireless connections edge, 2G, 3G, 4G and now 5G. All these advancements make life easier, promoting development, innovation, acceleration of digitalisation and the promotion of digital economies. The advancement of the Digital (Dig) Economy is closely related to the progress of several cutting-edge technologies with the addition of a few critical software-orientated technologies such as artificial intelligence (AI), blockchain and data analytics, Internet of things (IoT), 3D Printing, cloud computing, Big Data and automation (United Nations, 2019).

Given the diversity of technologies, some authors use the concept of *converging technologies* to explain the “synergistic combination of four groups of technologies: information technology, biotechnology, nanotechnology, and cognitive technologies” (Bashir, et al., 2021, p. 7). These technologies are beyond digital and characterise the current technological revolution. Inventions and innovative technologies of each industrial revolution challenge the status quo and ways of doing things in each era and drive change or transitions following new inventions. For instance, currently, the technology in the 4IR has had a massive impact on the ways of doing things, and industries have come to understand that fundamentally, survival relies upon transforming business models to survive this era (Deloitte Insights, 2020). Technology is presenting multiple push factors to the point that currently the rapid proliferation of technologies presents policymakers with numerous challenges and uncertainties to the temptation that the best strategy forward is to selectively pick technologies that seem promising (Bashir, et al., 2021).

The creativity, inventions and digital technologies presented by each industrial revolution, building up to the current era, cut across all aspects of life, impactfully presenting both threats and opportunities. Their impact leaves room for either adoption or catching up to 4IR technologies. Based on observations, the adoption of 4IR technologies for social and economic development is higher in developed countries compared to the developing world (Sihlongonyane, et al., 2020, p. 11). Making matters worse is that the notion of catch-up by the developing world is quite challenging given the constant technological changes, making it hard to make precise future predictions due to the uncertainty and complex nature of innovation advances (Sihlongonyane, et al., 2020). According to Schwab, (2016, p. 13) “still valid today is the lesson

from the first industrial revolution – that the extent to which society embraces technological innovation is a major determinant of progress. The government and public institutions and the private sector need to do their part, but citizens must also see the long-term benefits”.

Literature shows that the impact of the transformation that comes with each industrial revolution, especially the current 4IR, is great and uneasy to ignore in both government and business environments. Figure 3 outlines some of the impacts of the present industrial era on life's social, economic and cultural aspects. Regarding the potential impact of the 4IR age, Schwab, argued that empowerment is the most significant impact that is likely to result. Advising that governments need to relate to their citizens while businesses relate to their employees, shareholders and customers through transforming existing political, social and economic models and employing innovative strategies and make 4IR work for the people (2016, p. 31).

Figure 3: Some Impacts/Outcomes of 4IR on Communities

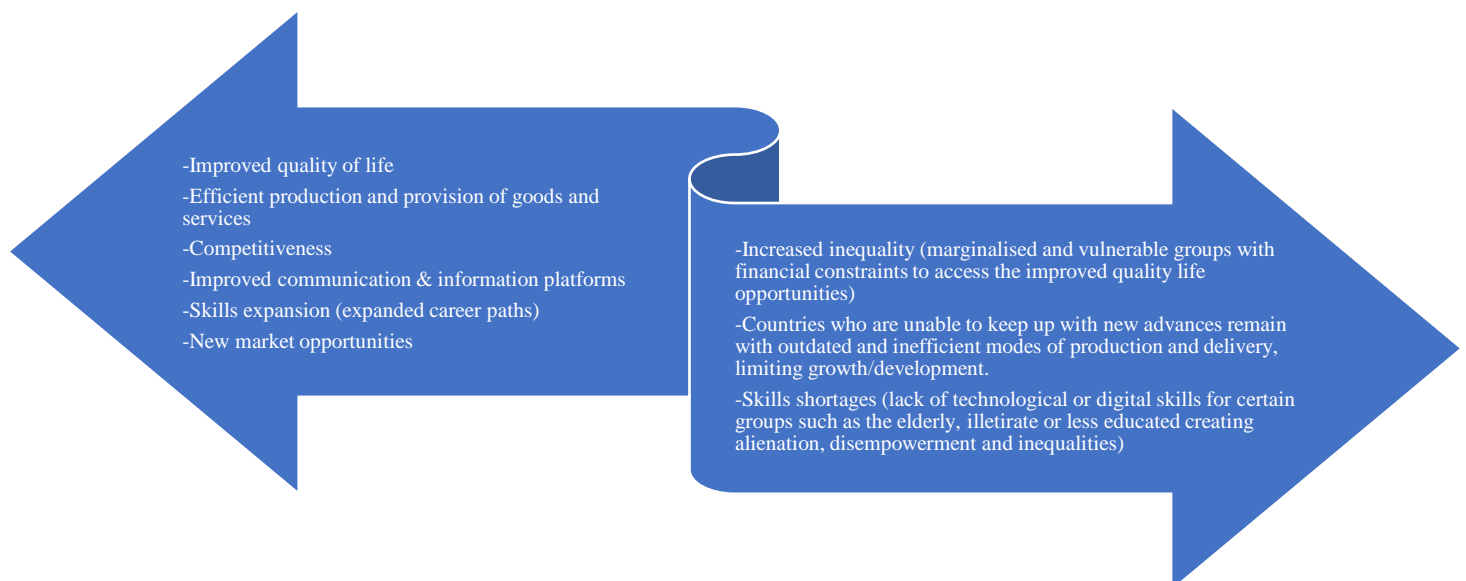


Figure 3 Adapted from: (Schwab, 2016, pp. 86-89).

2.2.2. The Fourth Industrial Revolution (4IR)

As defined earlier in this paper, the 4IR, also abbreviated as Industry 4.0, defines “*the marriage of physical assets and advanced digital technologies—the internet of things (IoT), artificial intelligence (AI), robots, drones, autonomous vehicles, 3D printing, cloud computing, nanotechnology, and more—that communicate, analyse, and act upon information, enabling*

organisations, consumers, and society to be more flexible and responsive and make more intelligent, data-driven decisions” (Deloitte Insights, 2020, p. 3). These digital technological advancements listed under the 4IR definition are primarily associated with efficiency, profitability and improved performance if they are understood and adopted through alignment with organisational strategies. Additionally, the 4IR builds on the Digital Revolution. Still, it takes technological advances further, representing new ways technology becomes embedded within societies. This era is far different from the previous revolutions due to its ability to exponentially fuse the physical, digital and biological dimensions, increasing its impact and forcing the transformation of governance, management and production systems to adapt (Schwab, 2016, pp. 30-31).

Throughout the literature on 4IR, the keywords associated with this era are fast phase progression or advancement and optimization tendencies, constant change, uncertainty, unpredictability and complexity. Perhaps Schwab, was correct to caution that the technology and digitisation of this era were going to affect all aspects of life and fuel a great need for momentous change due to the acute scale and scope of change which can result in disruption or innovation (2016). Moreover, Schwab, (2016, p. 19) compiled various technologies and grouped them into three interrelated categories, namely *physical*, *digital* and *biological*, as megatrends driving innovation in this 4IR; these are displayed in Figure 4.

Figure 4: Megatrends - Technology Developments

Physical	Digital	Biological
Tangible technologies namely: -Autonomous vehicles -3D printing -Advanced robotics -New materials	Digital applications, products or services emanating from the IoT.	Innovative technologies that are used in medicine or healthcare enable groundbreaking inventions or possibilities such as gene sequencing or gene editing.

Figure 4 Source: (Schwab, 2016, p. 19).

2.2.3. Change

Change is at the centre of everything in today’s highly globalised, dynamic and complex world. According to Zorn et al., (2000, p. 10) change refers “to any alteration or modification of organisational structures or processes”. Change is often considered an indication of progress or improvement; the opposite to change is stagnancy falling behind, or inadequacy (Lewis, 2011, pp. 21-22). Defining further, Lewis, explained that change refers to positiveness, improvement, continuous improvements, progress, innovation and being edgy (Lewis, 2011).

Change is a requirement pushed by specific pressure complex enough to demand organisations to adapt or innovate (Reissner, 2010). Moreover, change can be triggered by many factors which can either be resisted or adopted. The listed driving factors of change prove that most changes are closely related to the knowledge and innovations of this volatile era, and their effect cuts across all countries, industries or systems.

Table 3: Change Triggers

Trigger	Example
Changing legal requirements	Labour laws, health and safety, product regulations or environmental protection policies.
Changing customer or client needs	New trends or popular products or services spurring clients' or customers' desires, such as new technologies, new appliances or trending fashion items.
Changes in the availability of financial resources	Changes in investment capital, non-profit funding agencies, and government agencies' administrative priorities.
Changes in skills or labour	Ageing workforce, technological capabilities of the workforce, immigration.
Organisational self-initiated change	Based on internal decisions, some organisations initiate change or innovation stemming from personal choice or strategic direction. Examples include adding new products or shifting from manual to digital or paperless operations.

Table 3 Source: (Lewis, 2011, p. 23)

Change is more of a necessity than an option for organisations to survive and develop forward, which is why change management is a greater necessity (Iskandar, 2019, p. 27). Constant change, predominantly driven by technology and innovation, has made the 21st-century landscape unpredictable, competitive and highly globalised, putting strain on organisational structures (Halal & Taylor, 1999). Moreover, change affects key aspects of institutions, businesses or organisations, such as culture, operations and technologies (Reissner, 2010). According to Schwab, (2016, p. 17) change is unavoidable in this 4IR era, it comes with innovation and disruption, and it requires awareness and alertness of possible effects. Concurring Kasali, (2005, pp. 33-34) explained that change is mysterious and uneasy to handle; it demands extraordinary courage because not everyone can see or realise the change. Therefore, it is important for public institutions to prioritise organisational learning to achieve and sustain change in order to reinvent the government's way of embracing innovation or digital governance (Limba, et al., 2019).

2.2.4. Innovation

Innovation is one of the popular concepts commonly used in business and socio-economic development relative to development or change, especially in strategies or strategic plans. As a concept, innovation derives from a Latin verb called *innovare* or *innovus* which in English means “into new” (Costello & Prohaska, 2013, p. 61). Drawing from its meaning, innovation defines the process or activity of doing something different through improvement in cases of bettering something existing or inventing in instances of new creations, methods or systems with the aim of adding value to the organisation or service (Costello & Prohaska, 2013). In a development-centred context, innovation is an important aspect of development and growth as it introduces efficient approaches to addressing socio-economic challenges such as poverty and health (OECD, 2012). Hence, national governments worldwide have understood the importance of innovation and its ability to push for better public service delivery (Pratama, 2020, p. 26).

Further to the above, innovation can be described as an element of growth in organisations because its application to products, services or organisations can be radical, incremental or directly impact efficiency, quality, human experience and profit (O'Sullivan, 2008). Innovation can also be defined according to the type of organisation or service rendered; Table 4 presents three viewpoints characterising innovation. Within the government or public sector, innovation is concerned with finding and implementing new ways and approaches in services or operations, transforming old structures and embracing new thinking and technologies to impact lives (OECD, 2017).

Table 4: Defining Innovation

Perspective	Definition
Organisational development perspective	<i>“Innovation is the process of making changes to something established by introducing something new that adds value to customers”</i> (O'Sullivan, 2008, p. 4).
Learning and knowledge management perspective	<i>“Innovation is the process of making changes to something established by introducing something new that adds value to customers and contributes to the knowledge store of the organisation”</i> (O'Sullivan, 2008, p. 5)
Broad and extended perspective	Innovation defines inventions, creativity and change where ideas are proposed, designed and transformed into functions or products that can be exploited for opportunities or advantages (O'Sullivan, 2008).

Table 4 Source: (O'Sullivan, 2008, pp. 4-5).

O'Sullivan (2008) cautioned that innovation is not a one-time thing and does not occur in a vacuum; it requires management. Innovation management involves “defining goals, prioritising projects, improving communications, and motivating teams as today’s innovation informs the future, hence the need for continuous drive and sustenance” (O'Sullivan, 2008, p. 5). Concurring with O'Sullivan's assertions, Costello and Prohaska, (2013) explained that innovation is usually associated with costs and risks, and it usually takes time to be lucrative. The uncertain nature of innovation comes from the action being a possible outcome of an idea or approach (Tienken, 2013; Narayanan, 2017). For instance, the Department of Labour underwent a digital transformation in one of its Unemployment Insurance Fund (UIF) services, introducing an online uFiling system. The uFiling is an online system available for employers to register, declare and pay employee contributions digitally and for employees to apply for unemployment benefits digitally as well (Department of Labour, 2018).

This exemplified innovation aimed to replace the existing uneasy manual process and reflected multiple benefits in making the process more efficient. However, reports of technical inefficiencies, glitches and failures of the uFiling system have outshined the positive impact (if any) of this digital transformation based on service complaints or experience from employers and public users reported (de Lange, 2019; de Lange, 2021). This example speaks to Tienken's (2013) description of innovation being a possibility rather than an assurance due to the complex and diverse nature of creativity behind innovation. It makes innovation uncertain and risk-prone because its reforms, restructurings and changes can take time to be adapted and efficiently used.

In a study looking at the attainment of competitive advantage through innovation and knowledge, Urbancová, (2013) discovered that the public and public sectors have different beliefs on the importance or need for innovation, and these sectors have different innovation approaches or cultures. Figure 5 presents some main factors that push the public and private sector innovation approaches. Most importantly, it should be understood that “*innovation is a complex, social process, and not one we should take for granted. Therefore, even though this section has highlighted a wide array of technological advances with the power to change the world, it is important that we pay attention to how we can ensure such advances continue to be made and directed towards the best possible outcomes*” (Schwab, 2016, p. 26).

Figure 5: Sectoral Characterisation of Innovation Drivers

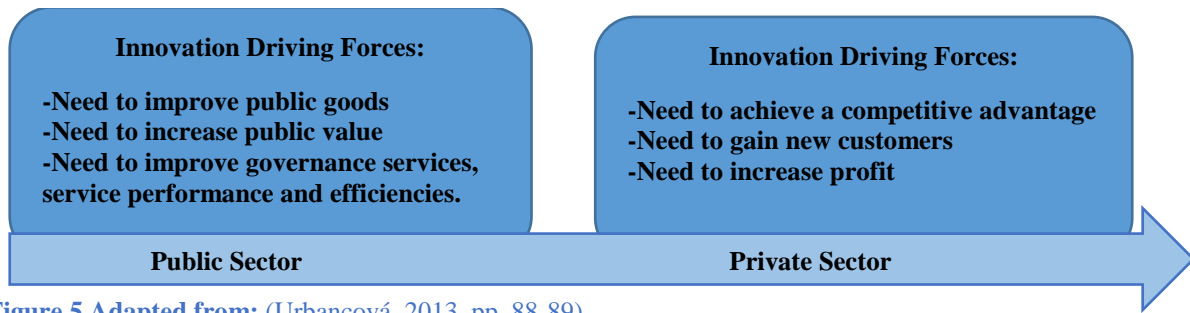


Figure 5 Adapted from: (Urbancová, 2013, pp. 88-89).

2.2.5. Strategy

Operations in organisations, businesses or government departments heavily rely on strategic guidance of frameworks, plans and activities are informed by strategies. Defining the concept, Barad, (2017, p. 3) described strategy as “a high-level plan to achieve one or more goals under conditions of uncertainty”. Barad (2017) highlighted that strategies are essential because they ordinarily entail a set of goals, activities to achieve those goals and necessary resources to execute action or implementation. Taking the definition further, Kvint (2009) stated that a strategy is more of a system of finding, identifying, formulating or developing a doctrine that will work for the organisation sustainably or long term, whose success relies on being followed or executed according to a plan. Successful strategies emanate from a well-informed build-up of the initiation or formulation stage whereby risks are identified, contingencies and corrective action applied when warranted while clear deliverables are set, and a thorough feasibility assessment is done. Within the overwhelming 4IR forces, successfully and efficiently implementing innovative strategies requires strategic orientation. According to Morgan and Strong, (2003) strategic orientation is about building new opportunities through innovation, experimentation and risk in decision-making.

2.2.6. Digital Technology

Digital technology is one of the commonly used and known terminologies. Studies have shown that technology is an uneasy concept to define, given its multiple understandings and perspectives in the various field (Reddy & Zhao, 1990). For instance, the engineering perspective of digital technology positions it as an entity that produces artificial functions, whilst the innovation or technology management’s perspective view technology as a problem-

solving process that changes and transforms the world so that it matches a preconceived idea, plan or design to generate a desired artificial function (Nightingale, 2014, p. 6). Despite being an old concept that first emerged in the 17th century, technology remains one of the most critical aspects of development and change (Nightingale, 2014). Agreeing with Reddy & Zhao as well as Nightingale, one can argue that technology is one of the main elements that support and drive operations, systems and processes that affect daily life and the way organisations do things. The importance of digital technology is undeniable.

According to Burgelman, et al., (1996) technology refers to the theoretical and practical knowledge, skills, and artefacts that can be used to develop products and services and their production and delivery systems. Since its introduction and transformation over the years, technology has significantly improved the way of life, made things easy, faster, and efficient, created opportunities and cut geographical barriers in communication and information (Schwab, 2016). Technology is the primary driver of change, development, and innovation and has evolved over the years. For instance, the decreasing size of computers, innovation of mobile phones, improved internet speed and appliances' automation are some significant technological transformations.

Further to the above, Kumar, et al., (1999) extended that technology has two components, a physical one consisting of tangible products or equipment and the informational component, which is made of intangible aspects such as the know-how in management, and production, marketing and other functional areas. Technology is closely associated with knowledge, and its application or usage is always directed at attaining specific results, solving problems or actioning specific tasks, and it requires knowledge or skill of use (Lan & Young, 1996; Beliz, et al., 2019). In the current industrial revolution, examples of technologies include artificial intelligence, robotics, autonomous vehicles, nanotechnology, biotechnology, materials science and quantum computing (Akileswaran & Hutchinson, 2019; Bashir, et al., 2021). These technologies resonate with Mokyr, (1992) who described technology as something resulting from a distributed co-evolutionary process constituted functions, knowledge, artefacts and their environment that mutually adapt to each other.

2.2.6.1. Blockchain Technology

Blockchain is one of the significant technological inventions of the 21st century. It is a technology that goes against the conventional and ordinary financial or banking systems. According to Sarmah, (2018, p. 23) blockchain is a transparent financial instrument exchange system made up of an open database or ledger with all transactions or digital events that have been executed and shared among participating parties. Blockchain is one of the world's transparent approaches to conducting business which has broken geographical lines. Its transparency emanates from the blockchain itself being a mathematically ensured cyber security technology that can rapidly identify and expose modifications in digital data and intelligent devices, which can be in the form of manipulation, misrepresentation, corruption or misuse of data (e-Estonia, 2022).

Within the public sector, Estonia is one of the countries that employ blockchain technology in its government operations. Estonia began testing blockchain in 2008 and called this technology “*hash-linked time-stamping*” as their testing occurred before the publication of the Bitcoin White Paper, which first coined the concept “*blockchain*” (e-Estonia, 2022). Ground-breaking blockchain technology operations in Estonia began in 2012 as national data protection of e-services and smart devices in the public and private sectors (GovChain, 2022; e-Estonia, 2022). A famous example of blockchain technology is Bitcoin although it has received a bleeding in value from the previous levels of more than 40K in dollars to the current hovering of 20K dollars in 2022 third quarter. Bitcoin is the “digital currency that serves the same functions and purposes as money” (Rigdon, 2016, p. 154). Bitcoin and digital currencies are based on the idea of a distributed trust mechanism called the “blockchain”, a way of keeping track of trusted transactions in a distributed fashion (Schwab, 2016, p. 143). Moreover, Lye, (2017) showed how blockchain technology could foster new approaches to banking and personal finance—by arguing that people might choose to trade with each other in unofficial currencies such as bitcoins rather than in fiat currencies run by central banks. Table 5 presents some of the positive impacts of blockchain technology.

Table 5: Positive Impacts of Blockchain

Increased financial inclusion in emerging markets, as financial services on the blockchain gain critical mass
Disintermediation of financial institutions, as new services and value exchanges, are created directly on the blockchain
An explosion in tradable assets, as all kinds of value exchange can be hosted on the blockchain
Better property records in emerging markets, and the ability to make everything a tradable asset
Contacts and legal services are increasingly tied to code linked to the blockchain, to be used as the unbreakable escrow or programmatically designed smart contracts
Increased transparency, as the blockchain is essentially a global ledger storing all transactions

Table 5 Source: (Schwab, 2016, p. 143).

2.2.6.2. E-Government

E-Government, also called Electronic Governance, Digital Government, or Online Government, is a field that emerged in the late 1990s born out of the internet boom (Grönlund & Horan, 2004, p. 714). It refers to a turnaround approach from manual to digital where governments across the world blended national strategies with technology and use the Internet to achieve national strategies excellently and achieve the goals of being more efficient, offering better services to citizens, and improving the democratic processes (Grönlund & Horan, 2004; Grönlund, 2002; Caetano & Charamba, 2017). Similarly, the OECD, (2003) described e-government as the use of ICT, particularly the Internet, to achieve better government. For instance, most governments in Asia are either implementing or piloting digital health whereby central health information systems are used to improve administrative competency and efficiency or connect doctors, hospitals, and patients by harnessing digital initiatives and converging technologies (Bashir, et al., 2021, p. 34).

It should be noted that e-Government does not refer to the mere internal use of technologies such as computers in government offices to carry out tasks. Instead, it defines the external use of IT systems or online government platforms offering services to the citizens' (Ho, 2002). Elaborating further, Samsor, (2020) explained that e-Government goes beyond digitalising services to citizens, including organisational change and empowerment. It can be argued that the nature of e-Governance services being easily self-accessible to citizens increase people's

trust in government, empowerment and openness. This argument corresponds with the thorough description of e-Government by the World Bank, with stated that:

E-Government refers to “*the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions*” (The World Bank, 2015).

Resonating with The World Bank’s definition, Ritchi, et al., (2016, p. 1) stated that the objective behind e-Governance is achieving clean, transparent and responsive credible public governance. This objective is fitting given the massive investments channelled towards the government's infrastructure and socio-economic development initiatives. Additional to a faster access to public services the promotion of transparency of government functions is one of the most anticipated benefits or impact of e-Government (Kamar & Ongo’ndo, 2007; Ulibarri & Scott, 2017). That said, e-Governance is an excellent asset and tool to accelerate service delivery in a more transparent democratic process, given the corruption and looting of public funds that are commonly reported to be prevalent in government predicated on institution-wide innovation culture.

Most importantly, investing in e-Governance fosters an innovative approach toward public sector development in this fast-changing world. Table 6 shares some examples of e-Government initiatives from various countries. According to Adeyemo, (2011, p. 11) “e-Government may be applied by the legislature, judiciary, or administration, in order to improve internal efficiency, the delivery of public services, or processes of democratic governance”. As a public platform, e-Government is ordinarily introduced, maintained and driven by the state through the relevant department, council or body that deals with the country’s information technology. For instance, in SA, the adoption of e-Government initiatives are introduced in strategic policy frameworks, and their implementation is installed and administered by the SITA.

The implementation of e-Government involves a phase of sequential activities called structures in literature (Mazoka, 2013). For instance, Siau and Long, (2006) listed 6 phases of e-Government implementation: presence, interaction, transactions, transformation, seamless, and e-democracy. While Layne and Lee, (2001, p. 124) presented 4 phases of e-Government named catalogue, transactions, vertical and horizontal integration. Moreover, Siau and Long (2006, p. 48) explained that the classification of e-Government development could be categorised into 4 areas, namely *government-to-customer* (G2C), *government-to-business* (G2B), *government-to-government* (G2G), and *government-to-employee* (G2E). Analysis of these 4 categories is provided in Figure 6.

Figure 6: Categories of e-Government

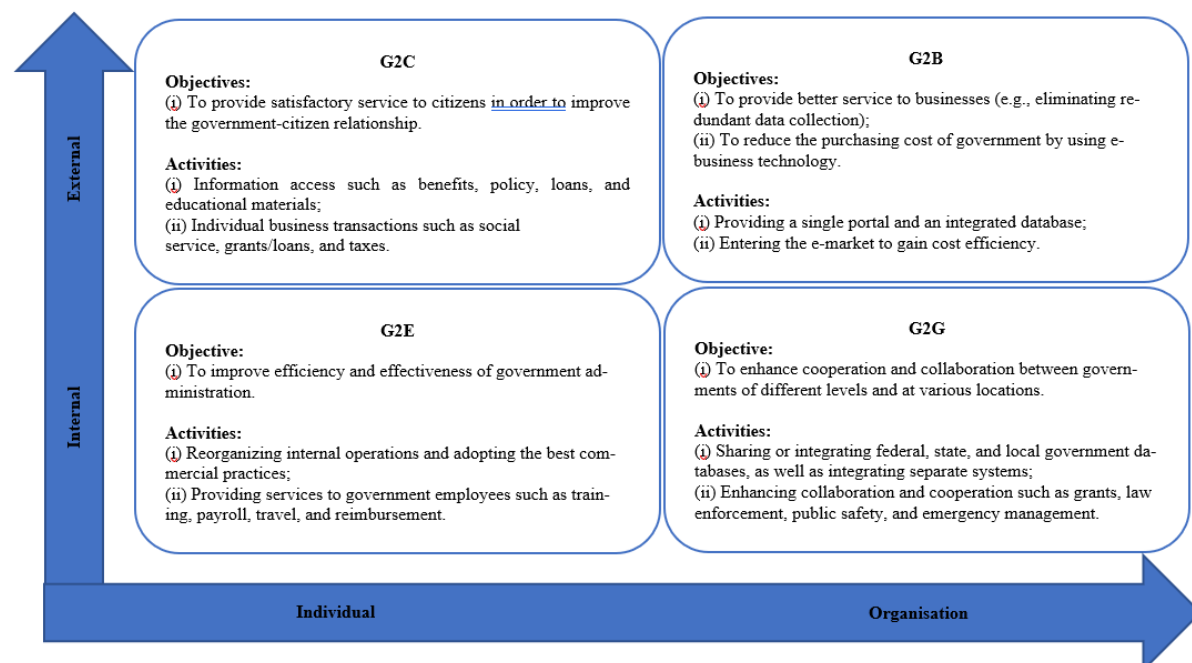


Figure 6 Source: (Siau & Long, 2006, p. 48).

Central to it all, e-Government intends to provide improved platforms for governments worldwide to facilitate and carry out their organisational and external service administration or delivery efficiently and effectively (Siau & Long, 2006; Adeyemo, 2011; Layton-Matthews & Landsberg, 2022). Literature shows that e-Government has been implemented primarily in developed countries. Also, countries which are developing are also gearing up to reaping the benefits of ICT usage in public service delivery; however, most developing countries have a difficult journey of e-Governance due to various challenges such as costs and infrastructure demands (Akileswaran & Hutchinson, 2019; Layton-Matthews & Landsberg, 2022).

Table 6: Global examples of e-Government

Country	E-Government Initiative	Country Experience: Lessons Learned	
		Success Factors	Challenging Factors
Bangladesh	E-health Technology integration into health systems, e.g., digitalised policies to address disparities.	Strong political support for the digital health strategy influenced the rapid growth of these e-government initiatives, particularly e-health standards and interoperable health information exchange platforms.	Mismatch between the availability of e-health services and the unavailability or insufficiency of digital services to overcome the underlying socio-economic barriers to their use, their sophistication or affordability to access technologies.
India	E-education National Digital Infrastructure for Knowledge Sharing (DIKSHA).	DIKSHA is a digital innovation in education that has enabled open architecture, open access, open licensing diversity, choice and autonomy. This initiative's use of internet technologies in education enhanced access to learning opportunities and improved teaching and learning.	The introduction of DIKSHA was not accompanied by teacher or learner involvement, material preparation or school support to integrate its use with the teaching and learning needs and realities. Making it difficult for the less digital literate individuals in public schools. Another observed challenge is the potential exploitation by private sector companies who will offer private tutorship and use it to higher-income families and offer them professional development, which will perpetuate inequalities. This was evident during the lockdown due to the COVID-19 pandemic, where learners who could afford the relevant technologies continued benefiting from e-learning whilst the less privileged in public schools could not use digital public platforms and had to switch to television radio, YouTube, and WhatsApp messages.
Wales	Xchangewales Digital programme for public sector organisations sourcing, tendering, evaluating and purchasing goods and services.	This technological tool and its web-based services are efficient, increasing public sector departments' productivity and lowering business costs.	Absence of an official online catalogue was problematic, and poor information management (budgetary information) and centralisation of services caused a lengthy procurement cycle and authorisation process.
Mauritius	Electronic Delivery of Services 53 public services were taken online, transformation from paper, manual or contact services to e-services.	E-services speed up the public administration process, improved quality of life and create new opportunities. Examples of e-services include: electronic document management, visa, border control, learner's driving licence, work permit applications, and many other public services.	Statistics of citizens with personal computers, internet subscriptions and broadband needed to increase for better exploitation of the e-services, especially for the elderly.
Malawi	Web-based presence First steps towards e-government have been taken and spread across various government departments.	Current practices are based on web-based information dissemination available for viewing and downloading online. This has improved communication and sharing of public information and documents.	Lack of public engagement, interaction or usage of services online and the government has been failing to meet the milestones outlined in the country's strategic frameworks.

Table 6 Source: (Bashir, et al., 2021; EkStep Foundation, 2019; Adeyemo, 2011; European Commission, 2014; Ministry of Information and Communication Technology, 2013; Mazoka, 2013).

2.2.7. Service Delivery

Service delivery as a mandatory factor, is one of the state's public duties of administrating or delivering specific services to customers, citizens, residents or businesses (OECD, 2019). Service delivery is an essential aspect of the government's role because it offers critical services such as healthcare, education, housing, water and sanitation or infrastructure indispensable to the public; hence service delivery needs to be effective, reliable and be the best quality (OECD, 2017). Moreover, the OECD highlighted that the efficiency and quality of service delivery significantly impact government as it determines public trust, integrity and success rate in terms of meeting public policy objectives (OECD, 2019).

The manner in which the private sector or businesses offer services through modernised or innovative systems has pressured governments to shift from reactive to proactive digital service delivery (OECD, 2017, p. 202). In most countries, both developed and developing the state and direction of service delivery during this 4IR era integrate modernisation and innovation strategies to impact public service delivery positively. Technology has been used as a powerful asset that strategically fits the current changes and disruption of traditional service delivery strategies caused by the innovation that comes with 4IR technologies.

2.2.8. Leadership

Leadership is one of the key drivers of organisational success, and it is an important aspect in both public and private organisations. Northouse, (2016) defined leadership as the process where an individual influence a group of individuals to achieve a common goal. In the organisational context, an individual in a managerial position responsible for leading employees can influence them to achieve the organisation's mission, goals and objectives. Successful or effective influence relies on the strategy or approach to leadership. According to Ingraham (2004), the 21st century and its complex changes demand effective leadership driven by flexibility, creativity, innovation and change agency. With that said, Ingraham, proposed that public human resource managers need to initiate leadership development programs that will result in a government workforce that meets the trends and requirements of the 21st century, balanced with abilities to create a positive organisational culture, strengthen motivation, meet

objectives and steer organisations to more productive and high performing outcomes (2004, p. 95).

As organisations operate in the complexity, uncertainty and volatile nature of this technological age, they operate amid disruption as the 4IR trends disrupt long-existing, traditional or normal operating and business models. “The scale, complexity and urgency of today’s challenges call for responsive and responsible leadership” (World Economic Forum, 2019, p. 6). Concerning matters such as the widespread of technologies, leadership strategies require transformative and adaptive approaches to capitalise and use the benefits of 4IR technologies. In the introduction of the 4IR era, Schwab, (2016) cautioned that technological innovation at its highest and fastest growing will fuel momentous changes worldwide. Argued that organisations will be impacted; therefore, leadership awareness, readiness and strategic capabilities to lead in the digital era will be an undeniable necessity.

With the complex nature of technological innovation, organisations must balance managing the present whilst simultaneously managing the hard-to-predict future. According to Urbancová, (2013, p. 82) “organisations’ success depends on employees’ knowledge, experience, creative activity and qualification and emphasis is placed on continuous learning and research and development”. Therefore, it is instrumental that leadership realises the value and potential contribution of a skilled, informed and continuous workforce who can stimulate innovation and help organisations succeed or gain competitive advantage. It can be argued countries that resemble visionary, strategic and proactive governance have aligned state obligations and responsibilities with the modern-day technological innovation trends. These countries adapted and aligned with change instead of being challenged or having operations disrupted by the competitive and complex landscape of the 21st century. For instance, the OECD (2019) argued that in the public sector, politicians and leaders need to recognise digital application, digital data and technology as the heart of the country’s future and best use technologies to understand citizens' needs and design solutions. Indeed, leadership plays an instrumental role in driving innovative strategies for service delivery.

2.3. Theoretical Underpinnings

Theoretical underpinnings are an essential support structure that blends the objectives and overall nature of the study with relevant theories. This section of Theoretical Underpinnings will unpack the narration of the sociotechnical systems theory, change management theories and transformational leadership theory to explain, predict and explore the constructs that are pertinent to this study. Discussions of these theories aim to support the theoretical arguments pertaining to accelerating innovation strategies and using digital technologies in public service delivery during the 4IR era.

2.3.1. Sociotechnical Systems Theory

Organisational development literature widely acknowledges the adoption of sociotechnical approaches to systems development assists organisations with implementing developments that are more acceptable to end-users and deliver better value to stakeholders (Clegg, 2000; Carayon, 2006; Baxter & Sommerville, 2011). According to Baxter and Sommerville, (2011, p. 4) sociotechnical systems refer to an approach to design that considers human, social and organisational factors when designing technical systems to be used by organisations. This is done to ensure a thorough understanding of how human, social and organisational factors affect how work is done. In this manner, technical systems, especially computer-based systems, can minimise risks and failure of technological systems not meeting the intended objectives or expectations of the organisation (Baxter & Sommerville, 2011).

Additionally, Stranks, (2007, p. 100) argued that “sociotechnical systems theory is an approach to the design and management of systems that aim to satisfy 4 closely related objectives, namely user satisfaction, system efficiency, successful system implementation, and effective change management. This approach is ordinarily used in managing organisational change or in certain projects where business process re-engineering may be involved”. For instance, in the context of adopting innovation strategies or technologies in government operations, changing from traditional service delivery operations to online or digital systems re-engineers the normal way of doing things in government or public institutions. This example is made on the basis that sociotechnical systems theory has 2 objectives: “*designing systems that improve the welfare and quality of users' lives and improving the performance of the organisation by adding shareholder value, improving productivity and competitiveness*” (Stranks, 2007, p. 100).

Therefore, applying the sociotechnical systems theory would mean that transformative systems such as e-Government consider user feasibility and relevance to the departments and citizens, then implement appropriate strategies that will be effective and acceptable to the public to the employees.

Arguing further, Stranks, (2007) added that human factors such as job design, work tasks analysis, process improvement, capacity enrichment and self-management in the workplace are some of the critical factors that the sociotechnical approach view when planning to introduce technological change in organisations. This complex view of technological change introduction is driven by the premise that “new systems or technologies should never be designed or implemented without considering the ‘softer’ issues. This means that if the context within which the technology will be used is ignored, overlooked or not properly understood, the technology may fail to be useful to its users. It may be disregarded or actively rejected by operators” (Stranks, 2007, p. 101). This may result in wasteful expenditure given the costs associated with technological infrastructure development and unnecessary frustrations to the workforce and people who are end-users of a digital system. The reported failure of the Department of Labour’s online uFiling digital system, reported by all stakeholders to be inefficient and challenging, is an excellent example of the adverse outcomes that the sociotechnical systems caution or aim to minimise.

The complex nature of the 21st century directly affects how people leave, work and operate. Therefore, any approach or service rendered to the people or organisation must consider the complexities of this volatile era to avoid incompatibility of service with user needs. For instance, digitalisation in government departments should consider the employees' capabilities or skills, the availability of digital resources and external factors such as citizens' access to smart devices or the internet to use online government services. Failure to synch or align the social and organisational elements in innovation strategies will likely result in a less efficient technological transition whereby employees and citizens will opt for traditional or manual systems instead of the new digital systems.

Elaborating further, Clegg, (2000, p. 464) argued that many organisations lack an integrated approach to organisational and technical change; technological developments are often seen as a given thing that employees must conform to instead of being considered as continuous change

that can be embraced. Such an attitude can hinder the innovation's diffusion, dissemination, implementation and sustainability (Carayon, 2006). With that said, Heeks (2005) defined e-Government as a sociotechnical information system. Thus, making the applicability of change, innovation or 4IR technologies adoption or implementation systems in government administration or services necessitates sociotechnical systems approach for better efficiency and success.

2.3.2. Change Management Theories

Change is important to consider in organisations due to today's fast-growing and highly competitive business environment. Over the years, many organisational change theories have been introduced in business management and organisational studies. These various theories of change mostly describe how organisations that modify their strategies, processes and structures through change management tend to maintain effectiveness and organisational success despite change (Hussain, et al., 2018). All these theories emanate from Kurt Lewin's 1947 change model, a fundamental planned change model defining the forces crucial to maintaining the status quo while pushing for change. Whereby organisations balance proactive and reactive organisational change through knowledge sharing and internal willingness stimulated by leadership style when organisations move from the known to the unknown (Hussain, et al., 2018, p. 123). Figure 7 presents the 3 stages of Lewin's Change Theory.

Figure 7: 3 Stages of Lewin's Change Model

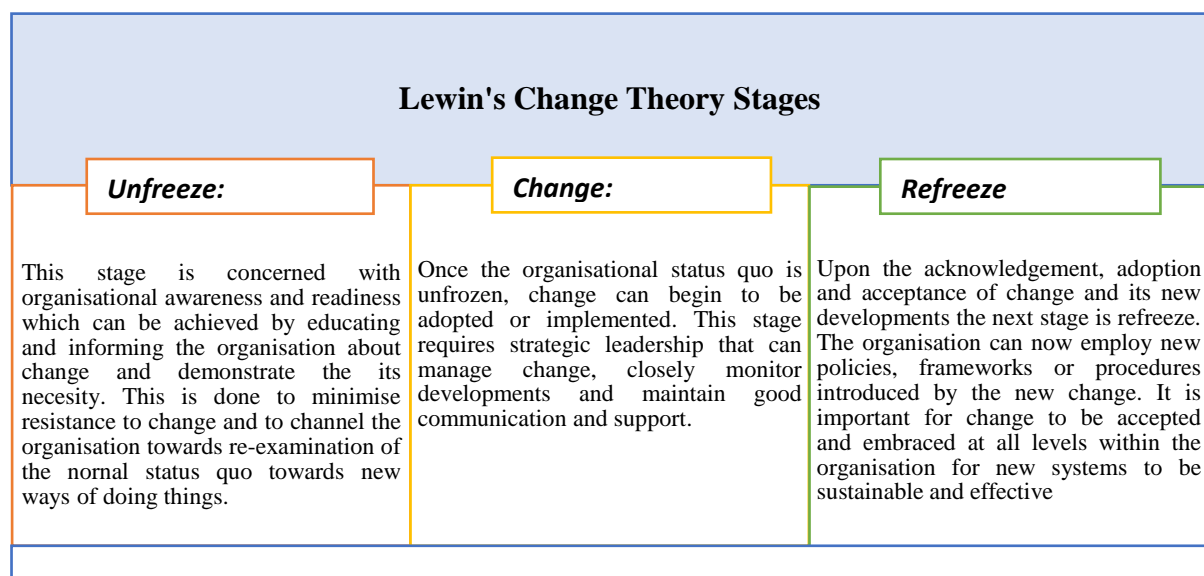


Figure 7 Adapted from: (Hussain, et al., 2018, pp. 124-125).

The stage process to change is a recommended change management approach which can offer actionable or constructive frameworks for managing change before, during and after implementation. Such a planned and leadership-facilitated change approach is necessary for public sector organisations because of the centralised decision-making nature as departments through all government spheres rely on policy framework direction. This is important in government because “planned change is aimed at improving the operation and effectiveness of the human side of the organization through participative, group-and team-based programmes of change” (Burnes, 2005, p. 75). The planned approach to change management assumes that leaders can effectively implement change through a coherent persuasion strategy (Garvin & Roberto, 2005). These authors introduced a 4-step approach to change through persuasion made up of *preparing the organisation for change, framing the turnaround plan by presenting the plan, managing the mood of acceptance during implementation* and preventing backsliding by close monitoring and reinforcing the planned changes (Garvin & Roberto, 2005, p. 25). Figure 8 depicts the 4 phases of change through persuasion.

Figure 8: 4 Phases of Change Through Persuasion

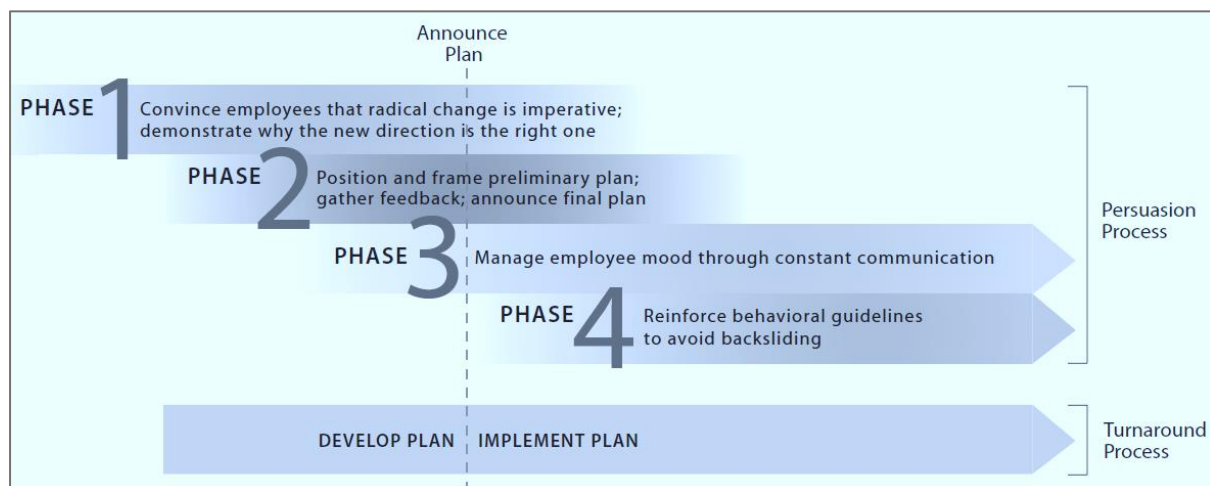


Figure 8 Source: (Garvin & Roberto, 2005, p. 28).

Garvin and Roberto (2005, p. 26) believed that for organisations to adapt to change entirely, they need to move away from responding predictably to the evolving needs. Whereby leaders think that by revamping existing strategies and shifting around the usual staff and resources, then patiently waiting for the performance to improve is managing change. The absence of a planned strategy contributes to poor change management. Adding a related perspective to

organisational change, Harold Leavitt developed a holistic model of organisational change made up of *tasks, people, structure and technology* as 4 interrelated components central to organisational change strategy (Leavitt, 1972). These 4 components are known as Leavitt's System Model, also known as the Leavitt's Diamond (See Figure 9) developed in 1965 as the main overlapping factors that need consideration if the organisation targets integrated change Paghaleh, et al., (2011). In this model, knowledge management, strategic planning and thorough planning before implementing strategies to change are highlighted as crucial for the success of any change strategy (Paghaleh, et al., 2011; Leavitt, 1972).

Moreover, Leavitt, argued that the 4 variables “have many transactions with each other. Thus, changing one of them would result in a regulatory and compensating change in other components” (Paghaleh, et al., 2011, p. 195). For instance, transitioning to digital systems is a complex organisational change as the use of technologies will affect how people perform tasks and change the existing structures with new operating procedures. Therefore, implementing digital or innovative strategies without a holistic strategic alignment that acknowledges that new change will affect various organisational aspects can make change seem burdensome, unnecessary or undesired.

Figure 9: Leavitt's Diamond Organisational System Model

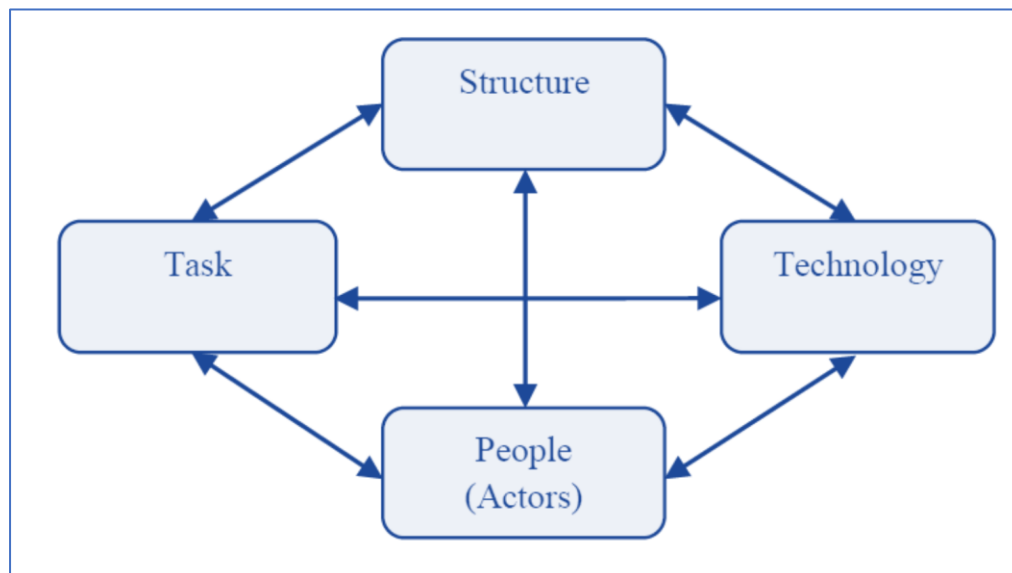


Figure 9 Source: (Leavitt, 1972; Paghaleh, et al., 2011, p. 195).

With the complexities and pace of technological change, organisations need to have leadership strategies that appreciate lifelong learning culture and the upskilling of the workforce with future skills, enabling the development and implementation of effective, holistic approaches that take advantage of 4IR technologies (Deloitte Insights, 2020).

2.3.3. Transformational Leadership Theory

Leadership is one of the main determiners of organisational success or failure in organisations and institutions. Therefore, organisations must select leadership styles and approaches that will drive them to the best performance and competitiveness. As a theory of leadership, transformational leadership is one of the approaches concerned with change making it essential in the 21st-century fast-changing business environment. Korejan and Shahbazi, (2016, p. 452) defined transformational leadership as “leaders who seek to create ideas and new perspectives to create a new path of growth and prosperity in front of the organization”. Moreover, Burns argued that transformational leadership has four components: *idealized Influence*, *Inspirational motivation*, *Intellectual Stimulation* and *Individualized Consideration*, also known as the Four I’s in literature (Burns, 1978; Bass, 1999; Kirkbride, 2006). Bass (1999, p. 11) described these four components as follows:

- Idealized influence refers to leaders with strong role model characters accompanied by a high level of confidentiality and ethical conduct.
- Inspirational motivation defines leaders who can inspire and motivate followers into improved organisational commitment and performance.
- Intellectual stimulation explains the leader’s ability to drive followers to be innovative and creative and to try new ideas, especially when dealing with difficulties.
- Individualized consideration refers to leaders who invest in individual coaching, knowing their followers' abilities, characters, capabilities or even needs for growth, which is empowering and encouraging to followers.

The four components of transformational leadership holistically make transformational leaders to focus on the employees' wellness and the organisational values, ethics, standards and long-term goals (Northouse, 2016, p. 161). In this way, strategic leaders ensure that new developments become positive changes rather than disruption or internal challenges. Moreover, transformational leadership describes leading from the future, where leaders develop new

perspectives and ideas as new paths of growth and ensure the organisation's capability for change (Burns, 1978). Meaning that transformational leadership emphasises strategically inspiring people to do more, be innovative and have a positive work attitude which improves the quality of work life and minimises demotivation and resistance to change.

In the current technological era where changes are fast and difficult to anticipate or predict, making uncertainty, volatility and ambiguity the order of the day, organisations, especially governments, need transformational leaders. To manage change, “the world needs transformational leaders whose actions will enable organisations to improve their performance in a turbulent and unpredictable environment” (Korejan & Shahbazi, 2016, p. 455). Indeed, transformative leadership is crucial in driving innovation strategies within public sector organisations. Especially because leadership approaches in government departments directly impact public service performance, functioning and effectiveness, sound practices from transformative leadership can successfully drive innovation strategies. “Transformative leadership honors the governance obligations of leaders by demonstrating a commitment to the welfare of all stakeholders and by seeking to optimize long-term wealth creation” (Caldwell, et al., 2012, p. 175). This assertion defines the type of leadership needed in the public sector where leaders balance meeting the needs and trust of employees and citizens at large. Caldwell, et al., (2012) characterised transformative leadership as a holistic and strategic approach inclusive of various strengths drawn from other leadership philosophies; see the demonstration in Figure 10.

Figure 10: 6 Leadership Perspectives Characterised in Transformational Leadership

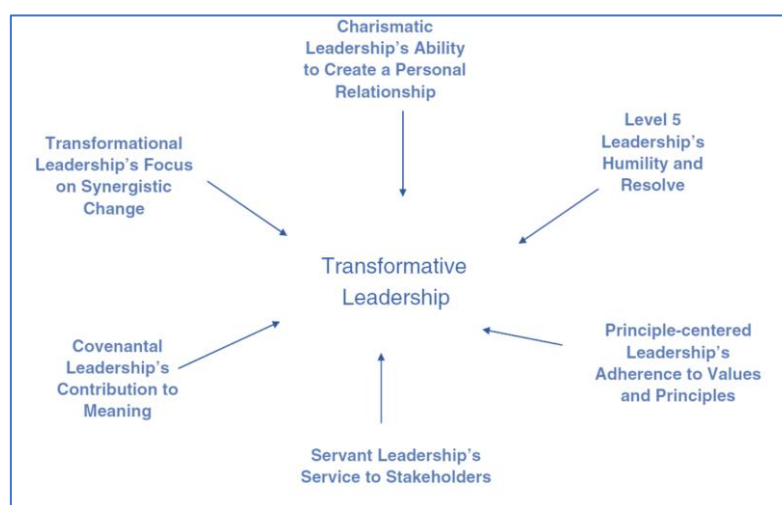


Figure 10 Source: (Caldwell, et al., 2012, p. 181).

Characterising transformative leadership based on the above illustration shows that transformational leadership goes against traditional leadership practices necessary when attempting to survive the current and future demands of this technological era. “In today’s complex organization, leaders face a numbing combination of challenges that demand the ability to manage change effectively” (Caldwell, et al., 2012, p. 184). Indeed, transformative leadership is necessary, instrumental and relevant in this technology-led environment.

2.4. International Overview of 4IR and innovation in the public sector

2.4.1. The Fourth Industrial Revolution

Globally, the 4IR is acknowledged as the most significant achievement for humankind as it has affected all aspects of life worldwide. This technological era has offered optimum productivity and efficiency through automation, expert systems, and artificial intelligence (Anshari, et al., 2022). The 4IR has 4 primary characteristics, namely, vertical integration concerned with smart production systems; horizontal integration concerned with the networks that create and add value; through-engineering, which cuts across the entire value chain; and integration of technologies (Belyh, 2018). These digital technologies, directly and indirectly, affect all aspects of life. For instance, advancements have affected digital humanities, changed employment structures, introduced smart processes and many other technological developments used in homes, workplaces, applications, operations and products.

Schwab, (2016) explained that the 4IR has a different velocity, scope, and systems whose transformation pace is evolving at an exponential rather than a linear pace compared to the previous three industrial revolutions. Additional to the incremental advancements of technologies, Schwab (2016) cautioned that disruptions of this industrial revolution would be felt in all industries and countries significantly as the depth of its changes will affect production, management and government systems. Indeed, in this current industrial revolution, technology plays a significant role in all operations, particularly IT. The primary principle of the 4IR is that all value chains are interconnected by autonomous systems created by intelligent networks of machines and data where operations such as cloud computing are critical (Belyh, 2018).

Further to the above, Belyh, (2018) pointed out 4 elements: the internet of things, the internet of data, the internet of services, and the internet of people as key drivers of the fast-growing

changes witnessed in this 4IR era; examples are displayed in Figure 11. According to Belyh (2018), these listed elements perpetuate the digitalisation of the manufacturing industry and give rise to transformation and new, smarter and advanced technology developments. Concurring, Herold, (2022) contend that the 4IR elements such as IoT have created a shift in the culture of doing things as the exponential growth of devices has become a norm in society.

Figure 11: Four Aspects of the Fourth Industrial Revolution

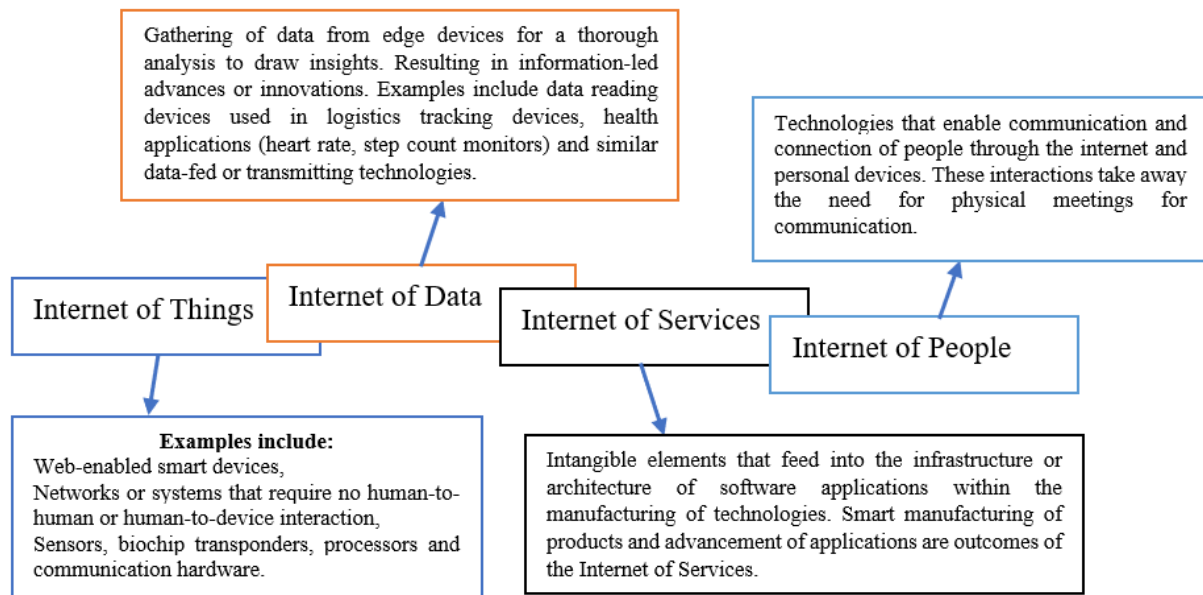


Figure 11 Adapted from: (Conti, et al., 2017; Reis & Gonçalves, 2018; Belyh, 2018; Gillis, 2022).

As an outcome of the 4IR, fast-growing technological advancements and innovations such as the fusion of technologies into physical, social and economic systems come with a mixture of positive and negative impacts. Experience and effect of accelerating innovation strategies vary, especially in service delivery. Literature shows that countries have experienced transformations, developments and positive changes due to adopting 4IR technologies and innovative strategies as good impacts. While at the same time, there are reports of challenges such as the inability to meet change demands, widening inequality levels and skills disruptions which are worrisome impacts. Moreover, “the rapid rate of change has necessitated a re-evaluation of corporate structure and workplace business practices, particularly within the leadership realm” (Herold, 2022, p. 3).

The pivotal role that technology plays in business practices as transformations that come with new technologies affect the industrial landscape is well represented in literature (Belyh, 2018).

Traditional operations tend to be challenged to a point where businesses adopt IT. The world needs to adequately turn these challenges into opportunities and proactively prepare for their impacts (Schwab, 2016, p. 103). Besides business, “innovation can make a difference in addressing urgent developmental challenges such as providing access to drinking water, eradicating neglected diseases or reducing hunger” (OECD, 2012, p. 4).

2.4.2. The Re-evaluation of Public Service Policies

The fast phase of technological change has necessitated organisations to re-evaluate existing corporate structures and workplace practices affecting strategies and work roles (Bashir, et al., 2021; Anshari, et al., 2022). Governments worldwide developed policies and frameworks indicating their understanding of 4IR and strategies adopting innovation and technological-led operations. Globally, various spheres of government started investing in technology and initiatives for electronic government services (de Araujo, et al., 2018, p. 678). Table 7 presents some examples of government policies and strategies from various countries that drive the integration and use of technologies in public service delivery.

Integrating technology in service delivery involves the government realising the need to embrace and better understand the technology and the solutions it can provide. If employed correctly, technology applications can dramatically affect positive change in government services (Holzer & Schwester, 2011, p. 380). Furthermore, understanding technology or ICT advances can inform the formulation of policies, frameworks and strategic plans adopting technology-centred public service delivery. In integrating and adopting technology in service delivery, governments must consider the planning, budget, ICT infrastructure and many other vital processes to make change manageable and effective (Holzer & Schwester, 2011; Kipingu & Shayo, 2021). Moreover, Holzer and Schwester, argued that the digitalisation of government services, e-government or similar initiatives demand the construction of applications to be used to provide services to the people in a new way, adding to the institutionalised policies and procedures (2011).

Table 7: 4IR Influence on Service Delivery Public Policy

Country	Policies and strategies	Background
Nigeria	Science, Technology and Innovation (STI) Policy, introduced in 2012	Committing to research and innovation to inform the implementation of science and technology socioeconomic development projects or programmes.
Germany	<ul style="list-style-type: none"> -High Tech Strategy, introduced in (2006) -Deutschland Digital 2015, introduced in (2010) -High-Tech Strategy 2020, introduced in (2010) followed by an Action Plan High-Tech Strategy 2020 in (2012) -Digitale Agenda 2014-2017 introduced in (2014) 	The various policy frameworks aimed to make Germany the global leader in innovation, manufacturing and supplying of the essential 4IR-related technologies, products and services. The country sought to harness the 4IR for economic and social transformation. This country value learning and experimentation.
Estonia	<ul style="list-style-type: none"> -High-Tech National ID System in 2002 -Public Information Act (2000) -Digital Signatures Act (2000) -Electronic Communications Act (2004) -E-Residency introduced in 2014 -Estonian Digital Agenda 2020 	The state wanted to create a digital government, citizens, and national digital identity. This country's digital policymaking culture resulted in multiple highly cooperative, overlapping networks across the public-private sector. The country made digitalisation mandatory and supported this formalisation by investing in digital infrastructure and driving innovation strategies.
China	<ul style="list-style-type: none"> -National Informatization (Guojia Xinxihua) Plan, introduced in 1997 (5-year rollout plans that began in 2001, for instance, the China E-Government Application Model Project -Government Online Projects (GOP, Zhengfu Shangwang Gongcheng) introduced in 1999 -Golden Projects (Jinzi Gongcheng) -Capital Public Information Platform (CPIP; Shoudu Gongyong Xinxi Pingtai) -Administration Affairs Network (Zhengwu Xinxi Wangluo) 	The People's Republic of China wanted to exploit Internet-based technologies throughout all levels of government to improve administrative and public services. The aim was to advance service quality, enhance the economy and cost-efficiency in socio-economic development strategies.
Brazil	<ul style="list-style-type: none"> -Digital Transformation Strategy (E-Digital) 2018-21 introduced in 2018 -National IoT Plan -Brazil More Digital (Brasil Mais Digital) 	Brazil uses ICT resources to render some government services to the citizens. Adopting technology integration in service delivery emanated from the need to improve management and public administration operations and processes. Additionally, the government wanted to expand access to services, better quality, effectiveness and extend democratic practices on offer.
Norway	<ul style="list-style-type: none"> -Public Administration Act -Regulation on Electronic Communication with and within Public Administration -Digitalisation Circular -Re-use of Public Sector Information -Electronic Signature Act -Population Registry Act -Public Procurement Act -eInvoicing Legislation Regulation FOR-2019-04-01-444 -eCommerce Act No 35 of 23 May 2003 -Electronic Communications Act No 83 of 4 July 2003 	Norway has digitalised most of its public services following prescriptions of the 2017 European Interoperability Framework. This framework outlined 47 recommendations, 68 key performance indicators and implementation monitoring pillars as a digitalisation suggestion to European member states. Each public administration or service taken online was informed by specific legislative guidance. The main aim was for e-Governance to be user-centric, transparent, enable cross-border accessibility and be a key enabler of efficient government services (European Commission, 2020).

Table 7 Adapted from: (Ma, et al., 2005; Lau, et al., 2006; de Laia, et al., 2011; Vassil, 2015; Oyewale, et al., 2017; Naudé, 2017; de Araujo, et al., 2018; Horst & Santiago, 2018; Kattel & Mergel, 2018; OECD, 2020).

Additional to the above arguments, de Laia, et al., (2011, p. 46) stated that “e-Government depends on ICT technical advances, which is marked by innovations, both in management associated with technology and in the technological development itself”. This was evident in Canada when this country had the intent of being the hub for innovative technology. Canada began by taking time to learn and prepare for intended changes and mapped out funding opportunities for innovation and new approaches. Today, this country successfully uses innovative technologies such as blockchain and AI in their digital services and communication (Clarke-Potter , 2019). For instance, Canada began by tasking the National Research Council of Canada to build an Ethereum blockchain explorer. The council developed the Industrial Research Assistance Program (IRAP), which now hosts the explorer on the InterPlanetary File System (IPFS) through services provided by Bit-access, a blockchain start-up and achieves the initial idea of providing a more transparent public administration (Shen, 2018).

Similarly, the government in China intended to improve administrative efficiency and efficiency and then started designing administrative policy reforms detailing plans and strategies to employ ICT to enhance economic development and administrative capacity (Bashir, et al., 2021; OECD, 2019). In the journey to foster administrative reforms through ICT and pushing e-Government as an engine for economic development, China had clear and actionable concepts that informed reform policies: (a) *transforming government functions*, (b) *reengineering the government process*, (c) *enhancing government transparency*, and these distinct concepts directed e-government application throughout all government levels (Ma, et al., 2005, p. 21). Strategic planning for change and policy and systems build-up phase took years before the country began e-governance and ICT use in public services, which were informed by research and development; see Figure 12 for demonstration.

Figure 12: Development of ICT Application in Public Service Administration and Delivery in China

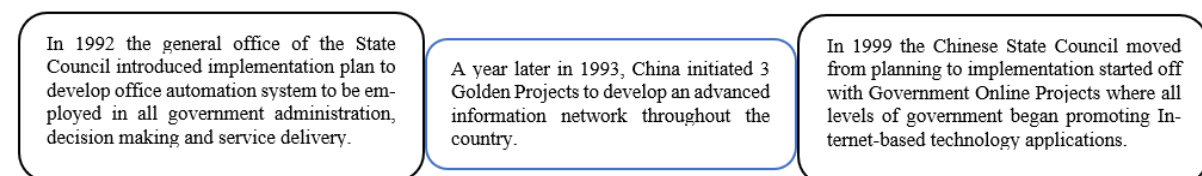


Figure 12 Adapted from (Ma, et al., 2005, p. 21).

Embarking on similar processes, Brazil wanted to adopt and use digital technologies in government processes and service delivery. In this country, “the government sector has been intensively using ICT resources to provide improved management and operations for public administration processes in terms of a greater variety of services for citizens as well as better quality and effectiveness for years” (de Araujo, et al., 2018, p. 677). Brazil set the scene for digital government services by organising and preparing for change, including policy reform and improving access to the Internet for employees and citizens. These were precautionary measures to increase digital skills and digital security to increase public trust and protect personal data before implementing their Digital Transformation Strategy (E-Digital) in most service delivery departments (OECD, 2020). According to de Araujo, et al., (2018, p. 677), examples of government services available for citizens digitally in Brazil include an electronic voting system, systems for filing income tax returns, scheduling medical appointments, registering students at public schools, citizen customer service centres and participatory digital budget.

Despite improving the competitiveness and efficiency of government services through innovative technologies and having the right policies, Brazil face challenges in doing innovative change work as intended. The OECD reported that Brazil made substantial progress over the last decades to prioritise education by offering free primary and secondary school education. However, the country faces low education attainment, which disrupts full exploitation and benefits from digital technologies as low skills prevent citizens and workers from efficiently using the Internet (OECD, 2020). Moreover, the country also fails to recruit technicians, skilled trades, engineers and ICT professionals, which causes low productivity levels and a digital divide (OECD, 2020, p. 19).

The Brazilian digital innovation and transformation state reform had good intentions of enhancing public management governance. Still, it could not ascertain the capacity or ability to efficiently and effectively carry out transformation in practice (de Laia, et al., 2011). As recovery measures, Brazil came up with strategies such as the online education programme named *Brazil More Digital (Brasil Mais Digital)* for technology, IT and ICT skills development and capacity building for youth aged 16-26, the *Pronatec Programme* for vocational training opportunities as well as plans to align university curricula with labour market demands (OECD, 2020). Indonesia followed the regulatory framework route of marrying technology

with public service delivery. According to Pratama, (2020, p. 26) the Indonesian government committed to supporting public sector service delivery through innovation and developed the *Government Regulation Number 38 Year 2017* on local innovation stipulating how local government should conduct innovative strategies in public service delivery.

Conversely to policy or framework-led ICT use in service delivery, Estonia is one of the countries whose digital “success is the product of a national approach rather than a single policy or even a bundle of programmes. Estonia’s digital initiative did not arise from a documented foundational policy or strategy, or even documented discussion and debate, and the country does not have a central office for digital transformation” (Kattel & Mergel, 2018). Additionally, Kattel and Mergel (2018) clarified that the digitalisation of public services was not designed to offer digital democracy, citizen engagement or enhance the country's welfare state. As opposed to a strategy, policy or framework, Estonia’s national approach set a direct objective of creating a **digital state** (*data infrastructure x-road*) and **digital citizens** compulsory (*national digital identification*).

The intention was clearly set on embarking on making Estonia digital, hence the mandatory switch from traditional identification (ID) documents to electronic ID cards, which were compulsory for all citizens (Vassil, 2015; Fabian, 2018). Digital ID cards were the first digital operation of Estonia’s government services designed to have a dual smart process embedded in the card’s electronic chip pins to offer personal authentication and a digital signature for every citizen (Vassil, 2015, p. 4). As most citizens attained digital identification, the government successfully converted public services online as personalised authentication enabled online access to basic infrastructure delivery and services such as individual health records, car registration, tax declaration and political voting (Vassil, 2015). Having targeted the status of being a digital state with digital citizens, it is safe to argue that Estonia’s virtual, borderless and blockchain-secure digital government is an achievement of being a digital state (Kattel & Mergel, 2018). Also, Vassil, (2015, p. 2) posited that the “user-level attitudes and behaviour survey’s evidence suggests that online governmental services are regarded as trustworthy and reliable. Citizens expect their provision, and governmental offices see their online presence not as a choice but as a strategic and inevitable part of their day-to-day operations”, which means that the country has also achieved its goal of having digital citizens.

Despite the absence of innovation, technology policy, designated council or office, Estonia invested in legal norms that guide the security and protection of personal data held in the country's population register database (Vassil, 2015). It can be argued that the Estonian Personal Data Protection Act (1996) and the Population Register Act (2000) are good examples of legislative frameworks that increase public trust in e-government services use as it regulates the government and its employees on ethical access and use of citizens private information. Furthermore, Estonia's leadership in the digitalisation of public services demonstrate a strong interplay between planning and implementation as one of the factors leading to this country's digital success. This argument is made on the basis that there are countries that developed strategic frameworks and policies for ICT use in service delivery but have minimally actioned the planned policy objectives.

The OECD, (2019, p. 3) contended that “people, firms and governments live, interact, work and produce differently than in the past, and these changes are accelerating rapidly”. Public sector innovation's importance and positive impact motivate national governments worldwide to implement innovation policies to improve public administration and services (Pratama, 2020). Globally, primarily in advanced western democracies, innovation in the public sector has become a political and administrative agenda which is now diffusing in developing countries (OECD, 2019). The re-evaluation of service delivery public policies by the various governments throughout the world indicates that the experienced unprecedented change brought by technological advancements requires innovative approaches.

2.4.3. Innovation in Public Services: From Traditional to New Operations

The 4IR and its unprecedented technological advances affect the ordinary ways of living, working and interacting. These advances demand new principles, operations, protocols and policies to accelerate technological advances' positive and inclusive impact while minimising the negative consequences of change (World Economic Forum, 2018, p. 4). Now, more than ever, organisations, especially governments, need to take a more agile approach to the use and governance of technologies as traditional policy development methods fail to catch up with the pace of technology innovation which requires transformation (World Economic Forum, 2018). Issues such as bureaucracy, lobbying for strategic buy-in or approvals, and staff or citizen resistance must be considered when adopting innovative technologies in government

operations. Estonia's successful digital plan proves that introducing new technological processes requires the complete support of all stakeholders. In this country, national ministries, institutions, agencies and departments across all levels of government supported and accelerated Estonia's strategy of using ICT to develop a well-functioning, safe and secure country with society and economic development driven by innovation (Misheva, 2021).

According to Arshad and Su, (2015, p. 1807) globalisation, technological innovations and competition have changed the global economic order, which presents opportunities and challenges, calling for innovative approaches that take advantage of the new changes to enhance efficiency and competitiveness in service delivery. As a result, of innovation due to technological advancements, competition and globalisation, customer service is under pressure as citizens' demands are more refined; service departments must improve service standards (Arshad & Su, 2015; Mishra & Geleta, 2020). Strategies such as China's Government Online Project exemplify the role of publicising government functions, rules, operations and processes to the public, especially new operating procedures under office automation (Ma, et al., 2005). Such strategies increase citizen awareness and trust in Internet-based operations and meet citizens' expectations increased by this digital and modernised economy (Schulze, 2019).

Additional to public awareness and exposure to technology use in public service, to make new government systems work, most countries invested in gearing up citizens and employees. Initiatives from Estonia included the state offering computer skills training to scholars and the adult population. The government pledged to equip all schools with computers and offer free computer training to 10% of the adult population by 2000 (Schulze, 2019). These initiatives were initiated two years before the digital ID and e-services rollout. At the time of the introduction of new systems, the number of Estonians with computer and Internet skills had increased to 91% (Schulze, 2019). These initiatives enabled Estonia to be a digital republic known for its ICT success, such as the development of Skype, which was later acquired by Microsoft and is now used globally (Kattel & Mergel, 2018, p. 1).

New government operations in Estonia that are recorded to be accessed online millions of times by individuals, businesses and employees include online tax services, digital vote casting, electronic health (digital medical records and digital prescriptions) and access to government

documents. Moreover, services such as e-schooling, health insurance services, electronic document signing, electronic birth certification, mobile parking, e-business registration and all government services, including defence, judiciary and transportation, are available digitally accessible to citizens via their digital ID linkage (Kattel & Mergel, 2018; e-Estonia, 2022).

Similar to Estonia, Norway has digitalised most of its public services and heavily invested in legislative frameworks, as presented in Table 7. Furthermore, strategic guidelines such as the White Paper on Digital Agenda for Norway emphasise the compulsory and important need for public administration to embrace change, accompanied by the National Cyber Security Strategy and a National Strategy for Digital Security Skills for the safe use of technologies as well as (European Commission, 2020). Moreover, this country takes a proactive approach to innovation as in 2020; it introduced the National Strategy for Artificial Intelligence to assist the government “to progressively adjust it in line with technological and social developments” (European Commission, 2020, p. 15).

Examples of services delivered online in Norway include: trade and industry business registry, land registry, a technical platform named Altinn used by the public sector for data exchange across departments, access databases with forms, population data and use it for reporting, eIDs used for person-sensitive services such as e-health. Overall, the e-Government services are available in the economic, education, health, culture, environment, social services, public housing, technical services and transport, and communication departments (European Commission, 2020, pp. 33-34).

Countries beginning to adopt ICT and innovation in public service delivery, such as Latvia, start with small steps limited to government communication and information sharing with citizens (OECD, 2021). Latvia began with a national-wide innovation strategy under the Information Society Development Guidelines Framework and invested in citizen digital skills initiatives such as the digital skills upgrade and the Information Society Development Programme, which offers public basic skills training (OECD, 2021). These training, such as the Third Father’s Son programme, were rolled out in public libraries where computers, the Internet and free- WI-FI are accessible (OECD, 2021). The OECD further report that Latvia offers distant learning or school continuity programmes for low-skilled individuals, employees, and small and medium businesses available to urban and rural citizens (OECD, 2021).

Digitalisation and innovation are still limited in Latvia, given that digital technologies used in the public sector are limited to basic tools. Therefore, the digital skills upgrade initiatives help accelerate digital transformation, increase understanding of government e-services and reduce regional disparities. Moreover, this country's strategic approach involves equipping workers with skills matching innovative operations such as teleworking, e-commerce, and telehealth adopted in the public sector administration and service delivery, especially during the COVID-19 pandemic (OECD, 2021, p. 18). Examples of online services are limited to telephone and online healthcare consultations and government announcements on official websites in Latvia. It is important to note that innovation strategies should be concerned about responding to the why, how, reason and cause that requires change, adaptation, improvement or intervention (Serrat, 2012, p. 1). Therefore, initiatives that are not advanced or which are limited to basic technological use should also be acknowledged and considered as a good route into the acceleration of innovation strategies.

Arshad and Su, (2015, p. 1808) explained that for service innovation to work, organisations need to understand their targets, the consequences of stretching out the organisation's service range, and fully understand the competencies, skills and knowledge required. In this way, technology developments can be seen as less of a threat to government control. New systems, processes and approaches to government administration and service delivery can achieve intended objectives and be accepted by employees and citizens if well planned and facilitated by leadership. Moreover, successful implementation and acceleration of innovation strategies need to understand that argued that *“innovation is something that is new, capable of being implemented, and has a beneficial impact; it is not an event or activity; it is a concept, process, practice, and capability that defines successful organizations. Therefore, innovation in the public sector can help create value for society”* (Serrat, 2012, p. 1).

2.4.4. Leadership Capacity

Leadership is an important aspect of organisational success (Herold, 2022). Leadership is instrumental in accelerating the utilisation of ICT, technologies and Internet systems in government service delivery. Disruptions associated with the complexity of the 4IR affect organisations and shift the leadership landscape and approaches (Deloitte Insights, 2020). In a study looking at leadership competencies in the 4IR, Mdluli and Makhupe, (2017, p. 2) argued

that “leaders today need to apply a different set of leadership competencies to successfully navigate their organisations through the rapid changes underpinned by new business models, increasing customer complexities, millennial labour force and the ‘internet of everything’ that we are experiencing with the 4IR”. These competencies can equip leaders with the relevant skills to navigate disruptions and change, be flexible, transformative, and quickly respond to the situation in an agile and adaptive way (Mdluli & Makhupe, 2017). A holistic account of leadership dimensions demanded by the 4IR is drawn from the World Economic Forum, (2017; 2019) presented in Figure 13.

Figure 13: 6 Leadership Dimensions for the 4IR

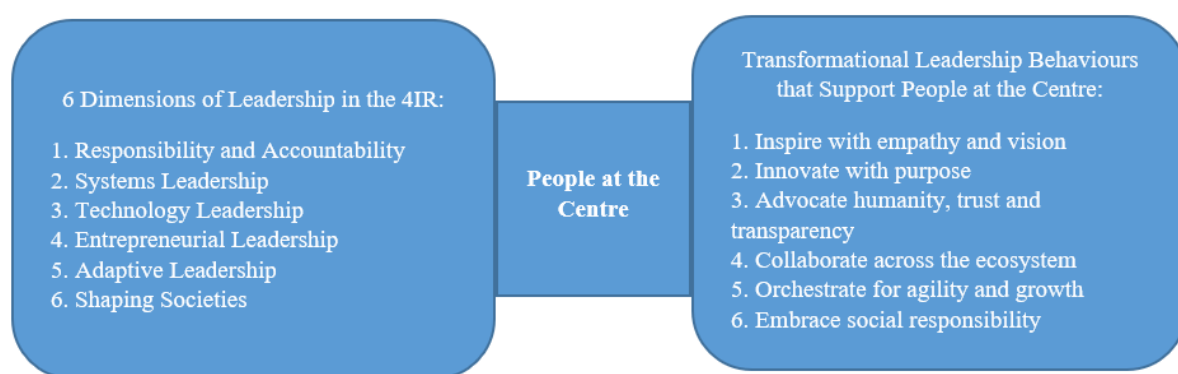


Figure 13 Adapted from: (World Economic Forum, 2019, p. 7).

These 6 dimensions of leadership and transformational leadership behaviours apply to government leadership as they take a people-centred approach. Recently, the world faced the Coronavirus (COVID-19) global pandemic, which disrupted normal operations in all aspects of life, including access to public services. The COVID-19 pandemic restrictions, especially of movement, demonstrated the need for strong leadership in organisations and governments that could manage change amid disruption. Sazzad, et al., (2021) argued that considering the COVID-19 challenges posed to communities and businesses, the world needs strong leadership to empower governments to address community challenges innovatively regardless of the magnitude of imminent threats such as the pandemic. Literature shows that India employed innovative and strategic leadership such as *Netnography* to gather citizens' views and experiences from online and social media communications to respond better to the needs of the people (Mehta, et al., 2020).

Another leadership approach that strategically reacted well to the crisis was observed in Singapore. Abdulla and Kim, (2020, p. 770) explained that Singapore's response to the COVID-19 challenges was a learning-driven and coordinated leadership approach, especially to healthcare services. These authors describe that Singapore used a three-phase approach to "learning": in-between learning, trial-and-error learning, and contingency learning, which resembled proactive change management and strategic leadership. The country observed trends from various countries, learned from their experience and developed preventative measures instead of reactive approaches. India and Singapore's leadership approaches to unique and complex challenges demonstrate the necessary visionary, strategic and transformative approach to government public service. These examples resonate with the viewpoint of innovation as "the art of making hard things easy. It is a collaborative, structured process that involves different parts of the organization and outside partners creating and exploiting new opportunities and finding new ways to solve complex problems" (Ernst & Young, 2017, p. 1).

Leaders need to be aware of the global changes caused by the 4IR. Within the public sector, Deloitte, (2018, p. 20) argued that successful transformational innovation could only succeed if it is wholly or partially accepted or sponsored by the top leadership. Therefore, it is instrumental for leaders in the public sector to evolve themselves by being capable of engaging, shaping and creating strategies and solutions within complex situations. Furthermore, Serrat, (2012) emphasised that innovation in the public sector must respond to the relentless market pressures, competitiveness, skills and resources changes and have effective strategies for mitigating risks associated with change. Indeed, public sector innovation requires strong leadership to facilitate and navigate service administration and successful delivery.

2.4.5. Examples Showing Impact of innovation in the public sector

The public sector needs to constantly innovate to keep up with the fast-changing pace of this world (Deloitte, 2018, p. 5). Innovation helps countries adapt and improve services delivered to the people; it assists governments in managing crises better and reduces costs and political demands (Mulgan, 2014; Filgueiras, et al., 2019). Moreover, innovation in the public sector organisations can create value in primary areas that drive government operations, such as the provision of services that are needed by the people and having a state with an innovation consciousness with capable and strong leaders at all levels of government (Bason, 2010).

Furthermore, innovation can foster good governance, which consists of governments who are transparent, willing to learn and flexible in adopting good ideas wherever they can get them through consideration of citizens' views and Private Public Partnerships (Mulgan, 2014). The World Economic Forum and Kearney (2018) advised that innovation positively affects public and private sector leaders working together at national, regional and global levels to promote productivity and inclusive growth.

Global reports show that innovation achieved from the use of technologies, Internet-based operations, and ICT, especially in countries with the relevant infrastructure, has: *decreased inequality and exclusion to public services, improved communication and citizen engagement, and made services such as healthcare, education and economic development accessible and efficient especially in high-income countries* (World Economic Forum, 2018). For instance, in Latvia, innovation strategies contributed to the reduction of ICT skills shortages, made this country realise gaps such as lack of digital technologies in socioeconomic challenged groups, ICT specialist shortages, and pinpointed the workforce and management digital capacity levels (OECD, 2021). Furthermore, innovation in the public sector has been associated with making governments more competitive; it has been linked to the improvement of service quality and improved trust between citizens and governments (Arshad & Su, 2015).

4IR technologies in service delivery have influenced countries such as Denmark, Estonia, China and Malaysia to improve security and risk management avenues. These countries invested in digital security strategies, protection of citizens' personal information and the inclusion of private companies in developing a digital strategy, given the successful track record of innovation in the private sector (European Commission, 2014; OECD, 2019). Moreover, innovation in government services has increased the culture of a joint corporation and multi-stakeholder citizen-focused approaches to service delivery. For instance: France and Israel policy coordination agency or Germany and the Netherlands multi-sectoral engagement in cyber security policy formulation where they considered telecommunications, health, finance, transport and energy sectors to maximise efficiency and minimise regulatory constraints (OECD, 2021, p. 130). In Germany, Horst and Santiago, (2018) cited innovation as being responsible for a sustainable and adaptable approach to the provision of resources, cumulative learning, experimentation, intensified public-private interactions, economic transformation and knowledge sharing.

Reporting on Indonesia's experience, Pratama, (2020, p. 37) cited the policy enthusiasm for amalgamating technologies in public administration, resulting in decreased socio-economic challenges, especially in the healthcare and education sectors. Other studies have linked innovative strategies with accelerating human capital outcomes, whereby adopting technologies improves working conditions, productivity, risk mitigation, monitoring and evaluation, and organisational performance (Heeks, 2005; Ma, et al., 2005; Ndung'u & Signé, 2020). Furthermore, Mulgan, (2014, p. 3) cited the easing up of bureaucracies in government operations as one of the positive outcomes caused by innovation and technology adoption as its systems makes governments more open, transparent, easily monitored and accountable.

Embedding converging technologies in service delivery is reported to have positive and negative impacts in South Asia. Bashir, et al., (2021) explained that in most South Asian countries, especially in India, innovation strategies advanced healthcare access and delivery, and digital learning improved the education sector. However, these authors noted that the high use of technologies by private companies is a threat that exacerbates the inequality gap between the social classes (Bashir, et al., 2021). This threat was noticed during the COVID-19 period when private schools and hospitals efficiently delivered services while a few public sector institutions could not efficiently operate (Bashir, et al., 2021). This practical challenge of inequality is not limited to South Asia or socioeconomic classes, it expands to the rural versus urban communities, literate and low skilled, and it can even be linked to age dynamics where the elderly can be left behind or not excluded by innovative technologies when compared to the technology savvy persons. Hence leading institutions like Deloitte advise governments to understand the pressures of innovation advances and inform the public sector to use balanced approaches when adopting transformation or innovation strategies (2018, p. 3).

2.4.6. Developing Countries 4IR Experience

The 4IR introduced digital tools, technologies, and business models such as analytics, virtual reality, blockchain, cloud environments, mobile solutions, machine learning, connected devices, the sharing economy, and digital ecosystems, which fuels disruptions in various industries (Mdluli & Makhube, 2017, p. 2). Literature shows that most developed countries have exploited technology and its tools rather than letting it be disruptive, and as a result, these countries have achieved considerable growth and development (Akileswaran & Hutchinson, 2019; Anshari, et al., 2022). Countries and organisations that aggressively pursued planned

goals during and despite the volatility, uncertainty, complexity, and ambiguity (VUCA) of the modern day without letting disruptive forces redefine targeted vision and strategies attained the highest payoff from the 4IR era (Mdluli & Makhupe, 2017).

Attainment of efficiency in public services and improved standards of living by digital economies has enabled developing countries to see the value of innovation capacities. Some countries have begun building up, investing, learning, adopting and catching up to innovation to foster growth and efficient public governance (OECD, 2012, p. 4). Despite the intention, aspiration and attempts to create innovative and digital economies through technology, developing countries, especially in Africa, still have many bridges to cross, starting with infrastructure development, urbanisation or modernising industrialisation processes (Naudé, 2017). Failure to do so can be disastrous as it can potentially increase threats such as job losses, re-shoring manufacturing to advanced economies or financial losses instead of affecting growth and efficiency (Naudé, 2017, p. 1). Schwab, (2016, p. 113) cited employment losses, privacy issues and low trust in digital or online services as some of the challenges to be expected with the adoption of 4IR technologies. Perhaps, these challenges pose more risks in developing economies than in developed ones.

Despite the reported threats and disruptions associated with the 4IR technologies or innovations, some African countries, such as Kenya, have been making great strides in adopting innovative strategies in service delivery. According to Kamar and Ongo'do, (2007, p. 4) in 2004, the government of Kenya channelled US\$25,500,000 towards the launch of the e-Government strategy that was to be implemented between 2005-2010. Outcomes of the Kenyan government's investment in taking some of the government operations online are listed in Table 14.

Table 8: Innovation Initiatives in Kenya

Outcome	Description
Official online government website	Nationwide accessible government website with 19 Kenyan ministries uploading government information for public access.
Improved education access	- African Virtual University offers some public universities e-learning programmes on computer literacy and Internet connectivity. -Ministry of Education website enables primary and secondary school learners to access school results via the Internet or short text message (SMS).
Efficiency in service delivery through ICT	Some departments such as Health, Kenya Revenue Authority and the Kenya Ports Authority use technologies to improve the phase of service delivery.
E-democracy	Digital voting, online political campaigns, online voter registration and communication of election results.

Table 8 Source: (Kamar & Ongo'ndo, 2007, p. 5).

The above-reported innovative strategies implemented in Kenya are not without challenges. These innovation achievements were accompanied by a myriad of problems such as: uncertainty about whether strategies achieve intended objectives, whether they are helpful to all citizens regardless of gender, race, class, location, language or economic status, and insufficient information from the government (lack of transparency or secrecy), low technology literacy in the country and uneven and shortages in network and Internet standards, regulations and distribution (Kamar & Ongo'ndo, 2007, p. 7). It can be argued that some of the reported issues challenging Kenya's innovation efforts fit the description of factors that hinders innovation success reported by the European Commission, (2020) as: *incoherent planning, budgeting and assessment methods, imposition of new and unproven strategies top-down to departments without awareness, consultation and readiness as well as lack of reliance on research and development in the adoption of innovation*. Additionally, to the European Commission's suggested innovation failure causative factors, Mulgan's 5 factors hinder public sector innovation, as presented in Figure 14.

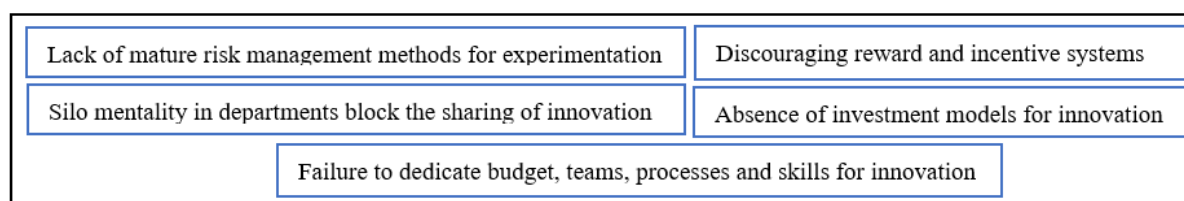
Figure 14: Factors That Hinder Innovation in The Public Sector

Figure 14 Adapted from: (Mulgan, 2014, p. 4).

2.5. Overview of 4IR and Innovation in the South African Public Sector

2.5.1. The Socioeconomic Context of South Africa

SA is a developing country characterised by high inequality, increasing poverty and unemployment, which cause significant vulnerabilities and related socioeconomic challenges (Nwosu, et al., 2021). The current socioeconomic state of SA is a legacy of the apartheid regime which laid inequality foundations that today haunt the country and trap the preciously disadvantaged groups in a virtuous circle of poverty (Futshane, 2021). As it stands, the South African economy is uniquely shaped by the country's colonial history, which contributes to the stagnant low economic growth, perpetuating the poverty, unemployment and inequality commonly known as the country's triple challenges (Habiyaemye, et al., 2022, p. 1).

The 2021 Statistics South Africa mid-year population estimates put SA's population at 60,14 million, with 80,9% of the population being Black African people and 11, 52 million people belonging to the KZN province (Statistics South Africa, 2021). A deeper demographic profile of the country shows that SA still has a long way to go in closing the inequality gaps. For instance, the socioeconomic development indicators presented in Figure 17 show that the legacy of past injustices is still traceable, and they perpetuate inequality. The large number of people relying on social grants speaks to the level of poverty, while the increased number of persons who cannot read and write at the age of 60 and above identifies with adults who had limited education access during apartheid. The democratic government that came into administration in 1994 has been deploying various development initiatives through service delivery to bring about change and reduce inequality (Habiyaemye, et al., 2022).

Figure 15: Income and Literacy Function Profile

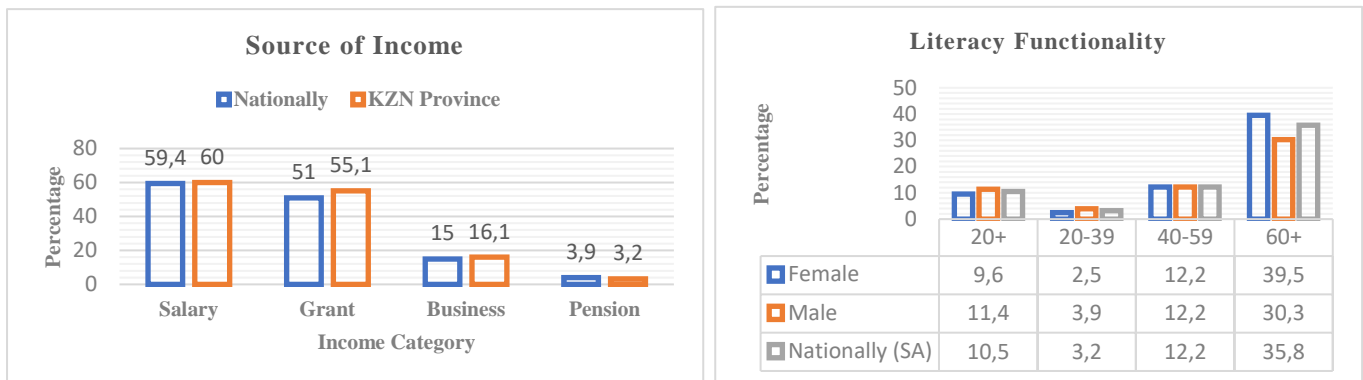


Figure 15 Source: (Statistics South Africa, 2021, p. 22 & 49)

Part of the government's socio-economic development agenda is using innovation to turn around the nation's current state (CSIR, 2022). This government commitment is cited in the primary strategic plans for the country, such as the NDP, where education, training and innovation are marked as instrumental weapons that the state aims to utilise in the plan to reduce the climbing levels of poverty and inequality by 2030 (National Science and Technology Forum, 2019). The current state of service needs and socioeconomic status of most South Africans point out that many citizens depend on state services. For instance, regarding access and use of healthcare services, statistics show that most South African citizens visit public clinics (Statistics South Africa, 2021). Thus, pointing to the need for efficient, effective and quality public service given that most of the population relies on state services. Table 9 presents a compilation of 4 socioeconomic indicators profiles of the percentage of people out of the total population drawn from the 2021 household survey.

Table 9: Socioeconomic Indicators Profile

Healthcare facility consulted in case of injury or illness				
	Public Hospital	Private Doctor	Public Clinic	Pharmacy
Nationally (SA)	6.1%	23.2%	65.6%	0.8%
KZN Province	4.9%	17.5%	73.9%	0.5%
Telecommunication device type available in households				
	None	Landline	Cell phone	Cell and Landline
Nationally (SA)	2.2%	0.8%	90.8%	6.5%
KZN Province	3.3%	0.8%	86.3%	9.6%
Internet Access available at home				
	At Home	At Home (Rural)	At Home (Urban)	At Home (Metro)
Nationally (SA)	10.4%	1.2%	8.8%	17.2%
KZN Province	6.4%	0.2%	10.0%	10.2%
Internet Access at Work or Education Facility (schools or higher education institutions)				
	Education Facility	At Work (Rural)	At Work (Urban)	At Work (Metro)
Nationally (SA)	13.6%	4.6%	17.1%	26.1%
KZN Province	14.4%	3.2%	22.3%	27.9%
Internet Access via Mobile Devices				
	Metro	Urban	Rural	
Nationally (SA)	73.4%	73.7%	59.2%	
KZN Province	83.5%	80.8%	57.8%	

Table 9 Source: (Statistics South Africa, 2021, pp. 23-46).

According to Layton-Matthews and Landsberg, (2022, p. 56) in addition to being visionary, proactive and cost-effective, technology harnessing in the public sector needs to sync with critical or immediate service demands and developmental needs of the country. For instance, the presented statistics on Internet access and telecommunication devices used by South African citizens should guide innovative strategies to avoid implementing strategies that will not be useful or accessible to citizens.

Arguing further, Layton-Matthews and Landsberg, (2022) concurred with the idea that technology can result in growth and advancement but contends that even so, technology needs to be articulated and integrated with the existing service delivery platforms in agile ways. For instance, South Africans receive most public services through welfare approaches where government incurs the costs; it would be ideal for government to accompany e-Governance

with zero-data access or public Internet access. In this way, the state could realise the objective of technologies by “creating greater access to information, enhanced communication and networks, broader community participation, more capacity for access to goods and services, and more significant innovation opportunities” (Layton-Matthews & Landsberg, 2022, p. 56).

2.5.2. South African Legislative Frameworks Guiding Innovation

Strategic and legislative frameworks and plans guide all development initiatives in SA. Development policies, procedures and frameworks also shape the acceleration of innovation in service delivery. Table 10 compiles some strategic frameworks and programmes concerning creation in SA. These frameworks and programmes aim to be the government’s stepping stones to the diffusion of IT as a tool to improve the public administration of state services and operations (Habiyaemye, et al., 2022).

Table 10: South African Strategic Frameworks Guiding Innovation

Strategy Frameworks and Programmes
Electronic Communications and Transactions Act, 2002 (Act No.25 of 2002)
Public Service Corporate Governance of Information and Communication Technology Policy Framework (2012)
National Cybersecurity Policy Framework for South Africa (2015)
National Integrated ICT Policy White Paper (2016)
National e-Government Strategy and Roadmap (2017)
White Paper on Science, Technology and Innovation (2019)
National Knowledge Management Strategy Framework (2019)
KwaZulu-Natal Digital Transformation Strategy 2020-2025
Centre for Public Service Innovation (CPSI)
Presidential National Commission on Information Society and Development
Innovation for Poverty Alleviation Programme
Information and Communication Technology Governance and Management
E-Enablement and ICT Service Infrastructure Management
Information and Stakeholder Management
Knowledge Management and Innovation

Table 10 Adapted from: (State Security Agency, 2015; Department of Telecommunications and Postal Services, 2016; Department of Telecommunications and Postal Services, 2017; DPSA, 2018; KZN Office of the Premier, 2020).

According to the Presidential Commission, (2019) it is important for the government to fully understand the 4IR and formulate the kind of balance needed to use its science and technology to produce economic competitiveness and citizen wellbeing. Formulation of programmes, plans and strategies on ICT and innovation is one of the indicators showing the state's commitment and prioritisation of innovation in public services. To demonstrate a historical count and strategic transition of state initiatives on the use of technology in public administration and service, Figure 18 gives frameworks informing e-Governance in SA.

Moreover, Table 11 presents sector-specific future projections of the use of technologies in public services.

Table 11: Sector Specific 4IR Technologies Utilisation Projections

Energy	Water and Sanitation	Health	Agriculture and biodiversity	Mining
Digital and smart energy planning and supply, storage, transmission and 3D printing of energy infrastructure.	Smart water and sanitation systems, real-time meter systems and smart hygiene solutions.	Telemedicine, Big Data supported predictive health analytics and advanced medicine.	Agro-informatics and automation.	Automation and robotics, digital rock mapping and other 3D virtual analytics.

Table 11 Source: (Presidential Commission, 2019, p. 30).

Figure 16: South African e-Government Evolution Profile

<p>1995: White Paper on the transformation of public service was released. This White Paper proposed the creation of a number of new and additional structures, including the Presidential Review Commission (PRC).¹</p> <p>1995: White Paper on the transformation of public service was released. This White Paper proposed the creation of a number of new and additional structures, including the Presidential Review Commission (PRC).²</p> <p>1997: a White Paper on transforming public service delivery was released labelled as the Batho Pele White Paper. The purpose of this White Paper was to provide a policy framework and a practical implementation strategy for the transformation of public service delivery. The DPSA was instrumental in the development of the eight Batho Pele (put the people first) guiding principles which should be taken into consideration in the implementation of e-Government in South Africa.</p> <p>1998: the Presidential Review Commission (PRC) released a report which detailed the PRC's main findings and recommendations in relation to the operation, transformation and development of the South African Public Service. Chapter 6 addressed the problems that were associated with Information Management, Information Systems and Information Technology in the public service. As a consequence of the recommendations of the PRC, the DPSA was granted the administrative responsibility for ICT in government. The formal ICT governance framework of Office</p> <p>2011: NDP introduces a single cohesive strategy to ensure diffusion of ICTs in all areas of society and economy.</p> <p>2012: SITA developed an e-Government Framework and started offering e-services.</p> <p>2014: establishment of the new Department of Telecommunications and Postal Services and transfer of e-Government mandate from DTSP and SITA</p>	<p>of the Government Chief Information Officer (OGCIO), SITA and Government Information Technology Officer's Council (GITOC) was established to proactively bring value to government in terms of ICT use for internal administrative applications and general government service provisioning to citizens and business entities in society.</p> <p>1999: The Thusong Service Centre programme of government was initiated to extend services of government to outlying areas where people live. The primary focus has been rural and underserved communities with the aim of providing citizens with access to government services and information.</p> <p>2001: the DPSA produced an e-Government policy document entitled 'Electronic Government: The Digital Future – A Public Service IT Policy Framework'. The DPSA also released the first version of Minimum Interoperability Standards (MIOS). MIOS specifies the technical standards and policies required for the achievement of interoperability of ICT systems across the public sector.</p> <p>2002: Electronic Communications and Transactions Act (ECTA) was promulgated.</p> <p>2004: the DPSA established an e-Government Batho Pele Gateway which is a publicly accessible, central government services information portal.</p> <p>2007: Information Society and Development (ISAD) Plan by DTSP adopted with emphasis on e-Government.</p> <p>2015: Gauteng and Western Cape provinces developed their provincial e-Government Strategies.</p> <p>2016: approval of the National ICT Integrated Policy White Paper, with emphasis on digital transformation of public service and the need to develop a National e-Government Strategy and Roadmap.</p> <p>2016: Development of the National e-Government Strategy and Roadmap.</p>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Figure 16 Source: (Department of Telecommunications and Postal Services, 2017, p. 9).

The above frameworks facilitate internal, external and intergovernmental implementation and operations of G2G, G2B and G2C processes using technological tools and systems (Department of Telecommunications and Postal Services, 2017). These services include: *G2G Systems*- the Basic Accounting System, Logistics Management System, National Population Register, Social Pension Fund, Police Crime System Administration, and Electronic National Transport Information System. *G2C and G2B*: The South African Revenue Service e-Filing, Department of Labour u-Filing and the Department of Home Affairs Track and Trace (Department of Telecommunications and Postal Services, 2017, p. 7).

2.5.3. Service Delivery in South Africa

Service delivery is the mandate and responsibility of the South African Government in SA. Previous discussions in this literature review have demonstrated the positive impact of technology in public service and administration in making government services more effective. The local literature outlook also indicated that the South African government intends to use ICT to address socioeconomic development challenges such as poverty, unemployment and inequality. However, SA is “faced with challenges including poorly developed infrastructure in rural and township areas, connectivity and internet accessibility, high-cost upgrading existing IT infrastructure systems and replacing them, and energy instability are seen as an obstacle for the digital transformation” (KZN Office of the Premier, 2020, p. 8). Moreover, Habiyaemye, et al., (2022, p. 10) acknowledges the legislative commitment to technology absorption and innovation while raising the sad reality that the state’s “ability to translate policies and plans into significant changes to the country’s economic and social priorities remains relatively slow”. This, shows that adoption and acceleration of innovation strategies may require less policy formulation and more government investment in 4IR technology infrastructure and systems.

To maximise innovation responsiveness, the country's strategic direction needs to consider a wide range of factors. Layton-Matthews and Landsberg, (2022, p. 56) argued that *“In many contexts, the agility factor required for creative and innovative responsiveness to this technological advancement is lacking. This is especially evident in many public sector environments, particularly in developing countries, who experience a critical shortage in resources, high levels of poverty and unemployment, a lack of education and skills, as well as limited access to technology within wider infrastructural and geographical contexts”*. This

argument speaks to the need to align innovation strategies with the country's context to minimise the culture of developing unimplementable policies with unrealistic goals. This argument emanated from Bason, (2010) who introduced the innovation pyramid (see Figure 19), which advised public leaders to consider internal and external factors that may increase or decrease the ability to innovate. According to Bason, (2010, p. 25) the barriers and potential to innovation lie in considering the political and structural conditions, such as how the change will affect management, staff, end-users, resources, budget and the degree to which it affects democratic principles. Furthermore, Bason (2010) advised that public needs or the organisation's needs must link with the objectives of an innovation strategy and consider both internal and external contexts. Moreover, at the organisation level, innovation should take a participatory and transparent process, inclusive of the needs and values of stakeholders; overall, innovation or new ideas should put the well-being of the people and culture at the centre (Bason, 2010; Xu & Tang, 2020).

Figure 17: The Innovation Pyramid

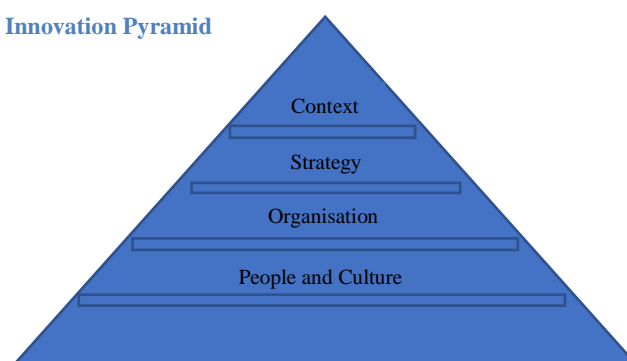


Figure 17 Source: (Bason, 2010, p. 25)

2.5.3.1. Traces of Innovation in Service Delivery

Throughout the various spheres of government, there are various technology-led approaches for service delivery from different departments. Initiatives vary per department and province mandate. In the country, the Western Cape and Gauteng Provincial governments are said to be leading in adopting e-Governance on service delivery; Gauteng even has a Department of e-Government (KZN Office of the Premier, 2020). In the KZN province, various government departments implement different innovation strategies in multiple operations, mainly work-based or internal processes and service delivery. The KZN Transformation Strategy document specifies that the various initiatives implemented by other provincial departments are basic

integration or implantation of ICT solutions for service delivery because the province does not have an e-Government initiative yet (KZN Office of the Premier, 2020, p. 8).

One of the most successful and widely acknowledged e-government initiatives in SA is the SARS Electronic Filing (eFiling) system, introduced in 2001 and has since undergone significant transformation in service offerings (Jankeeparsad & Jankeeparsad, 2017, p. 121). eFiling is an online system that allows taxpayers, practitioners, and businesses to register for free, submit returns and declarations, make payments, and communicate with SARS safely and securely online (South African Revenue Service, 2022). Jankeeparsad and Jankeeparsad, (2017) position of eFiling as an excellent example of an efficient e-Government system is based on the growth and system improvement that has occurred to this system since its introduction. Figure 18 marks the transitioning phases of the eFiling design, which characterise development, flexibility and adaptive driving principles.

Figure 18: Evolution of SARS eFiling

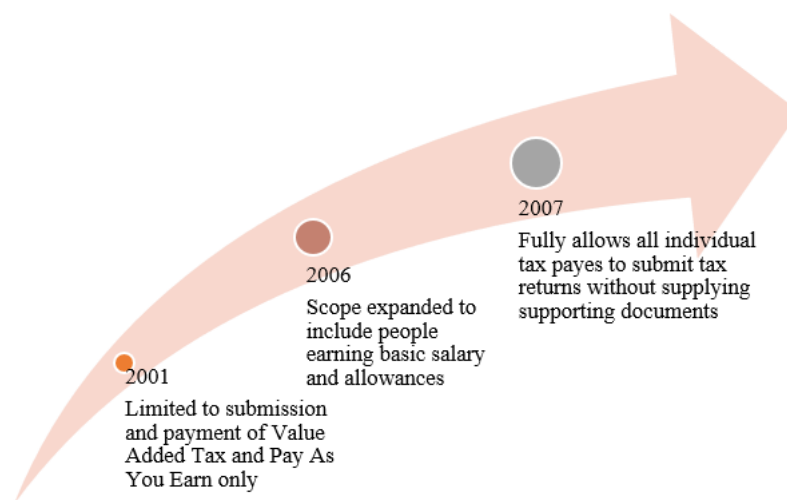


Figure 18 Source: (Jankeeparsad & Jankeeparsad, 2017, p. 121).

Another significant innovation initiative that was nationwide in SA was the transitioning from the green barcoded ID to Smart ID cards with optic variable ink, Line ID and a PDF417-type barcode introduced by the National Department of Home Affairs (DHA) (Magoma, 2020, p. 7). This change from the old ID system to the card system was driven by safety and security issues such as fraud, forgery, identity theft and other similar identity scams such as fake marriages that were prevalent and challenging in SA (Magoma, 2020). Several studies have

assessed the effectiveness of the ID card system in reducing identity-related fraud. They all conclude that the Smart ID solution does not prevent or reduce the prevalence of identity fraud and crime (Kamble, 2018; Junie, 2019; Magoma, 2020). The case of the reported rising incidents of shortcomings and security threats from the introduction of Smart ID cards speaks to what Ostrowick, (2021) cautioned as the risk and neglect of moral obligation by the government. According to Ostrowick, (2021) the SA government is bound by the moral duty gazetted in the Bill of Rights to protect citizens from certain harms and to provide specific benefits in the form of human rights. Therefore, government initiatives, especially those driven by technology, should abide by the ethical and moral duty to protect, promote justice, not discriminate and improve the citizens' well-being instead of increasing threats or harm.

The National Department of Health (DoH) initiated mobile health initiatives such as the *MomConnect programme*, designed to promote and educate women on antenatal and post-natal healthy practices. This programme is available during and after pregnancy to mothers who visit public health institutions. It is reported that over 5 million mothers were registered with MomConnect as of 31 March 2019 (National Department of Health, 2019, p. 16). Presenting an internal initiative, the DoH has a mobile *Stock Visibility System* that enables electronic tracking and management of hospital and clinic medicine stock (National Department of Health, 2019). This innovative strategy assists with informing health facilities on real-time stock status.

At the provincial level, the KZN Department of Health (KZN DoH) initiated a digital recording system named Health Patient Registration System (HPRS) Project. This project is a prerequisite step toward developing a patient Electronic Health Record system (National Department of Health, 2019, p. 14). The process of transferring patient records to the registry has begun. Still, the continuation of the electronic health record system is yet to be developed, pending diagnostic, treatment and billing factors due to budgetary issues and other important elements such as cybersecurity, human resource capacity and connectivity costs (National Department of Health, 2019). As previously noted, successfully implementing this innovation requires ICT infrastructure and broadband network or Internet procurement.

The use of technologies requires specific technological tools and skills (Arshad & Su, 2015). The KZN Department of Education (KZN DoE) realised the need and importance of integrating

technology into the schooling system. The OECD, (2021, p. 18) highlighted the benefit of skills development as one of the benefits of imbedding technology, especially the Internet, through introducing technologies to replace traditional teaching and learning tools. The KZN DoE began the journey toward using ICT in schools by providing ICT infrastructure and resources for school administration in all public schools in the province (South African Government, 2015). The department reported that over 1500 ICT resources such as computers, tablets, laptops, and interactive whiteboard digital projectors were provided from 2012-2014 to improve teaching and learning. Moreover, this infrastructural provision was made in partnership with private companies such as Vodacom network company and Sentech (South African Government, 2015). This initiative is a step closer to the national objective of paperless classrooms or e-education aimed at by the national Department of Education.

According to Thakur and Singh, (2013, p. 45) the province has a KZN Nerve Centre in the Office of the Premier. This centre introduced the KZNOnline, an information management system designed to provide automated and comprehensive monitoring and evaluation of service delivery in the province that can monitor internal performance, root out corrupt practices and promote transparency. The KZNOnline is a one-way platform displaying information to users without engagement options. Thakur and Singh (2013) marked this site as static due to limited interaction or updates since 2012. Perhaps questions of capability, willingness, value for money and responsibility of managing the website will be questioned, given the costs associated with website development and maintenance.

The various innovation strategies such as the Electronic Fraud Management system jointly developed by the KZN Treasury SITA and Datacentrix, the Department of Transport's smart technology on the Gautrain service and other similar services improved by technology support the governments' efforts towards innovation. The KZN digital transformation strategy emphasises that "digital Transformation is a driving force for innovative, inclusive, and sustainable growth which requires improving the standards of service quality and increasing the overall efficiencies of the government" (KZN Office of the Premier, 2020, p. 1). Given this declaration, the role of digitally transforming government services intends positive and efficient impacts on service delivery. Therefore, policymakers and leaders must employ informed and strategic initiatives; one of the ways is to understand the South African context's strengths, weaknesses, threats, opportunities and threats (SWOT). Table 16 illustrates a SWOT analysis from the KZN digital transformation strategy document.

Table 12: KZN Province SWOT Analysis for Innovation

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> • Skills (youth and institutions) • Progressive policies and strategies. • SA Connect Model • Political will • Change people's mentality/mindset • Young and dynamic populations. • High innovation and technology potential • Universities, research institutes, and the business sector developing high quality technologies, processes, services, and innovative products. • Good entrepreneurial spirit • Good technological equipment • Process and incremental innovation 	<ul style="list-style-type: none"> • KZN landscape-Deep rural areas that entrench the Digital Divide. • Poor implementation reactive, not proactive governance. • Lack of incentives for innovation. • Lack of innovation. • Fund rationalisation/redirection of budget. • ICT is viewed as an expense. • Lack of digital skills • Corruption • Poor Governance • Corporate culture is not conducive to mitigating challenges. • Localisation (lack of buying local) • Cybersecurity • Digital colonisation • Over-representation of SMME's • Low breakthrough in innovation • Lack of strong relationships between research and business. • Lack of a strong management culture. 	<ul style="list-style-type: none"> • SA Connect partnerships to connect the province. • Strong ecosystem and network for efficient intermediations between demand and offer. • Digital skills development • The opportunity of specification due to the digitisation of low skilled workforce • Young and dynamic population with the potential to drive digital technology within the province. • Transfer research results into industrial value-added processes. 	<ul style="list-style-type: none"> • The public and SMME's fear implementing the digital process because of suspected job loss. • Lack of digital education and ongoing training for marginalized communities. • Outsourcing • An increasing global competition • Lack of research/enterprise collaboration • Reduction of opportunities for high skilled jobs with high remuneration. • Cloud computing services remain marginal within the province, despite the technology credibility and maturity, the quality of the offers of the hosts. • Weak research in the private sector. • Lack of talents in the digital economy, especially developers and recruitment of suitable staff. • SME's lacking resources for the implementation of new technologies.

Table 12 Source: (KZN Office of the Premier, 2020, p. 13).

2.5.4. Lessons learned

It is evident that the “success of these e-gov initiatives is conditioned on access and predisposition to using ICTs which make this interaction between the government and civil society possible” (de Araujo, et al., 2018, p. 677). The observed challenges reported in the various countries as associated with the acceleration of innovation strategies in service delivery show that it is not enough for governments to blindly formulate policies and embark of digital transformations without thorough feasibility and risk assessments. Information and knowledge are crucial to pinpointing major issues that will make innovative technologies or digitalisation of public service administration and delivery fruitless. The OECD, (2019, p. 3) proposed a coherent and cohesive government approach consisting of key elements that governments should consider when developing reform policies that can better respond to the digital transformation and make it work for growth and well-being. Similarly, de Laia, et al., (2011, p. 47) presented a conceptual model made up of key mechanisms that should drive e-Government policies institutionalisation in government departments. Figures 19 and 20 illustrate the two proposed strategies that can shape technological innovations or e-Governance in the public sector.

Figure 19: OECD Going Digital Integrated Policy Framework



Figure 19 Adapted from: (OECD, 2019, p. 3).

Countries that employed strategic thinking, planning and leadership accompanied by risk and change assessment or management anticipated possible challenges and failures of technological integration in service delivery and proactively put mitigation measures in place. This argument resonates with Mulgan, (2014, p. 18) who concluded that “for public sectors to become more adept at innovation, they need to treat it with the same seriousness they deal with handling risk, financial controls or regulatory enforcement”. Table 7 presented some precautionary strategies that assisted some countries in making innovation and technology play their planned and intended roles. For instance, these strategies showed how Malaysia led from the future by anticipating the inequalities that the world emanates from digital transformation free of educating training and capacitating employees and citizens and providing relevant infrastructure to increase access to digital services. China and Estonia’s coherent and cohesive whole-of-government approaches enable these countries to better respond to digital transformation. Most importantly, global cases showed that e-Governance and similar innovations need ICT infrastructure and strong leadership to yield positive results (de Laia, et al., 2011; Hilhorst, et al., 2022).

Figure 20: Key Mechanisms that Should Drive e-Government Policies

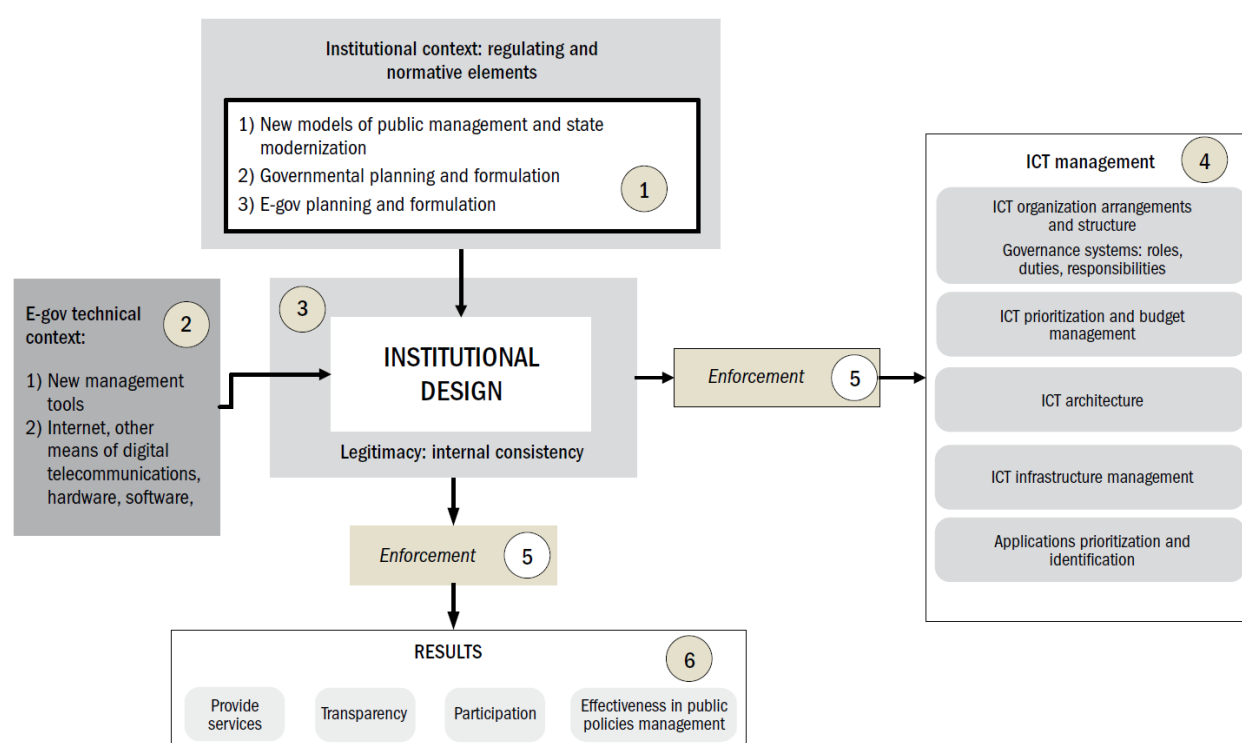


Figure 20 Source: (de Laia, et al., 2011, p. 45).

2.6. Chapter Summary

Chapter two presented the 4IR and its complex nature that directly and indirectly affects daily operations. In 2016, Professor Schwab alarmed the world about what was about to come with the 4IR, which he believed would change how people live fundamentally, work and relate to each other (Schwab, 2016). Alongside private companies, most governments worldwide, especially in developed economies, began planning ways and operations to align and adapt to the changes brought by this industrial revolution and its technologies. These countries channelled resources towards research, systems development, experimentation, ICT infrastructure and digital capacity enhancement to enable data-driven, informed and responsive adoption of 4IR technologies and innovations in public service delivery. Conversely, countries that lag behind, such as most developing countries, particularly those in Africa, are beginning to utilise technologies as impactful tools for service delivery. However, countries such as SA who are battling severe socio-economic development challenges and a great deal of inequalities and other economic constraints, are setting their countries in the direction of accelerating innovation strategies in public service delivery and administration. Despite the observation of

prematurely adopting strategies or having a limited trace of efficient e-governance throughout the country, the legislative direction and government intentions show the commitment to making innovation work for service delivery.

3. CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

Research is a systematic process that requires specific methods and approaches that best fit the nature of the study. The research methodology provides a theoretical analysis of the methods, techniques and specifics of how data was collected, analysed and presented (Igwenagu, 2016). This chapter describes how the investigation into the impact of accelerating innovative strategies in service delivery was conducted. It details the research method, approach and design that the research process took based on matching the study objectives. Moreover, this chapter will describe the data collection and analysis process and present the shortcomings, ethical considerations, trustworthiness and credibility of this research.

3.2. Research Paradigm

A paradigm refers to a world view, when this definition is applied to research it explains the worldview held about conducting research (Creswell, 2007; Makombe, 2017; Perera, 2018). As a basic belief system and theoretical underpinning, a research paradigm consists of assumptions about the axiology, ontology, epistemology and methodology which all characterise lens that the researcher views the world regarding the research. It determines the overall best fitting approaches to the study including data collection and analysis (Mertens, 2010, p. 11; Rehman & Alharthi, 2016, p. 51; Makombe, 2017; Kivunja, 2017, p. 26). Moreover, research paradigm provides a description of the entire research including the strategies, methods and analysis (Perera, 2018).

According to Kivunja (2017, p. 28) Axiology refers to the ethical considerations or philosophical approach of making the right decisions when compiling a research proposal. Moreover, Kivunja further explained that ethical considerations when facilitating participants and data in a study are primarily based on upholding the principles of privacy, accuracy, property and accessibility (2017, p. 28). Ontology defines the philosophical underpinnings of nature and structure of the world while epistemology is concerned with knowledge, especially how knowledge is acquired or known as the truth or reality (Kivunja, 2017). The research methodology provides a theoretical analysis of the methods, techniques and specifics of how data was collected, analysed and presented (Igwenagu, 2016).

Figure 21: Research Paradigms

<i>Basic Beliefs</i>	<i>Postpositivism</i>	<i>Constructivism</i>	<i>Transformative</i>	<i>Pragmatic¹</i>
Axiology (nature of ethical behavior)	Respect privacy; informed consent; minimize harm (beneficence); justice/equal opportunity	Balanced representation of views; raise participants' awareness; community rapport	Respect for cultural norms; beneficence is defined in terms of the promotion of human rights and increase in social justice; reciprocity	Gain knowledge in pursuit of desired ends as influenced by the researcher's values and politics
Ontology (nature of reality)	One reality; knowable within a specified level of probability	Multiple, socially constructed realities	Rejects cultural relativism; recognizes that various versions of reality are based on social positioning; conscious recognition of consequences of privileging versions of reality	Asserts that there is single reality and that all individuals have their own unique interpretation of reality
Epistemology (nature of knowledge; relation between knower and would-be known)	Objectivity is important; the researcher manipulates and observes in a dispassionate, objective manner	Interactive link between researcher and participants; values are made explicit; created findings	Interactive link between researcher and participants; knowledge is socially and historically situated; need to address issues of power and trust	Relationships in research are determined by what the researcher deems as appropriate to that particular study
Methodology (approach to systematic inquiry)	Quantitative (primarily); interventionist; decontextualized	Qualitative (primarily); hermeneutical; dialectical; contextual factors are described	Qualitative (dialogic), but quantitative and mixed methods can be used; contextual and historical factors are described, especially as they relate to oppression	Match methods to specific questions and purposes of research; mixed methods can be used as researcher works back and forth between various approaches.

Figure 21 Source: (Mertens, 2010, p. 11).

According to Rajasekar, et al., (2013, p. 14) when selecting a topic, researchers need to consider the possibility of data collection, the quantity of gain and the breadth of the topic. In this study, a purposive sampling method was used to identify the most relevant participants whose input was likely to be informative enough to strengthen the breadth of this topic. Having selected an interpretive paradigm, this study employed a thematic data analysis. Kiger and Varpio (2020) defined thematic data analysis as a method used to identify, analyse and report data patterns from selected codes and themes from a qualitative study. Moreover, Braun and Clarke, (2006)

argued that thematic analysis is not selective or restricted regarding paradigmatic orientation; instead, it is flexible to use within constructivist, critical realistic or post-positivist approaches. The selected qualitative approach, purposive sampling, open-ended semi-structured interviews and thematic analysis method resonated and best fit the objectives and research questions of this study due to the naturalistic and interpretive nature of this study.

3.3. Research Design

Research design can be defined as a well-defined plan that structures the research process, guiding how the study is implemented (Gray, et al., 2017). Expanding the definition, Saunders et al., (2016, p. 726) described the research design as a “framework for the collection and analysis of data to answer the research question and meet research objectives providing reasoned justification for the choice of data sources, collection methods and analysis techniques”. This means that a research design is a step-by-step guide employed by the researcher before the commencement of the study based on the relevance to achieve research objectives validly (Asenahabi, 2019). Asenahabi, (2019, p. 78) further explained that the essence of the research design is to:

- Translate the research problem into data that can be analysed to provide relevant answers to the study questions.
- Determine the different forms of analysis that can be employed to attain the study's objectives best, answer the research questions and make relevant recommendations or implications based on the study.
- Articulates the required data and points out the methods to be used for collecting, analysing and making sense of the collected data to answer the research questions.

Research design has three approaches: quantitative, qualitative and mixed methods. It is the researcher's responsibility to select the appropriate design guided by the study nature (Creswell, 2007; Creswell, 2014; Gray, et al., 2017; Asenahabi, 2019).

3.3.1. Quantitative Research

The quantitative research approach defines a “formal, objective, systematic study process implemented to obtain numerical data to answer a research question. Quantitative research describes variables, examine relationships among variables, and determine cause-and-effect

interactions between variables” (Gray, et al., 2017, p. 65). Creswell, (2007) further explained that quantitative research is mainly survey and experimental research, which gives a numerical description of trends, attitudes or opinions of the study population or sample and data can be collected through questionnaires or structured interviews. Quantitative research emerged from the logical positivism philosophy. This philosophy is centred on precise rules of logic, truth, laws and reduction, believing that there is one absolute truth or single reality that can be defined by careful measurement Gray, et al., (2017, p. 66).

Within positivism, quantitative researchers “believe that all human behaviour is objective, purposeful, and measurable; therefore, researchers need to find or develop the appropriate instrument or tool to measure behaviour” (Gray, et al., 2017, p. 66). However, the philosophical underpinning of quantitative research evolved from positivism to post-positivism, adding some flexibility compared to the initial strict rules. Gray, et al., (2017) argued that within post-positivism, quantitative research enquiry focuses on finding truth based on patterns and trends that can be implied to analyse, explain and predict phenomena. Post-positivism contends that “the truth can be discovered imperfectly and in a probabilistic sense, in contrast to the positivist ideal of establishing cause-and-effect explanations of immutable facts” (Ford-Gilboe, et al., 1995, p. 16). Moreover, the post-positivist approach to scientific research refutes the belief that the researcher conducting the study is entirely objective about the research findings but emphasises controlling the environmental influences (Shadish, et al., 2002).

3.3.2. Qualitative Research

Qualitative research takes a subjective view as a systematic approach that believes in interactive and naturalistic processes (Creswell, 2007; Creswell, 2014). These processes allow participants to describe experiences, cultures and social understandings of situations, practices or events based on subjective views (Gray, et al., 2017, p. 65). According to Gray, et al., (2017, p. 66) the philosophical ground of qualitative research is humanistic and interpretive, enabling the research to gather complex and dynamic meanings of the participant's social interactions and realities. The interpretive nature of qualitative research focuses on understanding and accounting for the meaning of participants' actions and experiences (Fossey, et al., 2002, p. 720). Thus positioning qualitative research with constructivism which believes that there is no single truth; instead, there are multiple realities (Gray, et al., 2017). Qualitative research is

primarily inductive; it values individuality and social justice and results in rich information despite being subjective (Asenahabi, 2019, p. 82). In this way, “qualitative research methodologies aim to develop an understanding of the meaning and experience dimensions of human lives and their social worlds” (Fossey, et al., 2002, p. 731).

Riessman, (2008) mentioned narrative research, case study research, ethnographies, phenomenology and grounded theory as examples of qualitative research. Creswell (2014) explained that qualitative research is rigorous and holistic because its enquiry uses data collection tools such as observations, interviews, and focus groups. The data collection instruments cited by Creswell complement the idea of qualitative research design producing “data that is not quantifiable using open-ended questions” (Asenahabi, 2019, p. 81). “Qualitative researchers gain insights without measuring concepts or analysing statistical relationships. Rather, they improve our comprehension of a phenomenon from the viewpoint of the people experiencing it” (Gray, et al., 2017, p. 122). Table 13 presents distinct characteristics that differentiate quantitative and qualitative research, compiled by (Gray, et al., 2017).

This study employed the qualitative research method as it aimed to get an understanding of the impact of the acceleration of innovation strategies on service delivery. The qualitative approach enables an exploratory and interpretive enquiry that best probed the participants' experiences and perceptions of embedding innovation in service delivery within the public sector at the provincial government level.

Table 13: Quantitative and Qualitative Research Characteristics

Characteristic	Quantitative Research	Qualitative Research
Philosophical origin	Logical positivism, post-positivism	Naturalistic, interpretive, humanistic
Focus	Concise, objective and reductionistic	Broad, subjective, holistic
Basis of knowing	Cause-and-effect relationships	Meaning, discovery, understanding
Theoretical focus	Tests theory	Develops theory and frameworks
Researcher involvement	Control	Shared interpretation
Methods of measurement	Structured interviews, questionnaires, observations, scales, physiological measures	Unstructured interviews, observations, focus groups
Data	Numbers	Words
Analysis	Statistical analysis	Text-based analysis
Findings	Acceptance or rejection of theoretical propositions/generalisation	Uniqueness, dynamic, understanding of phenomena, new theory, models, and/or frameworks

Source: (Gray, et al., 2017, p. 65).

3.3.3. Mixed Methods

The mixed methods combine some aspects of the quantitative and qualitative methods, and this approach is mostly instrumental in studies that warrant a combination of numerical and narrative enquiry (Gray, et al., 2017). Moreover, Asenahabi, (2019, p. 84) explained that the mixed methods “was born out of the idea that both qualitative and quantitative designs have weaknesses, thus collecting both of them neutralized the weakness of the other”. Therefore, the mixed method approach to research takes on a pragmatic worldview, promoting accuracy and a broad or complex understanding, unlike if the study employs a single approach.

3.4. The Study Population and Sampling

Sekaran and Bougie (2013, p. 262) defined the study population as “the entire collection of individuals, items, cases, things or events of importance under evaluation when conducting a study”. In this research, the study population was the KZN Treasury Department employees, and the study consulted 8 participants within KZN Treasury were Senior, Middle and Junior Managers from the Systems and IT Units.

Table 14: Participants Profile

Role/Specialty	Sub-Division
Assistant Director	IT
Assistant Director	IT
Assistant Director	IT
Deputy Director	IT
Deputy Director	Systems
Director	Systems
Director	IT
Assistant Director	Systems
Total Number of Participants	8

Table 14 Source: Author

The researcher was guided by Liamputton's assertions which stated that qualitative research requires experienced and well informed participants in a particular phenomenon of interest whose knowledge, experience and understanding let them share rich and indepth accounts of their experience (Liamputtong, 2013, p. 18). Therefore, the selection of the targeted population was informed by the work responsibilities, exposure and practical understanding of innovation practices in service delivery held by the targeted population. Supporting this method of pinpointing the targeted population is the idea that there are various ways to accumulate knowledge; examples include intuition, authority, experience, and reasoning (Trivedi, 2020).

Moreover, Gray, et al., (2017, p. 41) further mentioned acquiring knowledge from an authority, personal experience, borrowing, trial and error, research, reasoning, and role models or mentors. Information from participants of this study was based on their expertise which is made up of knowledge attained in various forms, skills and experience in their years of practice within the KZN Treasury. Following the determination of the relevant population was sampling. According to Gray, et al., (2017) sampling refers to selecting a specific number of people, units, objects or items from a large population for study or analysis. Various sampling strategies can be adopted in qualitative research; Table 14 describes some qualitative research sampling methods. Fossey, et al., (2002) emphasised that in qualitative research,

appropriateness and adequacy are critical in the sampling. In this study, purposive sampling was adopted given that the researcher knew the suitable participants whose work roles matched the research enquiry.

Figure 22: Purposive Sampling

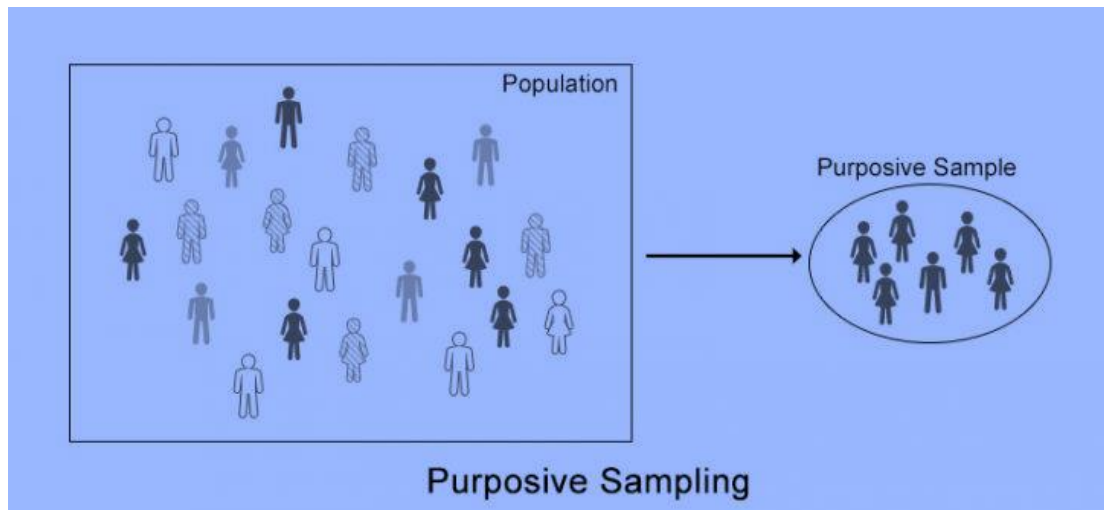


Figure 22 Source: (Saunders, et al., 2012, p. 17).

Table 15: Qualitative Research Sampling Strategies

Sampling	Definition
Convenience sampling	Inviting participants from a location or group because of ease and efficiency (Liamputtong, 2013a).
Snowball sampling	After first participant is acquired, researcher asks participant to refer others who have had similar experiences for participation in the study (Howie, 2013); also called <i>chain sampling</i> or <i>network sampling</i> .
Historical sampling	Exhaustive search for all relevant, surviving primary and secondary sources about an event or phenomenon that occurred in the past (Lundy, 2012)
Purposive sampling	Recruitment of participants as sources of data because they can provide in-depth information needed to achieve the study aims (Howie, 2013)
Theoretical sampling*	Recruitment of participants who are considered to be best sources of data related to the study's generation of theory; additional participants may be recruited to validate or expand upon emerging concepts; associated with grounded theory approaches (Wuest, 2012)
Criterion sampling*	Recruitment of participants who do or do not have certain characteristics deemed to affect the phenomena being studied (Liamputtong, 2013)
Maximum variation sampling*	Recruitment of participants who represent potentially different experiences related to the domain of interest (Miles et al., 2014; Seidman, 2013)
Critical case sampling*	Recruitment of participants whose experiences with the research topic are expected to be very different and whose input may support or not support the emerging themes (Miles et al., 2014).
Deviant case sampling*	Recruitment of participants who may be outliers or represent extreme cases of the domain of interest (Liamputtong, 2013a; Miles et al., 2014).

Table 15 Source: (Gray, et al., 2017, p. 407)

3.6. Data Collection Techniques

3.6.1. Secondary Data Sources

This study primarily consists of secondary data sources, especially chapter 2, which reviewed existing literature on the topic of this study. Igwenagu (2016, p. 41) defined secondary data sources as data already collected by someone else, which can be published or unpublished. Examples include unpublished log books, public or private institution registers, published journal articles and books, internet sources, government reports, and policies (Igwenagu, 2016, p. 41). This study consulted secondary data sources such as books, journal articles, reports and electronic documents on innovation and the 4IR in public sector service delivery.

3.6.2. Primary Data Sources

Primary sources refer to the data collected by the researcher first-hand (Igwenagu, 2016). This study collected primary data through semi-structured interviews conducted with the study participants. According to Fossey, (2002) the objective of qualitative research interviews is to gather participants' experiences, feelings and views. Furthermore, semi structured interviews facilitate a focused exploration of the topic by following the interview guide with a certain level of flexibility to follow-up questions emerging from the participants' responses (Fossey, et al., 2002, p. 727).

3.7. Data analysis

Qualitative analysis is the reviewing, synthesising and interpreting of data to explain or describe the phenomenon being studied (Creswell, 2007; Igwenagu, 2016). It is important to note that, similarly to data collection, data analysis procedures demand rigour, accuracy, adequacy and transparency (Gray, et al., 2017). This study used the thematic analysis method. According to Igwenagu, (2016) thematic analysis is a progressive process of classifying, comparing, grouping and refining text segments from the collected data to define categories and themes to develop meanings.

Furthermore, Kiger and Varpio, (2020) described the thematic analysis as a method suitable for rooting out experiences, thoughts or behaviours across a data set based on its ability to reveal codes enabling the construction of themes. Elaborating further, Kiger and Varpio, stated that thematic analysis is a six-step process involving: “*familiarizing yourself with the data,*

generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report” (Kiger & Varpio, 2020, p. 1). Braun and Clarke (2006) argued that thematic analysis helps examine different research participants' perspectives by grouping similarities and differences and generating unanticipated insights.

Figure 23: Data Analysis

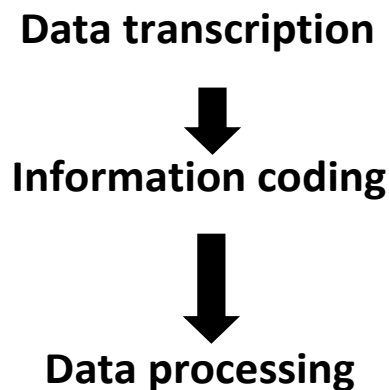


Figure 23 Source: Author

3.8. Research Approach

Research has two primary approaches, deductive and inductive (Gray, et al., 2017). This study adopted an inductive approach. The inductive research approach refers to “the inductive approach is a systematic procedure for analysing qualitative data in which the analysis is likely to be guided by specific evaluation objectives” (Thomas, 2006, p. 238). Braun and Clarke, (2006) defined inductive analysis as a thematic drive analysis where the coding of data is not fitted into pre-existing coding frames or the researchers' preconceptions. Additionally, Bryman et al, (2012, p. 384) stated that the quantitative research design is aligned with the deductive approach, and qualitative design is associated with the inductive method.

3.9. Ethical Considerations

Conducting research is accompanied by ethical conduct such as: ethical approval, personal and professional behaviour when conducting research, adherence to institutional regulations, informed consent between the researcher (signed with understanding) and participant, assurance of no risk of harm, anonymity and confidentiality and avoiding conflict of interest (Fleming & Zegwaard, 2018, p. 210). Table 15 presents the primary ethical considerations observed by the researcher in this study.

Table 16: Ethical Considerations

Ethics Observed	Action
Ethical Clearance	The proposal for the study was submitted to the University of KwaZulu-Natal, and ethical clearance was attained upon approval. Ethical approval was also attained from the KZN Treasury after following the relevant protocol.
Gatekeeping	Both ethical approval letters were shared with the gatekeepers (Department Heads) of the two units of the targeted participants. Upon approval, recruitment of targeted participants began.
Participants	The targeted participants were recruited into the study, and the researcher emphasised voluntary participation and that at any point, individuals had a right to participate or stop participating out of their own free will.
Informed Consent	Participants received an informed consent letter detailing the specifics of the study, outlined the study questions and informed participants how the data was to be collected and explained how the results were going to be presented in this dissertation.
Confidentiality and Anonymity	Participants were informed that no personal data such as names or designation information was going to be used in the data presentation of this study for confidentiality and anonymity purposes.
Communication of results	Data analysis and reporting of results were conducted ethically, free of plagiarism and accurately presented the participants' responses.

Conducting research is accompanied by ethical conduct such as: ethical approval, personal and professional behaviour when conducting research, adherence to institutional regulations, informed consent between the researcher (signed with understanding) and participant, assurance of no risk of harm, anonymity and confidentiality and avoiding conflict of interest . Table 15 presents the primary ethical considerations observed by the researcher in this study.

Table 16: Source: Author

3.10. COVID-19 Protocol Compliance

This study was conducted in line with the national COVID-19 protocol as mandated by the South African Government and the KZN Treasury in compliance. All interview sessions were held virtually vial Microsoft Teams to minimise physical contact. All communication with the research participants was digital.

3.11. Trustworthiness and Credibility

Trustworthiness is a concept in research refined by Lincoln and Guba (1985) who introduced the elements of credibility, transferability, dependability and confirmability to match the

conventional quantitative assessment criteria of validity and reliability. Moreover, Nowell, et al., (2017, p. 1) stated that the trustworthiness of a qualitative study requires a clear demonstration that data analysis was conducted in a: “precise, consistent, and exhaustive manner through recording, systematizing, and disclosing the methods of analysis with enough detail to enable the reader to determine whether the process is credible”. With that said, in this study, the researcher adopted Nowell, et al., (2017) embedment of trustworthiness within each stage of the thematic data analysis process to ensure trustworthiness and credibility, as outlined in Table 16.

Table 17: Synchronising Trustworthiness with the Six Phases of Thematic Analysis

Phases of Thematic Analysis	Means of Establishing Trustworthiness
Phase 1: Familiarizing yourself with your data	Prolong engagement with data Triangulate different data collection modes Document theoretical and reflective thoughts Document thoughts about potential codes/themes Store raw data in well-organized archives Keep records of all data field notes, transcripts, and reflexive journals
Phase 2: Generating initial codes	Peer debriefing Researcher triangulation Reflexive journaling Use of a coding framework Audit trail of code generation Documentation of all team meetings and peer debriefings
Phase 3: Searching for themes	Researcher triangulation Diagramming to make sense of theme connections Keep detailed notes about the development and hierarchies of concepts and themes
Phase 4: Reviewing themes	Researcher triangulation Themes and subthemes vetted by team members Test for referential adequacy by returning to raw data
Phase 5: Defining and naming themes	Researcher triangulation Peer debriefing Team consensus on themes Documentation of team meetings regarding themes Documentation of theme naming
Phase 6: Producing the report	Member checking Peer debriefing Describing the process of coding and analysis in sufficient detail Thick descriptions of context Description of the audit trail Report on reasons for theoretical, methodological, and analytical choices throughout the entire study

Trustworthiness is a concept in research refined by Lincoln and Guba who introduced the elements of credibility, transferability, dependability and confirmability to match the conventional quantitative assessment criteria of validity and reliability. Moreover, Nowell, et al., stated that the trustworthiness of a qualitative study requires a clear demonstration that data analysis was conducted in a: “precise, consistent, and exhaustive manner through recording, systematizing, and disclosing the methods of analysis with enough detail to enable the reader to determine whether the process is credible”. With that said, in this study, the researcher adopted Nowell, et al., embedment of trustworthiness within each stage of the thematic data analysis process to ensure trustworthiness and credibility, as outlined in Table 16.

Table 17 Source: (Nowell, et al., 2017, p. 4).

3.12. Limitations

The limitations in a research study refer to specific characteristics that the researcher could not control, which could inappropriately affect the study results (Price & Judy, 2004). Furthermore, Price and Judy (2004) argued that limitations in the study design, instrument or methodology directly impact the interpretation of findings. In this study, the unanticipated challenge was the low actual participant numbers compared to the expected number of the targeted population. The participants' low voluntary participation and slow response when scheduling data collection sessions stagnated the research process and limited the gathering of valuable information from a broader range of the targeted population.

3.13. Chapter Summary

This chapter detailed the method, design and approach that this study adopted. It described the overall processes followed in this study, such as the sampling, data collection, data analysis, ethical considerations, trustworthiness and credibility. Discussions in this chapter presented a layout of how the data was analysed informing the presentation of results in the following chapter.

4. CHAPTER FOUR: PRESENTATION AND DISCUSSION OF RESULTS

4.1. Introduction

As elaborated in the previous chapter, this study adopted a qualitative approach, employed purposive sampling in the selection of participants, utilised semi-structured interviews to collect data and followed a thematic approach to analyse data. this chapter presents a thorough analysis of data collected from (eight) 8 participants that were interviewed in this study, all permanent employees, various levels of management and all within KZN Treasury. The presented results are shared understandings, experiences and thoughts on the acceleration of innovative strategies in service delivery within the KZN Treasury.

The objectives of the study were:

- To investigate the innovation culture within the institution
- To determine the importance of innovation in improving the institution's internal processes and service delivery
- To investigate the innovative systems and processes and how users within the institution perceive the systems and policies in place within the institution
- To examine current systems in place and look at innovative ways they could be improved in terms of technologies in the fourth industrial revolution

The presented data in this chapter was gathered from interviews that were held through Microsoft Teams and Face to face with individuals within The Department of KZN Treasury. The study investigated the innovation culture within KZN Treasury, considering technologies in the fourth industrial that have been introduced in the department.

4.2. Profile of Participants

The participants of this study were employees of KwaZulu Natal Treasury and staff from IT and Systems. The IT Unit facilitates internal provision of technological service and support within the KZN Treasury and the Systems Unit offers external technological service and support to the KZN Province to all sister departments and other public sector stakeholders. Table 18 presents a demographic profile of the participants made 4 junior management, 2 middle management and 2 junior management interviewees.

Table 18: Participants Profile

Participants	Gender	Seniority
P 1	Male	Assistant Director
P 2	Male	Assistant Director
P 3	Male	Assistant Director
P 4	Female	Deputy Director
P 5	Male	Deputy Director
P 6	Male	Director
P 7	Male	Director
P 8	Male	Assistant Director

Table 18 Source: Author

4.3. Innovations within the KZN Treasury

Table 19 outlines the various innovation practices and activities gathered from the responses of experienced personnel who participated in this study.

Table 19: Categorisation of Innovations in the KZN Treasury

Innovation	Causal Factor Driving Adoption	Objective	Innovation Category
Microsoft Teams	Meetings could only be held face to face, which came at a cost in terms of travel expenses and via teleconference.	Allow users to communicate virtually with stakeholders internally and externally	Service Innovation

Microsoft SharePoint	Email applications have size limits in terms of sharing documents, and the old system did not allow all users to work on documents remotely and simultaneously	Digitising document management and sharing and offering cloud services	Service Innovation
e-Leave	The old system was paper based in terms of applying for leave and was vulnerable to losing documents.	A digitised online system to apply for leave	Process Innovation
e-Recruitment	Recruitment processes require individuals to be in the office to action processes	A digitised system for recruitment	Process Innovation
Nomination System	The old system was manual, working with paper and email	A digitised system online that allows users to nominate individuals for awards	Process Innovation
Cost Cutting Tool	Management of quotations was a hassle and was paper-based	Automated cost-cutting tool to assist with quotation management for events for other departments	Service Innovation & Process Innovation
Car Booking System (In Progress)	It is paper-based and requires many steps in terms of finding the signatories to sign for approval	A digitised system that will allow departmental cars to be booked and managed	Process Innovation
Biometrics System (e-DNA)	The old system was just a password system which was vulnerable to fraud and had no accountability in terms of tracking	The inclusion of biometrics in terms of fingerprints in the PERSAL and BAS systems as an extra level of security	Process Innovation
Stationary Ordering	The old system was a manual system via email	A digitised process in ordering stationery online	Process Innovation

Asset Barcode Scanner	The old system was a manual system of a pen to paper in terms of verifying the assist	A device used to scan departmental assets and assist with asset management	Process Innovation
Printing System	The old printing system allowed users to print and retrieve documents to a linked printer in their office or unit.	Printing system that allows users to print and retrieve their printed documents on any printer in the building	Process Innovation

Table 19 Source: Author

4.4. Identification of Themes and Link to Objectives

Theme identification is one of the fundamental tasks of a qualitative research enquiry as it leads to the development of meaningful interpretations (Alhojailan, 2012). Furthermore, Kumar, (2011, p. 212) highlighted that in the process of identifying themes gathered from interviews, it is instrumental for the researcher to keep the study relating study objectives in mind. Table 20 presents the themes and sub-themes discovered in the thematic analysis of the collected data.

Table 20: Identified Themes and Sub Themes

Theme 1: Identification of Potential Innovations
Sub-Theme 1: Culture of Innovation
Sub-Theme 2: Process of Innovation Emergence
Sub-Theme 3: Innovative Contributions
Theme 2: Management of Concerns in Innovation
Sub-Theme 1: Barriers in Innovation and Reducing those Barriers
Sub-Theme 2: Improving Innovation
Sub-Theme 3: Evaluation of Implemented Innovations

Theme 3: Innovation Technological Fusion
Sub-Theme 1: Innovation in COVID-19
Sub-Theme 2: Inclusion of 4IR Technologies

Table 20 Source: Author

4.5. Discussion and Analysis of Results

In qualitative research, tabulation of data accompanied by narrative presentation in the findings section is said to provide a rigour analysis (Reay, et al., 2019). Furthermore, Creswell, (2014) emphasised that researchers must employ the most appropriate method of presenting study findings to ensure the rigorous, richness and the maintenance of trustworthiness, credibility and confirmability standards. Chapter two of this research captured the literature review and was further linked to the presented data in chapter four to determine whether there is a coloration. The emerging themes were identified and discussed, and it should be noted that mistakes in the construction of sentences of the direct quotes of the respondents were not altered.

4.5.1. Objective One

To Investigate the Innovation Culture Within the Institution,

The first four questions in the interview schedule looked at the following:

- i. at identifying the culture of innovation within the institution,
- ii. at the improvements, these innovations brought within the institution,
- iii. how these innovations improved the performance of the institution and
- iv. the channels that have been put in place to bring forth this innovation

Objective one is linked to theme one, which identifies potential innovations discussed below with the sub-themes.

4.5.1.1. Theme 1: Identification of Potential Innovations

Proper identification of potential innovations is crucial, so there is no duplication of processes or introducing something that is not required within the department. The sub-themes identified were the culture of innovation, the process of innovation emergence and innovative contributions discussed below.

4.5.1.1.1. Culture of Innovation

Davies and Buisine (2018) agreed that an organisation's culture can be defined as a set of behaviours, everyday habits, and interpretations that the origination members share. They added that the organisation's culture serves as a social glue for its life, making innovative thinking and activities natural. Participants elaborated on the culture of innovation within the department. Some believe that the department is innovative, and some of the opposite view.

Participant 2: *"The culture of innovation within the unit is quite good as they allow innovation from individuals and flow of ideas. You can present such ideas and enter discussions about them in the unit. Even individuals fresh out of school, if they have any new ideas that may benefit the unit or department, are welcome as the unit director has an open-door policy."*

The same participant backed up that innovation is encouraged in his unit to the extent that people can identify training needs that may improve their skills.: *"A budget is presented in training, and individuals are encouraged to look for short-term or long-term training that would improve their skills in that field."*

The participant's inputs concur with Fernando (2019), saying that adequate training and upskilling are required to grow the innovation capability of employees.

Participant 7 indicated that the culture of innovation has improved under the new leadership, despite particular challenges. What the participant mentioned affirms what was mentioned in chapter two of the study that deals with how certain leadership styles impact innovation.

Participant 6 had a different view regarding innovation, and they stated that the culture of innovation is not there in terms of the public sector in its entirety. Therefore, we could not

exclude ourselves from the government. The participant argued that some of the innovations implemented in government are long overdue and made an example of the electronic pay slip system, which has recently been implemented in the province.

4.5.1.1.2. Process of Innovation Emergence

During the interviews, the participants revealed various methods and processes to identify and bring forth innovation. As demonstrated by the participants, these methods were either reactive or proactive in terms of something triggering that innovation or proactive in identifying potential innovations to solve a problem. Husan, et al. (2018) stated that organisations need to balance proactive and reactive organisational change through knowledge sharing and internal willingness stimulated by leadership style when organisations move from the known to the unknown.

During the interview, participants revealed that one method used to identify potential innovations or ideas that may lead to innovation is through meetings. Meetings that may occur monthly or frequently or through meetings that are done annually to plan what that unit aims to achieve for that financial year. As a result, those innovations surface through discussions or brainstorming.

The following three participants revealed that meetings are held to discuss possible innovations and plans regarding what can be done for the financial year.

Participant 3: *“At the beginning of every financial year, there is a meeting where all relevant staff members are present, and the meeting looks at what is new in the IT industry.”*

Participant 2: *“The culture of innovation within the unit is quite good as they allow innovation from individuals and flow of ideas. You can present such ideas and enter discussions about them in the unit. Even individuals fresh out of school, if they have any new ideas that may benefit the unit or department, are welcome as the unit director has an open-door policy.”*

Participant 1: *“In terms of identifying, we work as a team, so basically what we normally do when our plan I can’t say our performance plan but our yearly plan that we have, we have to identify how many systems we are going to produce within each quarter.”*

Participant 2 correspondingly indicated that they could develop individual innovations based on providing a solution to a particular problem. This allows individuals to be free in terms of finding meaningful solutions to issues or processes within the institution.: *“Thirdly, we identify things; for example, on our side, if we see something in other units that is done via forms, and we see that it can be done via an online platform, we approach that unit that solution. For example, there may be units distributing surveys within the department, so we approached them with this solution of doing those surveys digitally online or in a program.”*

Participant 5 mentioned that they have informal engagements, made an example, and added that they hold formal meetings where the functional and technical teams meet in the unit.: *“We have one informal meeting where one can share anything. Like yesterday, I approached my supervisor since I had something that popped up in my head.”*

What the participants mentioned above all coincide with the principle of being proactive in terms of innovation and agree with Unsworth and Parker (2003) that being assertive is about being self-starting and change-focused to improve organisational effectiveness in making improvements to solve problems or work procedures.

It was further revealed by participant 2 that other units do approach them in terms of finding out if they would be able to digitise any of the processes that they present or present their problem. The IT unit would provide a digital solution.: *“The second way, for argument’s sake, auxiliary services may have trouble managing their forms regarding the car booking process. Then that respective unit may approach IT or any other staff member to try and see if they can assist them regarding digitising their current systems or processes. So, it’s a matter of other units approaching us with their problem, and we try and provide them with a Technological solution.”*

According to Participant 5, their unit holds meetings with the government departments in the province to get their issues to which they provide a solution.: *“Secondly planned meetings with*

the departments where they raise their issues, and we provide the solutions Basic Accounting System (BAS) and Personal and Salary System (PERSAL) forums.”

The above mentioned by participants 2 and 5 speak to being reactive in terms of a problem given and then providing a solution. So, the unit waits for problems to come and then provides a solution.

4.5.1.1.3. Innovative Contributions

The participants shared that the innovations introduced in the department, considering the innovations listed in table 19, have improved the department. Most of these innovations have encouraged the department to digitise its processes and move away from manual paper systems. There is now accountability in terms of these processes and combating fraud.

Participant 1 stated that one of the innovations, SharePoint, contributed to the department providing a centralised document management system. Moving the department away from that paper-based to a digitised online/cloud system.: *“So, we came up with a solution of SharePoint, where there is a SharePoint document library where you can upload those documents on a server-based system. So, these documents will stay on the server where anyone can access them as long as they have the necessary access to access those documents. So, we created a system where all documents are in a central depository where anyone can access them from anywhere. You can even access them at home, in the office, or anywhere else. So, we created that environment so you will not have any issues and be able to share and collaborate with others on one document and access the document simultaneously. so basically, trying to move the department from paper-based to online processes.”*

The same participant further mentioned the vision he has for the department. *“I think 90% of paperwork-based systems will be unavailable in treasury in the next two financial years. That’s why I’m saying there is a speed of requests flowing into the unit. The introduction of SharePoint has played a major role because I think most of the things we can do on SharePoint. That means that SharePoint will work on every project we do, so maybe around 80 to 90% of the work will be done with SharePoint.”*

Participant 2 stated these innovations have eliminated paper-based processes and digitised them, enabling an audit trail for processes.: *“These innovations have improved the*

department's performance, but it has not only been regarding systems in innovation but has also improved in terms of management processes of managing systems. We are doing things differently, and it has enabled us to be more accountable in terms of auditors in terms of any information that is needed."

Participant 4 also shared their views that these innovations have enabled people to attend meetings virtually. This has also assisted the department in terms of reducing costs in travel expenses to these meetings. Further, the participant added that work processes and tasks could continue despite individuals not being in the building and performing tasks remotely, especially during COVID-19.: *"There is quite a lot since we are no longer work as we used before, the internet of things has taken over and made huge improvements as well as establishing a connection between the physical and digital worlds. We no longer need to be in the same venue to have meetings."*

The same participant added that these innovations assisted the department, especially during covid-19, *"Increases in productivity, efficiency and quality in processes, greater safety for workers against COVID 19 and enhanced decision making with data-based tools."*

Participant 5 talked about how the biometrics (eDNA) system they had introduced to government departments in the province decreased fraud. It may not have combated fraud completely, but it provided evidence regarding who approved a transaction. The participant explained that: *What was happening on these systems was that users of PERSAL were creating fictitious employees and making payments to those people. Even on BAS, they would create a fictitious supplier and make payments when asked why they made the payment, as reports would show that they made payments to these fictitious suppliers. The person would reply that they were on leave that day, so there was collusion. A person creates an account and then gives their login details to a person to log in and make payments into their account. Then when in court, the court cannot hold that person accountable. So, people were taken to court; however, there was insufficient evidence to compel the court to convict. Because the accused would raise the defence that somebody else had used their login details to log into the system or that they had left their workstation logged in while they went to the kitchen. It should be borne in mind that the burden of proof in criminal cases such as this is beyond a reasonable doubt."*

The same participant added, *“This is where this biometrics issue came in, where we said we need nonrepudiation which says you cannot deny it 100%. What is that? It is your DNA; even the system is called eDNA (electronic DNA). So, we had to devise a way to control this system. They still have a password and username, and on top of that, you put in a fingerprint. No one can take your fingerprint, and it requires a live fingerprint, so even if they cut it, it won’t work as it needs to detect a pulse.”* The participant concluded that the number of fraudulent activities has decreased despite not being eradicated.

Participant 6 agreed with participant 5 regarding the eDNA system’s improvements it brings to the province.

The above coincides with what was said by Bhasin (2016), that technology plays a significant role in combating fraud in the current era, as well as innovations in the use of technology to detect fraud.

4.5.2. Objectives Two and Three

The objectives were,

- *To determine the importance of innovation in improving the institution’s internal processes and service delivery. and*
- *To investigate the innovative systems and processes and how users within the institution perceive the systems and policies in place within the institution*

Questions five to eight looked at the importance of innovation as a tool for improving service delivery and operations. They further looked at the barriers that hinder innovation and the resources and capabilities that, if used efficiently, enhance innovation. Questions nine to thirteen investigated how these innovations have been introduced and have affected the department. This is regarding its performance and what required change it needs to decrease the barriers against innovation in the department.

4.5.2.1. Theme 2: Management of Concerns in Innovation

The discussed theme deals with objectives two and three collectively, looking at the barriers that hinder innovation, what could be done to break down those barriers and what could be done differently to improve innovation. The items mentioned are discussed below and incorporate the identified sub-themes.

4.5.2.1.1. Barriers in Innovation and Reducing those Barriers

Many barriers hinder innovation within a department, and they may delay the process or stop it in its entirety. The participants identified numerous obstacles that have hindered innovation in the department, as discussed below.

Madeira et al. (2017) revealed that economic and knowledge factors hinder innovation within an organisation. They further stated that economic factors in terms of lack of funds, finances, or knowledge factors in terms of lack of qualified personnel or lack of information on technology.

In terms of economic factors, it has been revealed by the participants that the ongoing budget cuts implemented in government have affected them in terms of innovation. As one knows, it costs money to procure or implement new innovative technologies, and the ongoing financial restrictions have made it difficult to implement specific technologies.

Participant 3 stated that employees suggested innovative ideas, but due to the unavailability of funds, the department turned down those innovations.: *“I would like to mention that the cost-cutting measures implemented are a barrier that hinders innovation.”*

Participant 5 agreed with the above regarding budget cuts being an issue and hampering innovation.: *“The barrier is finance; each year, the budget is being reduced due to cost-cutting measures, and we always need new technologies.”* The participant stated that the response often received is that there is no budget for implementing such innovations.

In terms of knowledge factors, specific training and exchange programs have also been suspended due to the finances needed to fund such programs, as stated by Participant 3.: *“I would like to mention that there is a program in India. India is one of the countries that are up*

to date in terms of technology. This program was halted in the department due to cost-cutting measures implemented.”

Participants 6 and 7 concurred with one another, stating that the budget within the government is a massive hindrance to them becoming more innovative. An apparent common problem they gave was that budget and high bureaucracy make it difficult for them to make changes to their organogram. Changes to the organogram include changing job specifications and creating posts that would promote innovation.

The above participants identified that budget cuts are a barrier. Implementing new technologies in the government costs money. The ongoing budget cuts interfere with what can be implemented as everything relies on the allocated budget. Maharajh (2021), stated at the 6th Research and Innovation Strategy Group (RISG) Biennial Research and Innovation Dialogue in June 2021 that budget cuts hurt innovation and hold back transformation.

Users and staff within the department are cited as hindrances towards innovation due to people not accepting change. Individuals are not open to change, significantly if it disrupts and removes them from their comfort zone, resistance to change is experienced more amongst the older generation. Griesse (2022) stated that in some cases, age might act as a factor in accepting or adapting to change in the workplace. This is because the older workforce is accustomed to years of standard routines and processes, so being required to do a task differently would take more time to adjust than someone new.

Participant 4, agreeing with people not accepting change, stated, *“People not wanting to adapt and move with technology hinders implementing new technologies in the department.”*

What was also raised by the participants was that the structure or organigram also hinders innovation within the department. In terms of that, certain levels allow you to only do so much due to your responsibility. More senior employees can do more. Lynn & Kalay (2016) stated that most studies concluded that a non-formalised or decentralised organisational structure is more beneficial to innovation performance. Adding to that, they mentioned that centralisation and formal structures impede innovation.

Participant 1 stated, *“to be honest, where I am, in terms of the structure, there is a limitation. I am an AD reporting straight to the manager. Besides, our structure does not accommodate a deputy director system developer in IT”*. The participant further mentioned that the current structure and functions of their unit hinder them from being more innovative. The current unit only services the needs of the current department and does not service other departments unless requested assistance from other departments. The participant stated that with these skills, knowledge, and vision, they would want to service added departments and help them become more innovative. The participant further mentioned, *“If they were to create a post for a deputy director in software development, this person would look after all KZN departments within the province would assist. So, these limitations are holding us back.”*

Participant 1 added, *“If we can implement things at treasury and make the other departments utilise these innovations in our environment, it can be lovely. I do have the capabilities to develop such systems with my team that can be utilised by other departments as well, so why don’t we try and implement things that the entire province can use. But now, here is the limitation I was talking about. There is a limitation in terms of the structure and IT as we are only servicing treasury and not the province.”*

Participant 7 raised the issue that the unit’s current structure is outdated, based on IT being a support service to the department that’s being more reactive in terms of innovation. They also mentioned that they are currently in the process of altering their unit structure to embrace innovation. They said, *“Now we are starting to embrace 4IR and starting to do more development and all things that go with innovation. The amount of work and demand that has increased format guys in terms of systems development has increased that’s one of the reasons to change the structure.”*

Participant 6 argued that the unit organogram is an issue hampering innovation. Currently, they are also busy with the process of making changes to their structure. The participant stated that organograms within units are outdated and need to evolve the same way technology is evolving to accommodate change.

Savvides (1979), backed up what has been discussed that organisations cannot and don’t change their structures overnight and that the subject related to organisational change is a topic

that remains unresolved in the area of social science. The author adds that the organisation must shift its structure from right to left as the innovation process evolves.

The issue of infrastructure hampering innovation being rolled out effectively was raised by Participants 6. The participant mentioned that being a transversal service means that they provide services to all government departments within the province of KZN. They made an example of the new way of handing out payslips via email and not physically printing and delivering them to each individual. *“Local government, education and health is a challenge, but remember KZN is more rural and don’t look at Pietermaritzburg and Durban. Some of these departments based in these locations don’t even have emails, and we still print the payslips manually for those that don’t have emails. Education, forget about these smart schools in urban areas and look at the rural schools. Few schools have the proper infrastructure or technology access, and many still print the pay slips. Health the same problem looks in clinics in remote areas. Hence, you cannot just shut down with delivering of payslips due to this challenge.”*. This shows that the geographical location limits access to information and technology.

Innovation moves hand in hand with access to technology, and evolution in infrastructure in terms of ICT brings technology and innovation to an area. This lack of infrastructure contributes to the digital divide experienced in remote areas. ICT is both a driver and an enabler for innovation.

Participants 6 and 7 stress the issue of SITA that sometimes hinders or delays them in becoming innovative. SITA was born for IT in the province and country to be centralised around one agency. Participant 7 stated that they are currently searching for a specialised skill, but they are required to go through SITA. SITA does not have that particular skill and must go to the market to get such skill.

Barriers that hinder innovation need to be managed efficiently and effectively to stop them from impeding the evolution of innovation and transformation of the organisation. Change is vital in an organisation, whether in terms of organisational processes or hierarchies. Even change in people accepting the change that is introduced in the organisation

4.5.2.1.2. Improving Innovation

An organisation in term of innovation management deal with nurturing innovation in an institution and ensuring it thrives using various methods. It's a matter of determining items that hinder innovation and having a contingency plan to deal with those factors that impede innovation from thriving. The participants identified various things that could be done within the department to improve innovation.

Participant 7 stated that raising awareness around its unit at certain levels in government would assist. Specific forums must be established, bringing all relevant units together to discuss issues and share knowledge to help one another. The participant said, *“We need a forum that hears the concerns of IT Departments in the province. Like we used to have PGITOC (Provincial government IT offices council), it's a structure in the province chaired by the premier's office, and there is a national one where the P falls away. These bodies bring all the managers together and have a common provincial strategy on what you do, have work groups, and get everyone to work together. More like a coordination body ensuring that everyone is moving in the right and the same direction.”*

Participant 2 added, *“I think the part of making big decisions in the department is inviting those within your unit and asking them to comment about introducing this sort of thing and not just surprising them. Better communication channels in terms of introducing technologies within the department or unit.”*

Participant 1 stated that if there were a better system in terms of incentivising workers, there would be an increase in innovation. The participant felt that based on their personal experience, they were not being incentivised regarding their hard work within the department. They then stated, *“it makes us hold back as we are not being recognised regarding what we're doing, but if you're being recognised in what you are doing, you can even push even further beyond 100%”*

The majority of the participants stated that a budget should be made available for the implementation of innovations. This can be through providing finances for implementing innovations or funding for an additional post within unit structures.

Participant 6 mentioned: *“One of the issues is budget. For example, you hear people say there is a shortage of a certain skill. The issue is not the unavailability of the skills, but there is no budget to appoint that skill.”*

The same participant pointed out that the structure is rigid with red tape, making it troublesome to make any changes. Organograms need to change and evolve as innovation evolves, *“The skills are there, but our organogram needs to address the will to adopt innovation”*. They further raised the question of where research and development on their unit organogram is. Adding to the above, they mentioned, *“I think government and departments should be able to go to the respective units and sit down. Let’s you review your structure, does it assist with innovation, does it assist with I23?”*

Organisations and governments need to review their internal processes and legislations and change them as innovation changes ensuring that they don’t hinder or prevent the growth of innovation. Point to note the release of circular No. 01 of 2022 from the department of public service and administration that advocates the public sector in considering cloud computing. The directive’s purpose is to guide government departments on adopting and using cloud computing technology services.

In closing, gathered from the participants, employees’ policies and job descriptions should be reviewed regularly. This is to see if they are still serving the purpose and aligned with what is current and the direction the organisation wants to follow. Rauf (2020) indicated how the incorporation of rules and regulations into the public sector influences the overall performance of that organisation, not ignoring its overall impact on the employees’ behaviour and attitudes.

4.5.2.1.3. Evaluation of Implemented Innovations

Organisations implement innovation with an intended purpose and hope it achieves its intended purpose. What has been revealed by the participants is that majority of these innovations introduced in the department have had the common goal of digitising processes and moving away from paper-based systems.

Participant 3 agreed that *“the clinic booking system operated by individuals contacting Wellness or replying to the email in terms of booking a slot for clinic booking. The digitising*

of this connect booking system assisted in relieving pressures in the network in terms of many people sending emails to HR and many people visiting Wellness to book.”

The same participant further stated, *“From what I know, many individuals who left treasury that I communicate with tell us that the infrastructure in their departments is not as good as what we have in treasury. Many departments are still operating using a physical network connection in terms of the internet, while here at treasury, we have introduced a Wi-Fi connection. So, I can submit that in terms of infrastructure and technology, KZN treasury leads in the province.”*

It was disclosed that participants 5 and 6 concurred that implementing and incorporating the biometrics system (eDNA) with systems such as BAS and PERSAL has decreased fraud in the province. It has not eliminated fraud, but it has provided security in identifying the person that approves a particular transaction, thus putting an identity to the approved fraudulent activity.

4.5.3. Objective Four

To examine current systems in place and look at innovative ways that could be improved in terms of technologies in the fourth industrial revolution

The questions regarding this objective spoke to determine what has been done by the department to stimulate innovation during the COVID-19 pandemic. In addition to further determining if other technologies could be implemented in the public sector, this 4IR would benefit it.

4.5.3.1. Theme 3: Innovation Technological Fusion

The participants revealed that measures had been implemented to stimulate innovation during the COVID-19 pandemic. Further, they identified technologies they felt would benefit the public sector considering technologies in this 4IR.

4.5.3.1. Innovation in COVID-19

Participants revealed that, at times, the department is not proactive but is reactive, looking at one example regarding the COVID-19 pandemic. The pandemic forced many organisations to adjust to the change but simultaneously allowed the organisation to operate as normally as possible by introducing innovations or technologies.

Participant 2 stated, *“There has been plenty because we’re working with a high priority in saying people cannot work from home fully due to the pandemic. If you look at the introduction of teams, most departments are not even aware of teams, and now MS teams is the main communication platform being used.”*

Participant 6 revealed that they had introduced electronic payslips in the province, although not to all departments. This was to deal with the issue of workers not being in the office for payslips due to COVID-19. At the same time, it was moving away from a paper-based process to a digital solution via email.

4.5.3.2. Inclusion of 4IR Technologies

Technology is forever evolving and not stagnant, and the 4IR has introduced many technologies that could benefit the government or many other sectors. Most participants agreed that digitisation, e-commerce, and cloud computing could, and some currently benefit the government.

Participant 2 stated that digitisation and data mining could benefit the public sector and provided a detailed example, *“If you look at health and education, you’ll find that they’re still doing extensive manual processes. If you digitise these processes, it will allow you to centralise the information making it available and assisting in better decision making. One other thing is data mining will help the government make decisions by having a centralised base in terms of finding information.”*

“For example, look at UKZN can find papers of students they worked on previously many years back and you can find it for many different fields at a different location. But when it comes to the government, you find that you can only make a decision based on treasury and treasury only and may not be able to find the information on National Treasury or treasury from Eastern Cape or Western Cape. Our information is scattered all over, and it’s not centralised. Such platforms and innovations can give you all this information, link departments, and help you

make better decisions. This is based around the 4th industrial revolution focused on data mining, digitalisation and Blockchain.”

Most participants agreed that cloud computing would benefit the government in terms of what it can offer. Based on that, the department would not be purchasing and maintaining servers. That responsibility would lie with someone else, including that user could access their information remotely; there would be no need to connect to a server in the office. Danielsen, Flak, and Ronzhyn (2019) agreed with this, stating that computing is a possible solution to the government’s challenges regarding the dramatic increase in computational data.

To the same extent, Participant 3 was of a different view, and they felt that the department and government would benefit from these 4IR technologies. Still, they stated that the government was not at a level to fully accommodate such technologies due to the public sector’s infrastructure in terms of ICT. *“I would like to mention that these technologies are the right alternative that would benefit the department of the public sector, but the main issue is the infrastructure that the public sector currently has. I feel it is not at the level at which it can fully support these new technologies.”*

Participant 7 stated, *“Blockchain is still in its infancy, and most of it is still speculative and driven by the commodities market or financial markets. If I were to implement Blockchain, it would not give me so much of an edge but would rather give me some recognition. But give it another 5 to 10 years”*.

4IR, as it evolves, comes with many technologies developed during that revolution. Those technologies may provide a benefit to an organisation. Still, technologies in their infancy do not provide a use case for particular industries or sectors.

4.6. Chapter Summary

The chapter dealt with the presentation of the data and results obtained from the eight respondents. The responses have been linked to the various objectives set for the study and further connected to the literature review chapter to qualify and support the literature provided. The respondents could respond to most of the questions to the best of their knowledge and

experience. The following chapter will present findings, conclusions, and recommendations of this study.

5. CHAPTER FIVE: DISCUSSION OF CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter provides some insight into the findings of the study. The chapter further presents the conclusions of the research and provides recommendations for the department and future studies. The study was only limited to the KZN Provincial Treasury Department.

5.2. Review of the Objectives of The Study

The objectives of the study were the following:

- To investigate the innovation culture within the institution
- To determine the importance of innovation in improving the institution's internal processes and service delivery
- To investigate the innovative systems and processes and how users within the institution perceive the systems and policies in place within the institution
- To examine current systems in place and look at innovative ways they could be improved in terms of technologies in the fourth industrial revolution

5.3. Summary of Research Findings

The section presented in the below paragraph will give context to the questions asked to the study participants. The themes and subthemes identified in the previous chapter will also be dealt with.

5.3.1. Objective One

To investigate the innovation culture within the institution

5.3.1.1. The Culture of Innovation in the Department

It isn't easy to pinpoint if the department has a culture of innovation. From the study, what can be taken is that the culture of innovation in the department varies amongst units. The findings indicated that there is innovation within the department but varies among units. For instance, we can look at IT, one of the interviewed units for this study. They stated that there was innovation within their unit but could be better by addressing some of the hindrances prevented from growing. Looking at applications that have been developed or are in the pipeline regarding digitising specific processes within the department illustrates that innovation exists.

The systems unit, on the other hand, was of a different view, and it should be noted that them being a transversal service, provide a service to all departments within the province. The participants interviewed indicated that there was innovation, but it was limited. The head of the unit was over a different view stating that the culture of innovation was nonexistent based on the hindrances that hamper it from being innovative.

One should not forget the relationship between leadership style and innovation and its impact on the culture of innovation within the organisation. An organisation's leaders affect innovation positively and are achieved by adopting a suitable leadership style that nurtures innovative behaviour (Abdolmaleki, et al., 2013). The authors in their study further concluded that the components of leadership innovation are a function

In supporting the culture of innovation, there are processes in place in the department that allow innovation to come forward, which is discussed in the following subsection

5.3.1.2. Process of Innovation Emergence

The study's findings highlighted and revealed that there are processes in place for the units and departments to support the emergence of innovation. The junior and middle management participants defended the previous sentence by saying they can approach their supervisors if they have an idea or problem-solving solution. The supervisors have an open door policy and always welcome innovation from their subordinates and staff members. As stated by Shenhar (1990), there is a positive impact on employees' performance with open communication between their managers. Additionally, the open door policy of these supervisors allowed that if an employee had an idea I wanted to discuss something with your supervisor, they could formally approach the supervisors for a discussion. Creativity can be the spur-of-the-moment thing based on one's thoughts, and some innovations are unexpected and may materialise by accident (West, 2002).

The various units have meetings regularly, and individuals can bring forth any ideas to be discussed amongst the teams; this is another method that the participants mentioned. These meetings were either held as a unit to be reactive or proactive in providing innovative solutions. Additionally, regarding the IT unit, meetings were held with various units and other departments regarding the systems unit. All this was to determine their needs and provide innovative solutions, which was another aggressive method.

At the same time, responding to the notion that innovation can be reactive, the units can be approached by other units in terms of IT or other departments in terms of systems. At these meetings, these units would request whatever they needed, maybe requesting the automation of a process or providing a problem to which IT or systems would offer a possible innovative solution.

5.3.1.3. Innovative Contribution

Innovations introduced in an organisation should have a positive contributing factor and be implemented to provide a change. The study revealed that most of the innovations introduced in the department are process-based; they moved processors from paper-based to digital systems.

Participants within the IT unit revealed that many of the processes within the department had been digitised, digitised in the sense that there has been an elimination of paper in the transition

to digital. One of the participants mentioned how digitising the leave process assisted in being able to apply for leave online and know where your leave application process is. Many of these innovations have allowed the department to function remotely, allowing users to be at home while performing work processes without hindering the department's performance.

The COVID-19 pandemic is an example that can be used. It affected many organisations regarding the lockdown requiring people to stay at home and only allowing essential services to work. During the various stages of lockdown, the department could operate at minimal levels. The introduction of Microsoft Teams allowed individuals to hold meetings remotely. The introduction of the online COVID-19 questionnaire let the department know if any individuals presented any symptoms regarding COVID-19. Most of the innovations, if not all, have allowed the department and its employees to operate remotely, allowing employees to perform and work on specific tasks at home. Egbuta et al. (2017) agreed that IT has rapidly facilitated the growth of working from home due to modern ICT and computer technology allowing workers to work remotely.

The systems unit within the department indicated that they provide a service to all government departments within the province as they offer transversal support. Introducing the biometric system (eDNA) has assisted in deterring fraud. It has been indicated that the biometrics system provides an extra layer of security on top of a username and password, adding the requirement of a fingerprint and linked smart card in approving transactions. Though blatant fraud and corruption cannot be eliminated, the system gives the assurance of putting an identity to the person performing that fraud, allowing law enforcement to take action. Melvor et al. (2014) supported this by mentioning that identification systems such as biometrics can be helpful to security, accountability and convenience.

The innovations introduced in the department have assisted the department in digitising specific processes, cutting out paper, and eliminating many steps to reach the final destination. The introduction of 4IR security systems has helped combat fraud and improve security in terms of financial systems within the department.

5.3.2. Objective Two

To determine the importance of innovation in improving the institution's internal processes and service delivery.

5.3.2.1. Barriers in Innovation and Reducing those Barriers

According to the study, the major hindrance raised by most participants was the budget issue experienced in the government and the department. Budget affects many things, and without sufficient money available, it becomes hard to implement anything. Over the years, the South African government has implemented cutting government and department budgets as part of its reconstruction and recovery plan for the country.

Linked to budget, another that the participants flagged are the current organograms and the difficulty in making changes to the structure of their respective units. Skill gaps within unit structures and rectifying such issues require budget availability to make such changes. Further problems with the structure are when amending it. It has to go through many stages upon getting approval raising the issue of so much red tape. The bureaucratic procedures in government mean that anything that will have financial implications requires certain internal and external approvals depending on the magnitude. It should be noted that the reported barriers to innovation concurs with Mulgan's 5 factors that hinder public sector innovation presented in Figure 14 in this paper. Moreover, what the participants presented as barriers to innovation also speak to the weaknesses in the KZN Province SWOT analysis for innovation displayed in Table 12.

Burcharth and Ulhøi (2011) stated that there needs to be a realisation that different structural arrangements must be used for incremental and radical innovation. Constant and incremental enhancements must match these hierarchical structures. The participants raised the issue that some units' structure is rigid and does not change as innovation evolves. They added that the unit organogram and job specs of the particular post need to be reviewed regularly to ensure that the positions evolve with the changing demands of organisations steered by innovation.

There is a link in terms of research and development with regards to improved innovation, one of the participants posed the question pointing out in his organogram that there is no post with regards to research and development, thus making it difficult to be innovative.

South Africa's National Research and development strategy 2002 stated that innovation needs people that are well trained, hence the importance of investing in human capital to benefit an organisation. Burcharth and Ulhøi (2011), in their study, were able to conclude that innovation activity is dependent on the quality of human capital present. Participants in the study raised that the budget cuts have affected their training needs. A participant raised the issue that in the past, IT staff went to India to learn in terms of information and technology. That exchange program has since been halted due to the unavailability of budget. This coincides with the study by Duarte et al. (2017), showing that projects are abandoned mainly due to a lack of funds within the organisation and the cost of innovation being too high.

IT infrastructure and access to technology in remote areas is an issue, and this was one of the issues raised by a participant in the systems unit. As stated in the study, the systems unit provides transversal support to all government departments within the province of KZN. When the unit introduced the electronic payslip via e-mail, it could not roll out this service to every department. More detail was given that schools in rural areas regarding teachers and clinics regarding nurses could not benefit from the system due to the infrastructure. Hence those employees still require their pay slips to be physically delivered. An estimated 45% of the South African population lives in rural areas less developed than urban areas with a lack of ICT infrastructure (Naidoo, 2012).

SITA was born as a strategic resource for the government regarding managing IT procurement and delivery processes, ensuring that the state gets value for money. In addition, in using IT effectively to support the delivery of government services to all citizens. Participants have raised that SITA, at times, is a hindrance in terms of their performance. Services or human capital procured through SITA may take time, as revealed by the participants. The delay may even be more if SITA does not have that particular skill and has to advertise externally.

Departments must manage change within the working environment, whether individual or organisational. Participants indicated that most people have become so accustomed to how they do specific processes and work that it becomes difficult for them to accept change. There is a common perception that the older generation is more resistant to change and that age plays a significant role in individuals accepting change.

Dr Ramakrishnan (2020) determined the internal and external barriers that impede innovation in his study. He stated the below obstacles to innovation,

External Barriers:

- Absence of good infrastructure
- Insufficiencies in training and education systems
- Mismanagement of talent society

Internal Barriers:

- Resistance to change by individuals
- Strict communication structures
- Inflexible organisational arrangements

5.3.2.2. Improving Innovation

For innovation to thrive in an organisation, there must be proper management of innovation and dealing with any obstacles that may impede innovation from flourishing in the department. Looking at the culture of innovation, it seems that employees need a mindset and environment that encourages innovation.

According to the study findings and looking at some of the hindrances that impede innovation in an organisation, one can determine what needs to be improved to nurture innovation, thus improving it.

To enhance knowledge in innovation, sharing opinions, ideas, and the discussion amongst people is a crucial process through which ideas rise amongst people (Ghazali, et al., 2014). The participant agreed to this, detailing that a way in which innovation can be improved is through the establishment of specific forums. This would bring all relevant units together to discuss issues and share knowledge to assist one another.

Participants raised the issue that relaxation in bureaucracy and rigid procedures in government would greatly assist in improving innovation. The red tape in government has made it

challenging to change organograms and unit structures easily. The Strict processes followed in procuring services through SITA is a challenge that needs improvement raised by the participants. Generally, red tape is something perceived as problematic and has to be overcome as it has an eroding effect on the performance of governments (Brewer & Walker, 2010)

In speaking about the easing of red tape in government regarding policies and procedures, one of the participants mentioned the circular published by the DPSA. The circular mention that government departments should consider cloud computing as a solution for any new system they want to implement.

5.3.3. Objective Three

To investigate the innovative systems and processes and how users within the institution perceive the systems and policies in place within the institution.

5.3.3.1. Evaluation of Implemented Innovations

It has always proved difficult to quantify the benefits of innovation. Andresen (2000) states that the true benefit of IT is only realised when that specific technology is applied to a particular relevant task and aligned to the organisation's business strategy.

From the study's findings, The innovations introduced have positively benefited the department. The processes that have been digitised have eliminated paper-based systems and digitised tasks. The processes are trackable at every stage; a case in point is the leave system. It has eliminated the need to physically fill in a form, take it to your supervisor to approve your leave, and then take it to HR. A person can now navigate the online dashboard to apply for leave, see where their leave approval is held up, and check for leave balances. Corydon et al. (2016) stated in a report published by McKinsey & Company, that governments could save money, improve services and enhance citizens' quality of life by making organisational changes and digitising processes.

The introduction and integration of the biometric system (eDNA) with the financial systems of treasury have allowed the department to manage and deter fraudulent payments within the

department of KZN. Participants from the systems unit mentioned that introducing this system decreased fraud. Even though fraudulent activities continue, the system can at least put an identity to the person approving or performing fraudulent payments within the systems of PERSAL and BAS. The system has given the government more power in evidence when prosecuting those who decide blatantly participate in fraudulent activities. In a report by Wickberg (2013), she agrees that new technology can promote accountability, transparency and public involvement.

5.3.4. Objective Four

To examine current systems in place and look at innovative ways that could be improved in terms of technologies in the fourth industrial revolution

5.3.4.1. Inclusion of 4IR Technologies

In his state of the nation address in 2019, the Republic of South Africa president highlighted the importance of the 4IR and how it can drive growth in the country and unlock a prosperous future. The president announced during that year that he had appointed a presidential Commission on the 4th industrial revolution. The Presidential Commission On The 4IR (2020), in their report, summarises critical findings stating that the 4IR has the potential to catalyse the nation's patha to achieving the NDP goals.

Most participants agreed that cloud computing would benefit the government and the department based on its benefits to the public sector. Cloud computing is Internet-based computing where virtual servers are shared, and it helps to save and avoid the substantial capital investment needed to set up server infrastructure.

One participant mentioned that all these technologies that come with 4IR are beneficial to the government. The only issue was that the government infrastructure was not ready to support these technologies fully. In addition to this, another participant mentioned technologies such as blockchain are still at their infancy stage to have a use case in government

Technologies such as E-governance and digitisation are already emerging in the public sector. Digitisation is already used in the current department in the study and various other departments and government agencies.

5.4. Recommendations

5.4.1. Objective One

To investigate the innovation culture within the institution

The department needs to establish an innovative culture within the institution, and it is clear that innovation exists in some units but not in all. In improving the innovation culture within the organisation, employees need to be empowered to think and work innovatively. They need to be equipped with the right skills and knowledge to adapt to the ever-evolving technological advancements. Most importantly, leaders of units and organisations need to be equipped with the correct skills to lead and guide their various divisions to think innovatively and embrace innovation.

5.4.2. Objective Two

To determine the importance of innovation in improving the institution's internal processes and service delivery

First, the study has shown that the innovations introduced in the department have benefited the department. Some of these innovations may not be considered innovations since some implementations have been long overdue. As mentioned by one of the participants in the study, it is clear that the department should invest more in research and development in terms of innovation. There needs to be an investigation into any other processes, tasks or services that could be digitised within the institution. The digitisation of processors has proved beneficial for the department eliminating and saving on paper waste. It has further provided traceability and the ease and speed at which tasks can be performed at your workstation.

Technological security additions to processes such as biometrics prove advantageous in deterring fraud and corruption within the KZN Treasury and other government departments. The department and other departments should continue using the biometric system and roll it

out to other services or processes it feels may benefit from such a system through proper due diligence. One thing about criminal activities is that they are forever evolving and changing as technology and new ways of doing things improve. Innovation is all about continuous improvement. The department should be doing just that, continuously improving the biometric system by looking at other biometrics such as voice recognition, facial recognition, and iris recognition.

Even though not mentioned by the participants, the labour unions pose a challenge and impede innovation in the public sector. It is known that with innovation comes job losses, the labour unions will have to be won over, and employees reskilled to fit in elsewhere. There has to be innovation with minimum job losses. Reskilling employees to fit in elsewhere will assist the labour unions in holding back change and acceptance of technology.

5.4.3. Objective Three

To investigate the innovative systems and processes and how users within the institution perceive the systems and policies in place within the institution

Change management is very critical and an organisation to assist in managing change it may affect its employees, whether it be based on new working arrangements or new in different ways of doing things.

The government is known for its high level of red tape in getting approvals and implementing new technologies. Processes should be put in place to allow the deviation from the following 13 steps to allow for quicker procurement of goods and services that may prove beneficial to the organisation

5.4.4. Objective Four

To examine current systems in place and look at innovative ways that could be improved in terms of technologies in the fourth industrial revolution

The country wants to move with the technologies and innovation that emerge from 4IR based on what the president stated in his state of the nation address. Furthermore, establishing the

Commission on the 4th industrial revolution shows that the country is in the right direction regarding such investigations.

As mentioned in objective two, the biometric system has benefitted two government departments in the province. This system should be improved in terms of additional security measures such as other forms of biometrics and rolling out this system two other systems or processes within the department that may benefit from such security.

5.5. Recommendations for Future Studies

The study only focused on one government department within the province of KZN, so the study could be further extended to cover additional departments within the province to compare the culture of innovation amongst departments. Further, the study could perhaps incorporate a mixed methods approach to get a broader audience in terms of receiving information regarding innovation and additionally including employees within organisations to determine innovation in other units.

Given the fast phase of change and the complexities brought by innovation technologies, the literature is moving towards the fifth industrial revolution (5IR). 5IR is concerned with the human and machine collaborations in the workplace to improve service, (Noble, et al., 2022). It is recommended that future research studies look into 5IR innovation and its potential impact on service delivery.

5.6. Chapter Summary

The chapter summarises the results, conclusions and recommendations of this research. Various literature was reviewed in terms of the study, which supports the findings of the responses of the participants. Innovation needs to be embraced by the department together with its leaders and management, in addition to that, to ensure that the environment encourages innovation. At the same time, government and departments should make available funds and a budget for innovation to grow. The study has made clear that one of the significant innovation

hindrances is the unavailability of a budget to implement. Technology is not stagnant and is evolving daily due to new technologies and innovations. Therefore, institutions should invest more in research and development with regards to their institutions so they can keep up with possible technologies that could be implemented in government.

Bibliography

- EkStep Foundation, 2019. *DIKSHA - Learnings from India Experience*. [Online]
Available at: <https://ekstep.in/resources/9-general/11-diksha-learnings-from-indian-experience>
[Accessed 1 May 2022].
- Abdolmaleki, J. et al., 2013. A study on effects of leadership style on innovation: A case study from automaker industry. *Management Science Letters*, pp. 1977-1982.
- Abdullah, J. W. & Kim, S., 2020. Singapore's Responses to the COVID-19 Outbreak: A Critical Assessment. *American Review of Public Administration*, 50(6-7), pp. 770-776.
- Adeyemo, A. B., 2011. E-government implementation in Nigeria: An assessment of Nigeria's global e-gov ranking. *Journal of internet and information system*, 2(1), pp. 11-19.
- Akileswaran, K. & Hutchinson, G., 2019. *Adapting to the 4IR: Africa's development in the age of automation*, s.l.: Tony Blair Institute for Global Change.
- Alhojailan, M. I., 2012. Thematic Analysis: A Critical Review Of Its Process And Evaluation. *West East Journal of Social Sciences*, 1(1), pp. 39-47.
- Andresen, J., 2000. A Framework For Measuring It Innovation Benefits. Volume 5, pp. 57-72.
- Angen, M., 2000. Evaluating interpretive inquiry: Reviewing the validity debate and opening the dialogue. *Qualitative Health Research*, 10(3), pp. 378-395.
- Anshari, M., Syafrudin, M. & Fitriyani, N. L., 2022. Fourth Industrial Revolution between Knowledge Management and Digital Humanities. *Information*, 13(292), pp. 1-12.
- Arnold, E. & Lane, S., 2011. Qualitative research: a valuable tool for transfusion medicine. *Transfusion*, Volume 51, pp. 688-691.
- Arshad, A. M. & Su, Q., 2015. Interlinking Service Delivery Innovation And Service Quality: A Conceptual Framework. *Journal of Applied Business Research (JABR)*, 31(5), pp. 1807-1822.

- Arshed, N. & Danson, M., 2015. The Literature Review. In: K. O’Gorman & R. MacIntosh, eds. *The Global Management Series: Research Methods for Business & Management - A guide to writing your dissertation*. Wolvercote, Oxford: Goodfellow Publishers Limited, pp. 31- 49.
- Asenahabi, B. M., 2019. Basics of Research Design: A Guide to selecting appropriate research design. *International Journal of Contemporary Applied Researches*, 6(5), pp. 76-89.
- Barad , M., 2017. Definitions of Strategies. In: *Strategies and Techniques for Quality and Flexibility*. s.l.:Springer, Cham, pp. 3-2.
- Bashir, S., Dahlman, C. J., Kanehira, N. & Tilmes, K., 2021. *The Converging Technology Revolution and Human Capital: Potential and Implications for South Asia*, Washington, DC: The World Bank Publications.
- Bason, C., 2010. *Leading public sector innovation: Co-creating for a better society*. 1st ed. s.l.:Bristol University Press, Policy Press.
- Bass, B. M., 1999. Two Decades of Research and Development in Transformational Leadership. *European Journal of Work and Organizational Psychology*, 8(1), pp. 9-32.
- Baxter, G. & Sommerville, I., 2011. Socio-technical systems: From design methods to systems engineering. *Interacting with Computers*, 23(1), pp. 4-17.
- Bazeley, P., 2009. Analysing qualitative data: More than ‘identifying themes. *Malaysian Journal of Qualitative Research*, Volume 2, pp. 6-22.
- Beliz, G., Basco, A. I. & de Azevedo, B., 2019. Harnessing the opportunities of inclusive technologies in a global economy. *Economics E-Journal*, 13(1), pp. 1-15.
- Belyh, A., 2018. *Industry 4.0: Everything You Need To Know*. [Online]
Available at: <https://www.cleverism.com/industry-4-0-everything-need-know/>
[Accessed 3 May 2022].
- Berg, B. L. & Lune, H., 2011. *Qualitative Research Methods for the Social Sciences*. 8th ed. s.l.:Pearson.
- Bhasin, M. L., 2016. Combatting Bank Frauds by Integration of Technology: Experience of a Developing Country. *British Journal of Research*, pp. 64-92.
- Bostrom, N., 2007. Technological Revolutions: Ethics And Policy in the Dark. In: M. Nigel, D. S. Cameron & M. E. Mitchell, eds. *Nanoscale: Issues and Perspectives for the Nano Century*. s.l.:John Wiley, pp. 129-152.
- Braun, V. & Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), pp. 77-101.
- Brewer, G. A. & Walker, R. M., 2010. The Impact of Red Tape on Governmental Performance: An Empirical Analysis. *Journal of Public Administration Research and Theory: J-PART*, pp. 233-257.

- Burcharth, A. & Ulhøi, J., 2011. Structural Approaches to Organizing for Radical Innovation in Established Firms. *The International Journal of Entrepreneurship and Innovation*, pp. 117-125.
- Burgelman, R. A., Maidique, M. A. & Wheelwright, S. C., 1996. *Strategic Management of Technology and Innovation*. 2nd ed. Chicago: Cengage.
- Burnes, B., 2005. Complexity theories and organizational change. *International Journal of Management Reviews*, 7(2), pp. 73-90.
- Burns, J. M., 1978. *Leadership*. New York: Harper and Row.
- Bush, P. W., 2012. Leadership at all levels. *American Society of Health-System Pharmacists, Inc*, Volume 69, pp. 1326-1330.
- Caetano, L. & Charamba, A., 2017. Implications of the Fourth Industrial Revolution. *HR Future*, 2(1), p. 26–28.
- Caldwell, C. et al., 2012. Transformative Leadership: Achieving Unparalleled Excellence. *Journal of Business Ethics*, 109(1), pp. 175-187.
- Carayon, P., 2006. Human factors of complex sociotechnical systems. *Applied Ergonomics*, 37(4), pp. 252-253.
- Cassell, C., Cunliffe, A. L. & Grandy, G., 2019. *The SAGE Handbook of Qualitative Business and Management Research Methods: History and Traditions*. 55 City Road: SAGE Publications Ltd.
- Chandler, A. J., 1962. *Strategy and Structure: Chapters in the History of the American Industrial Enterprise*. s.l.:MIT Press.
- Clarke-Potter , K., 2019. *These Are The Six Countries Leading The Fourth Industrial Revolution*. [Online]
Available at: <https://blockheadtechnologies.com/these-are-the-six-countries-leading-the-fourth-industrial-revolution/>
[Accessed 1 May 2022].
- Clegg, C. W., 2000. Sociotechnical principles for system design. *Applied Ergonomics*, 31(5), pp. 463-477.
- Conti, M., Passarella, A. & Das, S. K., 2017. The Internet of People (IoP): A new wave in pervasive mobile computing. *Pervasive and Mobile Computing*, 41(1), pp. 1-27.
- Corydon, B., Ganesan, V. & Lundqvist, M., 2016. *Transforming government through digitization*, s.l.: McKinsey & Company.
- Costello, T. & Prohaska, B., 2013. Innovation. *IT Professional*, 64(13), pp. 61-63.
- Creswell, J. W., 2007. *Qualitative inquiry and research design: Choosing among five approaches*. 2nd ed. s.l.:SAGE Publications Inc..

Creswell, J. W., 2014. *Research design qualitative, quantitative and mixed methods approaches*. 4th ed. s.l.:University of Nebraska-Lincoln: SAGE.

Creswell, J. W. & Creswell, J. D., 2018. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 5th ed. London: SAGE Publications.

CSIR, 2022. *Centre for the Fourth Industrial Revolution South Africa*. [Online]
Available at: <https://www.csir.co.za/centre-fourth-industrial-revolution-south-africa>
[Accessed 9 May 2022].

Daft, R. L., 2018. *The Leadership Experience*. Seventh edition ed. s.l.:Cengage Learning.

Davies, M. & Buisine, S., 2018. Innovation Culture in Organizations. In: *Science, Technology and Innovation Culture*. s.l.:s.n., pp. 101-115.

de Araujo, M. H., Reinhard, N. & Cunha, M. A., 2018. Electronic government services in Brazil: an analysis based on measures of access and users' internet skills. *Brazilian Journal of Public Administration*, 52(4), pp. 676-694.

de Laia, M. M., da Cunha, M. A. V. C., Nogueira, A. R. R. & Mazzon, J. A., 2011. Electronic Government Policies in Brazil: Context, ICT Management and Outcomes. *Revista de Administração de Empresas*, 51(1), pp. 43-57.

de Lange, R., 2019. *UIF says uFiling to be fixed by July*. [Online]
Available at: <https://www.news24.com/citypress/business/uif-says-ufiling-to-be-fixed-by-july-20190531>
[Accessed 1 May 2022].

de Lange, R., 2021. *Readers complain: 'You wait almost a year for unemployment insurance to pay out'*. [Online]
Available at: <https://www.news24.com/citypress/news/readers-complain-you-wait-almost-a-year-for-unemployment-insurance-to-pay-out-20211010>
[Accessed 1 May 2022].

DeJonckheere, M. & Vaughn, L. M., 2019. Semistructured interviewing in primary care research: a balance of relationship and rigour. *Family Medicine and Community Health*, 7(2), pp. 1-8.

Deloitte Insights, 2020. *The Fourth Industrial Revolution: At the intersection of readiness and responsibility*, s.l.: Deloitte Development LLC.

Deloitte, 2018. *Transforming the Public Sector Delivering successful public sector transformation through innovation*. [Online]
Available at:
https://www2.deloitte.com/content/dam/Deloitte/ie/Documents/PublicSector/GovLab_Transforming%20the%20public%20sector_spreads.pdf
[Accessed 29 April 2022].

Department of Labour, 2018. *uFiling System User Guide*, Pretoria: Department of Labour.

Department of Science and Technology, 2019. *White Paper on Science, Technology and Innovation*, Pretoria: Department of Science and Technology.

Department of Telecommunications and Postal Services, 2016. *National Integrated ICT Policy White Paper*, Pretoria: Department of Telecommunications and Postal Services.

Department of Telecommunications and Postal Services, 2017. *National e-Government Strategy Roadmap*, Pretoria: Government Gazette.

DPSA, 2012. *Public Service Corporate Governance of Information and Communication Technology Policy Framework (2012)*, Pretoria: Department of Public Service and Administration.

DPSA, 2018. *National Knowledge Management Strategy Framework 2019*, Pretoria: Department of Public Service and Administration.

Duarte, F. A. et al., 2017. Barriers to innovation activities as determinants of ongoing activities or. *International Journal of Innovation Science*, pp. 244-264.

e-Estonia, 2022. *Estonian blockchain technology*. [Online]

Available at: <https://e-estonia.com/wp-content/uploads/2020mar-nochanges-faq-a4-v03-blockchain-1-1.pdf>

[Accessed 1 May 2022].

Egbuta, I., Thomas, B. & Al-Hasan, S., 2017. Teleworking as an innovative work practice in Small Business Enterprises in South Wales. *Innovation Management and Policy Track*.

Ernst & Young, 2017. *Public sector innovation: from ideas to actions*, Canada: Ernst & Young Global Limited.

European Commission, 2014. *eGovernment in the United Kingdom: eGovernment Factsheet*. [Online]

Available at: <https://joinup.ec.europa.eu/sites/default/files/document/2014-06/eGov%20in%20UK%20May%202014%20v.16.0.pdf>

[Accessed 3 May 2022].

European Commission, 2020. *Digital Public Administration Factsheets - Norway*. [Online]

Available at: https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Public_Administration_Factsheets_Norway_vFINAL.pdf

[Accessed 2 May 2022].

Fabian, S., 2018. *It is not only size that matters: How unique is the Estonian e-governance success story?*, s.l.: Econstor.

Fernando, Y., 2019. Impact of Training and Development on Innovation Capability. *International Journal of Science and Research*.

Filgueiras, F., Flávio, C. & Palotti, P., 2019. Digital Transformation and Public Service Delivery in Brazil. *Latin American Policy*, 10(2), pp. 195-219.

Fleming, J. & Zegwaard, K. E., 2018. Methodologies, methods and ethical considerations for conducting research in work-integrated learning. *International Journal of Work-Integrated Learning, Special Issue*, 19(3), pp. 205-213.

Flick, U., 2018. *The SAGE Handbook of Qualitative Data Collection*. 1st ed. Berlin, Germany: SAGE Publications Ltd.

Ford-Gilboe, M., Campbell, J. & Berman, H., 1995. Stories and numbers: Coexistence without compromise. *Advances in Nursing Science*, 18(1), pp. 14-26.

Fossey, E., Harvey, C., Mcdermott, F. & Davidson, L., 2002. Understanding and Evaluating Qualitative Research. *Australian and New Zealand Journal of Psychiatry*, 36(6), pp. 717-732.

Futshane, V., 2021. *Recovering from COVID-19 and inequality: the experience of South Africa*. [Online]

Available at: https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2021/05/Futshane_paper.pdf

[Accessed 13 April 2022].

Garvin, D. A. & Roberto, M. A., 2005. *Change Through Persuasion*. Boston, Massachusetts: Harvard Business Review.

Ghazali, N. I., Long, C. S. & Ghazali, N., 2014. *Knowledge sharing factors and innovation capability*. Bandung, Indonesia, IEEE, pp. 315-320.

Gillis, A. S., 2022. *What is the internet of things (IoT)?*. [Online]

Available at: <https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT>

[Accessed 1 May 2022].

Given, L. M., 2012. *The SAGE Encyclopedia of Qualitative Research Methods*. Thousand Oaks: SAGE Publications, Inc..

Goundar, S., 2012. Chapter 3 - Research Methodology and Research Method. In: *Cloud Computing*. s.l.:s.n.

GovChain, 2022. *Estonia: X-Road and KSI Blockchain*. [Online]

Available at: <https://govchain.world/estonia/>

[Accessed 1 May 2022].

Gray, J. R., Grove, S. K. & Sutherland, S., 2017. *Burns and Grove's the Practice of Nursing Research: Appraisal, Synthesis, and Generation of Evidence*. 8th ed. China: Elsevier, Inc..

Griesse, B., 2022. *The Influence of Age on Change Management*. [Online]

Available at: <https://blog.avaap.com/2020/07/07/the-influence-of-age-on-change-management>

Grönlund, A., 2002. *Electronic Government: Design, Applications, and Management*. Hershey, PA: IGI Global .

- Grönlund, A. & Horan, T. A., 2004. Introducing e-Gov: History, Definitions, and Issues. *Communications of the Association for Information Systems*, 15(39), pp. 713-729.
- Habiyaremye, A., King, N. A. & Tregenna, F., 2022. *Innovation and socio-economic development challenges in South Africa: An overview of indicators and trends. SARChI Industrial Development Working Paper Series WP 2022-03*, Johannesburg: SARChI Industrial Development, University of Johannesburg.
- Halal, W. E. & Taylor, K. B., 1999. *Twenty-first century economics: Perspectives of socioeconomics for a changing world*. New York: Macmillan.
- Hax, A. C. & Majluf, N. S., 1988. The Concept of Strategy and the Strategy Formation Process. *Interfaces*, 18(3), pp. 99-109.
- Heeks, R., 2005. *Implementing and Managing eGovernment: An International Text*. 1st ed. Manchester, UK: SAGE Publications Ltd.
- Herold, G., 2022. *Leadership in the Fourth Industrial Revolution*. [Online] Available at: https://executiveacademy.at/fileadmin_synced_assets/documents/White_Papers/Leadership-in-Fourth-Industrial-Revolution-Stanton-Chase.pdf [Accessed 3 May 2022].
- Hilhorst, C., Behrens, C., Brouwer, E. & Sneller, L., 2022. Efficiency gains in public service delivery through information technology in municipalities. *Government Information Quarterly*, 39(4), p. 101724.
- Ho, A. T., 2002. Reinventing Local Governments and the E-Government Initiative. *Public Administration Review*, 62(4), pp. 434-444.
- Holzer, M. & Schweser, R. W., 2011. *Public Administration: An Introduction*. New York: M.E. Sharpe, Inc.
- Horst, J. & Santiago, F., 2018. *What can policymakers learn from Germany's Industrie 4.0 development strategy?*, Vienna: United Nations Industrial Development Organisation.
- Hudson, L. & Ozanne, J., 1988. Alternative Ways of Seeking Knowledge in Consumer Research. *Journal of Consumer Research*, 14(4), p. 508–521.
- Hussain, S. T. et al., 2018. Kurt Lewin's change model: A critical review of the role of leadership and employee involvement in organizational change. *Journal of Innovation & Knowledge*, 3(3), pp. 123-127.
- Igwenagu, C., 2016. *Fundamentals of Research Methodology and Data Collection*. [Online] Available at: https://www.researchgate.net/publication/303381524_Fundamentals_of_research_methodology_and_data_collection [Accessed 3 April 2022].

- Ingraham, P. W., 2004. Leadership in the Public Sector. *Review of Public Personnel Administration: Models and Assumptions for Leadership Development*, 24(2), pp. 95-112.
- Iskandar, I., 2019. Change Management: Concept, Application, and its Relevance for Higher Education Management. *Journal of Educational Experts*, 2(1), pp. 27-32.
- Jankeeparsad, R. W. & Jankeeparsad, T. R., 2017. Acceptance of the electronic method of filing tax returns by South African taxpayers: An exploratory study. *Journal of Economic and Financial Sciences*, 9(1), pp. 120-136.
- Junie, S., 2019. *Identity fraud and theft on the rise in South Africa compared to 2018*. [Online] Available at: <https://www.thesouthafrican.com/news/finance/increase-identity-fraud-and-theft-insouth-> [Accessed 12 April 2022].
- Kamar, N. & Ongo'ndo, M., 2007. *Impact of e-Government on Management and use of Government Information in Kenya*. World Library and Information Congress: 73rd IFLA General Conference and Council, Durban, South Africa, pp. 19-23.
- Kamble, S. S., 2018. Sustainable Industry 4.0 framework: A systematic literature review identifying the current trends and future perspectives. *Process Safety and Environmental Protection*, 117(1), p. 408–425.
- Kasali, R., 2005. *Change! Manajemen Perubahan dan Manajemen Harapan*. 2nd ed. Jakarta: PT Gramedia Pustaka Utama.
- Kattel, R. & Mergel, I., 2018. *Estonia's digital transformation: Mission mystique and the hiding hand*, s.l.: Institute for Innovation and Public Purpose.
- Kiger, M. E. & Varpio, L., 2020. Thematic analysis of qualitative data: AMEE Guide No. 131. *Medical Teacher*, Volume 131, pp. 1-10.
- Kiger, M. E. & Varpio, L., 2020. Thematic analysis of qualitative data: AMEE Guide No. 131. *Medical Teacher*, Volume 131, pp. 1-10.
- Kipingu, M. K. & Shayo, D. P., 2021. Technology and Immigration System: A New Paradigm for Improving Government Service Delivery in Tanzania. *PanAfrican Journal of Governance and Development (PJGD)*, 2(2), pp. 81-106.
- Kirkbride, P., 2006. Developing transformational leaders: the full range leadership model in action. *Industrial and Commercial Training*, 38(1), pp. 23-32.
- Kivunja, C., 2017. Understanding and Applying Research Paradigms in Educational Context. *International Journal of Higher Education*, 6(5), pp. 26-41.
- Klaus, S., 2016. *World Economic Forum*. [Online] Available at: <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it->

means-and-how-to-respond/

[Accessed 30 July 2021].

Korejan, M. M. & Shahbazi, H., 2016. An analysis of the transformational leadership theory. *Journal of Fundamental and Applied Sciences*, 8(3), pp. 452-461.

Kumar, R., 2011. *Research Methodology: a step-by-step guide for beginners*. 3rd ed. London: SAGE Publications Ltd.

Kumar, V., Kumar, U. & Persaud, A., 1999. Building Technological Capability through Importing Technology: The Case of Indonesian Manufacturing Industry. *Journal of Technology Transfer*, 24(1), pp. 81-96.

Kvint, V., 2009. *The Global Emerging Market: Strategic Management and Economics*. 1st ed. London: Routledge.

Kwa-Zulu Natal Treasury, 2020. *Revised Annual Performance Plan 2020/2021*. [Online]

Available at:

<http://www.kzntreasury.gov.za/ResourceCenter/Documents%20%20Administration/KZN%20Treasury%20Annual%20Performance%20Plan%20%202020-21%20%20Revised.pdf>

[Accessed 9 May 2022].

KZN Office of the Premier, 2020. *Digital Transformation Strategy 2020 - 2025*, s.l.: KwaZulu-Natal Office of the Premier.

Lan, P. & Young, S., 1996. International Technology Transfer Examined at Technology Component Level: A Case Study in China. *Technovation*, 16(6), pp. 277-286.

Lau, T. Y., Fung, A. & Ji, M., 2006. E-Government in China: Keeping Up with the Joneses?. *Journal of E-Government*, 2(4), pp. 15-38.

Layne, K. & Lee, J., 2001. Developing fully functional E-government: A four stage model. *Government Information Quarterly*, 18(2), pp. 122-136.

Layton-Matthews, S. & Landsberg, C., 2022. The Fourth Industrial Revolution (4IR) and its Effects on Public Service Delivery in South Africa. *Special Focus*, Volume 90, pp. 55-64.

Leavitt, H. J., 1972. *Managerial Psychology*. Chicago: University of Chicago Press.

Leiner, B. et al., 2009. A Brief History of the Internet. *Computer Communication Review*, Volume 39, pp. 22-31.

Lewis, L., 2011. *Organizational Change: Creating Change Through Strategic Communication*. s.l.:Wiley-Blackwell.

Liamputtong, P., 2013. *Qualitative Research Methods*. 4th ed. Victoria, Australia: Oxford University Press: South Melbourne.

Limba, R. S., Hutahayan, B., Solimun, S. & Fernandes, A., 2019. Sustaining innovation and change in government sector organizations: Examining the nature and significance of politics of organizational learning. *Journal of Strategy and Management*, 12(1), pp. 103-115.

Lincoln, Y. & Guba, E. G., 1985. *Naturalistic inquiry*. Newbury Park, CA: SAGE Publications.

Lowhorn, G. L., 2007. Qualitative and Quantitative Research: How to Choose the Best Design. p. 5.

Lye, D., 2017. *The Fourth Industrial Revolution And Challenges For Government*. [Online]
Available at: <https://www.ge.com/news/reports/fourth-industrial-revolution-challenges-government#:~:text=On%20the%20upside%2C%204IR%20helps,those%20that%20make%20best%20use>
[Accessed 9 May 2022].

Lynn, G. S. & Kalay, F., 2016. The Impact of Organizational Structure On Management Innovation: An Empirical Research In Turkey. *Journal of Business, Economics and Finance*, pp. 125-137.

Madeira, M. et al., 2017. Barriers to Innovation and the Innovative Performance of Portuguese Firms. *Journal of Business*, pp. 2-22.

Magoma, T., 2020. *The effectiveness of the South African Smart ID card: Fighting digital identity fraud*, London: Yoti Fellowship Programme.

Maharajh, P. R., 2021. *6th Research and Innovation Strategy Group (RISG) Biennial Research and Innovation Dialogue* [Interview] (11 June 2021).

Makamase, M., 2018. *The Fourth Industrial Revolution: Impact on unemployment and inequality in South Africa*, Pretoria: Institute for Global Dialogue (IGD).

Makombe, G., 2017. An Expose of the Relationship between Paradigm, Method and Design in Research. *The Qualitative Report*, 22(12), pp. 3363-3382.

Ma, L., Chung, L. & Thorson, S., 2005. E-government in China: Bringing economic development. *Government Information Quarterly*, 22(1), pp. 20-37.

Manville, B. & Ober, J., 2003. Beyond empowerment: building a company of citizens. *Harvard Business Review*, 81(1), pp. 48-53.

Mariani, J., Eggers, W. D., Chew, B. & O'Leary, J., 2021. *A new age of government service delivery: How government can use technology to create more citizen-centered services*. [Online]
Available at: <https://www2.deloitte.com/za/en/insights/industry/public-sector/new-technology-new-model-public-service-delivery.html>
[Accessed 1 May 2022].

Marwala, T., 2020. *National Development Plan and the Fourth Industrial Revolution*. [Online]
Available at: <https://www.voices360.com/economy/national-development-plan-and-the-fourth-industrial-revolution>
[Accessed 2 May 2022].

Mazoka, F., 2013. The Level of E-Government Implementation: Case of Malawi. *Electronic Journal of e-Government*, 11(2), pp. 268-279.

Mclvor, T. et al., 2014. Overview of Benefits of Biometric Security Technology System. *International Journals of Scientific & Technology Research*.

Mdluli, S. & Makhupe, 2017. *Defining Leadership Competencies Needed for the Fourth Industrial Revolution: Leadership Competencies 4.0*, Centurion: Bank SETA.

Meganck, R., 2007. Using the Balanced Scorecard as a Strategic Management System. *Harvard Business Review*, July-August, pp. 150-161.

Mehta, M., Sarvaiya, H. & Chandani, A., 2020. Community engagement through responsible leadership in managing pandemic: insight from India using netnography. *International Journal of Sociology and Social Policy*, 43(3/4), pp. 248-261.

Mertens, D. M., 2010. *Research and Evaluation in Education and Psychology: Integrating Diversity With Quantitative, Qualitative, and Mixed Methods*. 3rd ed. Thousand Oaks: SAGE Publishing.

Ministry of Information and Communication Technology, 2013. *e-Government Initiatives in Mauritius*. [Online]

Available at: https://unctad.org/system/files/non-official-document/CSTD_2013_Ministerial_WSIS_Mauritius.pdf

[Accessed 4 May 2022].

Misheva, G. V., 2021. *Estonia - Digital Agenda for Estonia 2020*, Luxembourg: European Commission Publications.

Mishra, S. S. & Geleta, A. T., 2020. Can an E-Government System Ensure Citizens' Satisfaction without Service Delivery?. *International Journal of Public Administration*, 43(3), pp. 242-252.

Mkansi, M. & Landman, N., 2021. The future of work in Africa in the era of 4IR – The South African perspective. *Africa Journal of Management*, 7(1), pp. 17-30.

Mohajan, H., 2019. The First Industrial Revolution: Creation of a New Global Human Era. Volume 5, pp. 377-387.

Mohajan, H. K., 2020. The Second Industrial Revolution has Brought Modern. *Journal of Social Sciences and Humanities*, 6(1), pp. 1-14.

Mokyr, J., 1992. *The Lever of Riches: Technological Creativity and Economic Progress*. s.l.:Oxford University Press.

Morgan, R. & Strong, C. A., 2003. Business Performance and Dimensions of Strategic Orientation. *Journal of Business Research*, 56(3), pp. 163-176.

Mulgan, G., 2014. *Innovation In The Public Sector: How Can Public Organisations Better Create, Improve and Adapt?*, London: Nesta.

Naidoo, G., 2012. Implementation of E-government in South Africa - successes and challenges: the way. *International Journal of Advances in Computing and Management*, pp. 62-66.

Narayanan, V. K., 2017. Idea labs: instituting an innovation discovery process capable of sustaining. *Strategy and Leadership*, 45(1), pp. 27-36.

National Department of Health, 2019. *National Digital Health Strategy for South Africa 2019-2024*, Pretoria: National Department of Health.

National Science and Technology Forum, 2019. *Featured SET policy: Improving education, innovation and training (Chapter 9, NDP)*. [Online]

Available at: <https://www.nstf.org.za/wp-content/uploads/2019/02/The-NDP-ch9-1.pdf>

[Accessed 2 May 2022].

Naudé, W., 2017. *Entrepreneurship, Education and the Fourth Industrial Revolution in Africa*, Bonn, Germany: IZA – Institute of Labor Economics.

Ndung'u, N. & Signé, L., 2020. Capturing the Fourth Industrial Revolution: A regional and national agenda. In: B. S. Coulibaly & C. Golubski, eds. *Foresight Africa: Top priorities for the continent 2020-2030*. s.l.:Foresight Africa - Brookings Institution's Africa Growth Initiative, pp. 60-73.

Nightingale, P., 2014. What is Technology? Six Definitions and Two Pathologies. *SSRN Electronic Journal*, pp. 1-29.

Noble, S. M., Mende, M., Grewal, D. & Parasuraman, A., 2022. The Fifth Industrial Revolution: How Harmonious Human–Machine Collaboration is Triggering a Retail and Service [R]evolution. *Journal of Retailing*, 98(2), pp. 199-208.

Northouse, P. G., 2016. *Leadership: Theory and Practice*. Seventh ed. Thousand Oaks, California: SAGE Publications, Inc.

Nowell, L. S., Norris, J. M., White, D. E. & Moules, N. J., 2017. Thematic Analysis: Striving to Meet the Trustworthiness Criteria. *International Journal of Qualitative Methods*, 16(1), pp. 1-13.

Nwosu, C. O., Kollamparambil, U. & Oyenubi, A., 2021. Socioeconomic inequalities in ability to work from home during the coronavirus pandemic: The case of South Africa. *The Economic and Labour Relations Review*, 33(2), pp. 290-307.

OECD, 2003. *Background Paper: Implementing E-Government in OECD Countries - Experiences and Challenges*, Paris: Organisation for Economic Cooperation and Development (OECD) Publications.

OECD, 2012. *Innovation for Development*, Paris: Organisation for Economic Co-operation and Development (OECD) Publishing.

OECD, 2017. *Embracing Innovation in Government: Global Trends*, Paris: Organisation for Economic Cooperation and Development (OECD) Publications.

OECD, 2017. *Government at a Glance 2017*, Paris: OECD Publishing.

- OECD, 2019. *Digital Government Review of Panama: Enhancing the Digital Transformation of the Public Sector*, OECD Digital Government Studies, Paris: OECD Publishing.
- OECD, 2019. *Embracing Innovation in Government: Global Trends 2019*, Paris: Organisation for Economic Organisation for Economic (OECD) Publishing.
- OECD, 2019. *Going Digital: Shaping Policies, Improving Lives – Summary*, Paris: OECD.
- OECD, 2020. *OECD Reviews of Digital Transformation: Going Digital in Brazil*, Paris: OECD Publishing.
- OECD, 2021. *OECD Reviews of Digital Transformation: Going Digital in Latvia*, Paris: OECD Publishing.
- Olaitan, O. O., Issah, M. & Wayi, N., 2021. A framework to test South Africa's readiness for the fourth industrial revolution. *South African Journal of Information Management*, pp. 1-10.
- Ostrowick, J., 2021. Moral risks and government policy in South Africa in the context of 4IR. *South African Journal of Philosophy*, 40(2), pp. 195-212.
- O'Sullivan, D., 2008. Defining Innovation. In: D. O'Sullivan & L. Dooley, eds. *Applying Innovation*. s.l.:SAGE Publications, Inc, pp. 1-32.
- Oyewale, A. A., Adebowale, B. A. & Siyanbola, W. O., 2017. Nigeria's STI policy and the dilemma of implementation. In: S. Kuhlmann & G. Ordóñez-Matamoros, eds. *Research Handbook on Innovation Governance for Emerging Economies*. s.l.:Edward Elgar Publishing, pp. 345-374.
- Paghaleh, M. J., Shafieezadeh, E. & Mohammadi, M., 2011. Information Technology and its Deficiencies in Sharing Organizational Knowledge. *International Journal of Business and Social Science*, 2(8), pp. 192-198.
- Parliament of the Republic of South Africa, 2019. *4th Industrial Revolution: Opportunities and Threats*, Cape Town: Government Publishers.
- Perera, S., 2018. *Research Paradigms*. [Online]
Available at: http://www.natlib.lk/pdf/Lec_02.pdf
[Accessed 19 July 2022].
- Pratama, A. B., 2020. The landscape of public service innovation in Indonesia: A comprehensive analysis of its characteristic and trend. *Innovation & Management Review*, 17(1), pp. 25-40.
- Presidential Commission On The Fourth Industrial Revolution, 2020. *Summary Report*, Pretoria: Department of Communications and Digital Technologies.
- Presidential Commission, 2019. *Report of the Presidential Commission on the 4th Industrial Revolution*, Pretoria: Government Gazette.
- Price, J. H. & Judy, M., 2004. Research Limitations and the Necessity of Reporting Them. *American Journal of Health Education*, 35(2), pp. 66-67.

Queirós, A., Faria, D. & Almeida, F., 2017. Strengths And Limitations Of Qualitative And Quantitative Research Methods. *European Journal of Education Studies*, 3(9), pp. 369-387.

Rajasekar, S., Philominathan, P. & Chinnathambi, V., 2013. *Research Methodology*. [Online] Available at: <https://arxiv.org/pdf/physics/0601009.pdf#:~:text=Research%20methodology%20is%20a%20systematic,phenomena%20are%20called%20research%20methodology.> [Accessed 1 May 2022].

Rapanyane, M. B. & Sethole, F. R., 2020. The rise of artificial intelligence and robots in the 4th Industrial Revolution: implications for future South African job creation. *Journal of the Academy of Social Sciences*, 15(4), pp. 489-501.

Rauf, S., 2020. Effects of red tape in public sector organizations: a study of government departments in Pakistan. *Public Administration and Policy: An Asia-Pacific*, pp. 327-338.

Reay, T., Zafar, A., Monteiro, P. & Glaser, V., 2019. The Production of Managerial Knowledge and Organizational Theory: New Approaches to Writing, Producing and Consuming Theory. *Emerald Insight*, Volume 59, pp. 201-216.

Reddy, N. M. & Zhao, L., 1990. International Technology Transfer: A Review. *Research Policy*, pp. 285-307.

Rehman, A. A. & Alharthi, K., 2016. An Introduction to Research Paradigms. *International Journal of Educational Investigations*, 3(8), pp. 51-59.

Reis, J. Z. & Gonçalves, R. F., 2018. The Role of Internet of Services (IoS) on Industry 4.0 Through the Service Oriented Architecture (SOA). In: I. Moon, L. J. Park, D. Kiritsis & G. von Cieminski, eds. *Advances in Production Management Systems. Smart Manufacturing for Industry 4.0: IFIP WG 5.7 International Conference, APMS 2018, Seoul, Korea, August 26-30, 2018, Proceedings, Part II*. Seoul, Korea: Springer Cham in cooperation with The International Federation for Information Processing, pp. 20-26.

Reissner, S. C., 2010. Change, Meaning & Identity at the Workplace. *Journal of Organizational Change Management*, 23(3), pp. 287-299.

Riessman, C. K., 2008. *Narrative methods for the human sciences*. Thousand Oaks, CA: Sage Publications, Inc.

Rigdon, J. C., 2016. *Dictionary of Computer and Internet*. 1 ed. Cartersville, GA: Eastern Digital Resources.

Ritchi, H., Fettry, S. & Susanto, A., 2016. Toward Defining Key Success Factors of E-Government and Accounting Information Quality: Case of Indonesia. *International Journal of Accounting Research*, 4(1), pp. 1-6.

Robbins, S. P. & Judge, T. A., 2013. *Organisational Behaviour*. 15th ed. United Kingdom: Prentice Hall.

- Rowley, J. & Slack, F., 2004. Conducting a literature review. *Management Research News*, 27(6), pp. 31-39.
- Samsor, A. M., 2020. Challenges and Prospects of e-Government implementation in Afghanistan. pp. 51-70.
- Sarmah, S. S., 2018. Understanding Blockchain Technology. *Computer Science and Engineering*, 8(2), pp. 23-29.
- Saunders, M., Lewis, P. & Thornhill, A., 2003. *Research Methods for Business Students*. 3rd ed. England: Prentice Hall.
- Saunders, M., Lewis, P. & Thornhill, A., 2016. *Research Methods for Business Students*. 7th ed. Harlow: Pearson.
- Saunders, M. N. K., Lewis, P. & Thornhill, A., 2012. *Research methods for business students*. 6th ed. Harlow, England: Pearson.
- Savvides, S., 1979. Organisational Structure and Innovation. *Development Journal*.
- Sazzad, F., Rajan, V. P. & Demircioglu, M. E., 2021. The Role of Leadership in Public Sector Innovation: A Systematic Review and Meta-Analysis of the Management of COVID-19 in Asian Countries. *Frontiers Public Health*, 9(743748), pp. 1-16.
- Schulze, E., 2019. *How a tiny country bordering Russia became one of the most tech-savvy societies in the world*. [Online]
Available at: <https://www.cnn.com/2019/02/08/how-estonia-became-a-digital-society.html>
[Accessed 1 May 2022].
- Schwab, K., 2016. *The Fourth Industrial Revolution*, Cologny, Geneva: World Economic Forum.
- Sekaran, U. & Bougie, R., 2013. *Research Methods for Business: A Skill-Building Approach*. 6th ed. New York: Wiley.
- Serrat, O., 2012. *Innovation in the Public Sector*, Manila, Philippines: Asian Development Bank.
- Shadish, W. R., Cook, T. D. & Campbell, D. T., 2002. *Experimental and quasi-experimental designs for generalized causal inference*. Boston, MA: Houghton Mifflin Company.
- Shen, M., 2018. *A Canadian Government Body Has Built an Ethereum Blockchain Explorer*. [Online]
Available at: <https://www.coindesk.com/markets/2018/08/22/a-canadian-government-body-has-built-an-ethereum-blockchain-explorer/>
[Accessed 3 May 2022].
- Siau, K. & Long, Y., 2006. Using Social Development Lenses to Understand E-Government Development. *Journal of Global Information Management*, 14(1), pp. 47-62.

Sihlongonyane, F. M., Ndabeni, M. L. & Ntuli, B., 2020. *The Fourth Industrial Revolution: Synopses and Implications for STI Policy Development*. Pretoria: Republic of South Africa Department of Science and Innovation.

Sima, V., Gheorghe, I. G., Subić, J. & Nancu, D., 2020. Influences of the Industry 4.0 Revolution on the Human Capital Development and Consumer Behavior: A Systematic Review. *Sustainability*, 12(4035), pp. 1-28.

South African Government, 2015. *KwaZulu-Natal Education on Information and Communication Technology in schools: Information and Communication Technology (ICT) in KwaZulu-Natal Schools*. [Online]

Available at: <https://www.gov.za/speeches/ict-kwazulu-natal-schools-24-jul-2015-0000> [Accessed 13 April 2022].

South African Revenue Service, 2022. *eFiling System*. [Online]

Available at: <https://www.sars.gov.za/about/sas-tax-and-customs-system/efiling-system/> [Accessed 10 April 2022].

State Security Agency, 2015. *National Cybersecurity Policy Framework for South Africa (2015)*, Pretoria: Government Gazette.

Statistics South Africa, 2021. *Statistical Release P0302: Mid-year population estimates 2021*, s.l.: Statistics South Africa.

Statistics South Africa, 2021. *Statistical Release P0318: General Household Survey 2021*, Pretoria: Statistics South Africa.

Stranks, J., 2007. *Human Factors and Behavioural Safety*. 1st ed. London: Routledge.

Sutherland, E., 2019. The Fourth Industrial Revolution – The Case of South Africa. *South African Journal of Political Studies*, 47(2), pp. 233-252.

Swayne, L. E., Duncan, W. J. & Ginter, P. M., 2006. *Strategic Management Of Health Care Organizations*. 5th ed. s.l.:Blackwell Publishing, Oxford.

The Constitution of the Republic of South Africa, A. 1. o. 1., 1996. *South African Government*, Pretoria: GovernmentGazette.

The World Bank, 2015. *Definition of E-Government*. [Online]

Available at: <https://www.worldbank.org/en/topic/digitaldevelopment/brief/e-government> [Accessed 1 May 2022].

Thomas, D. R., 2006. A General Inductive Approach for Analyzing Qualitative Evaluation Data. *American Journal of Evaluation*, 27(2), pp. 237-246.

Tienken, C. H., 2013. International Comparisons of Innovation and Creativity. *Kappa Delta Pi Record*, pp. 153-155.

Trivedi, C., 2020. *Ways of knowing/acquiring knowledge*. [Online]
Available at: <https://conceptshacked.com/ways-of-acquiring-knowledge/>
[Accessed 1 June 2022].

Ulibarri, N. & Scott, T. A., 2017. Linking network structure to collaborative governance. *Journal of Public Administration Research and Theory*, Volume 27, p. 163–181.

United Nations, 2019. *Digital Economy Report 2019*, New York: United Nations.

Unsworth, K. & Parker, S., 2003. Proactivity and innovation: Promoting a new workforce for the new workplace. *The New Workplace: A Guide to the Human Impact of Modern Working Practices*.

Urbancová, H., 2013. Competitive advantage achievement through innovation and knowledge. *Journal of Competitiveness*, 5(1), pp. 82-96.

Valenduc, G., 2018. Technological revolutions and societal transitions. *SSRN Electronic Journal*, pp. 1-15.

Vanclay, F., Baines, J. & Taylor, C., 2013. Principles for ethical research involving humans: ethical professional practice in impact assessment Part I. *Impact Assessment and Project Appraisal*, 31(4), pp. 243-253.

Vassil, K., 2015. *World Development Report 2016: Estonian e-Government Ecosystem: Foundation, Applications, Outcomes*, Washington, D.C: World Bank.

West, M. A., 2002. Sparkling Fountains or Stagnant Ponds: An Integrative Model of Creativity and Innovation Implementation in Work Groups. *Applied Psychology: An International Review*, p. 355-452.

Wickberg, S., 2013. *Technological innovations to identify and reduce corruption*, Berlin: Transparency International.

World Economic Forum, 2017. *Leadership in the Fourth Industrial Revolution*. [Online]
Available at:
<https://toplink.weforum.org/knowledge/insight/a1G0X000004Q9aRUAS/explore/summary>
[Accessed 5 May 2022].

World Economic Forum, 2018. *White Paper: Agile Governance Reimagining Policy-making in the Fourth Industrial Revolution*, Geneva, Switzerland: World Economic Forum.

World Economic Forum, 2019. *Leading through the Fourth Industrial Revolution: Putting People at the Centre*, Cologny, Geneva: World Economic Forum.

World Economic Forum & Kearney, T. A., 2018. *Insight Report: Readiness for the Future of Production Report 2018*, Geneva, Switzerland: World Economic Forum's System.

Xu, C. K. & Tang, T., 2020. Closing the gap or widening the divide: The impacts of technology-enabled coproduction on equity in public service delivery. *Public Administration Review*, 80(6), pp. 962-975.

Xu, M., David, J. & Kim, S., 2018. The Fourth Industrial Revolution: Opportunities and Challenges. *International Journal of Financial Research*, Volume 9, p. 90.

Younus, U. M., 2017. *Fourth industrial revolution*. [Online]
Available at: <https://www.dawn.com/news/1331909>
[Accessed 9 May 2022].

Zorn, T. E., Christensen, L. T. & Cheney, G., 2000. *Do We Really Want Constant?*. 2nd ed. San Francisco, CA: Berrett-Koehler Communications.

APPENDIX A: INTERVIEW QUESTIONS

Appendix 1: Interview Questions

Study Title: The Impact Of Acceleration Of Innovation Strategies In Service Delivery Performance Within Fourth Industrial Revolution Era: A Case Of Provincial Public Institution

Duration: 30 Minutes

Interview Schedule

Objective 1 - To investigate the innovation culture within the institution

1. How would you describe the culture of innovation and your personnel contribution in the Department?
2. How have such innovations changed and contributed into improvements in departmental performance compared to previous pre-innovation era.
3. In terms of the department's goals, to what extent are these innovations assisting in achieving an improvement in both individual and organizational performance?
4. What channels would you cite as being put in place by the department to cultivate and bring forth the culture of innovation?

Objective 2 - To determine the importance of innovation in improving the institution's internal processes and service delivery

5. What could be the barriers or constraints that hinder innovation within the department?
6. Looking at The Centre for Public Service Innovation having competitions and supporting innovation in the public sector, has the department entered any competitions and won and how could the department continue to win or win any other related innovation related awards?
7. What resources, assets and capabilities could be utilised to effectively achieve the implementation of innovation for the enhanced organizational performance?
8. What are the attributes and competencies that could strengthen or solidify the implementation and adoption of innovation in the department, which could be replicable elsewhere or broader public sector?

Objective 3 - To investigate the innovative systems and processes and how users within the institution perceive the systems and policies in place within the institution

9. How have the innovations that have been introduced affected the operational efficiency in the department?
10. How have you adjusted to these innovations in improving your performance?
11. What are the required necessary changes that could reduce the barriers to innovation that you have experienced?
12. How well do you think this department ranks when looking at other departments or institutions in terms of being innovative and implementing digital services, example maximising government E-Services?

13. What could you cite as the necessary strategic leadership intervention needed in the department that could facilitate, enhance, or promote innovation in a consistent and sustainable manner?

Objective 4 - To examine current systems in place and look at innovative ways they could be improved in terms of technologies in the fourth industrial revolution

14. In your opinion, what has been undertaken in the department to stimulate and enhance innovation specifically during the COVID-19 Pandemic?
15. Looking at current technological trends in the 4th Industrial Revolution, such as block chain, AI, digitization, e-commerce, and cloud computing, in your opinion how could this be integrated in the department?

APPENDIX B: INFORMED CONSENT

Appendix 2: Informed Consent

Informed Consent Letter

UNIVERSITY OF KWAZULU-NATAL
GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP
Master of Business Administration Research Project (MBA)

Researcher: Lonwabo Mzileni

220019204@stu.ukzn.ac.za

Supervisor: Dr Tony Ngwenya (031 260 7825)

Ngwenyat2@ukzn.ac.za

Research Office: HSSREC (031) 260 8350/3587

Email: hssrec@ukzn.ac.za

Dear Respondent,

My name is Lonwabo Mzileni. I am a MBA student at the Graduate School of Business and Leadership of the University of KwaZulu-Natal Student number: 20925610. You are invited to participate in a research project titled **The Impact Of Acceleration Of Innovation Strategies In Service Delivery Performance Within Fourth Industrial Revolution Era: A Case Of Provincial Public Institution**

Intrapreneurship is defined as a process within which individuals or groups in an organizational setting, identify, pursue, and promote innovation.

The aim of this research is to investigate the culture of innovation in the Department, how innovation is dealt with and innovations that have emerged in the department to assist it internally or externally in terms of service delivery. In addition it will try to further establish solutions to better enhance the innovation in the department.

I volunteer to participate in a research project conducted by Lonwabo Mzileni from the University of KwaZulu- Natal. I understand that this research project is designed to study the State of Innovation in the Department of KZN Provincial Treasury

As an Employee at KZN Provincial Treasury, I understand that I am being invited to take part in an interview. I understand that in agreeing to participate:

- My participation is voluntary. I understand that I will not be paid for my participation.
- The interview will last approximately 30 minutes. Notes will be written during the interview and/or an audio taped. I can decline to be recorded.
- I understand that if I feel uncomfortable in any way during the interview, I have the right to decline to answer any question or ask to leave the interview session.

- I understand that the researcher will not identify me by name in any reports using the information obtained from the interview. My confidentiality as a participant will remain secure. Subsequent uses of recordings and data will be subject to standard data use policies which protect anonymity of individuals and institutions.
- Administrative and other teaching staff at (UKZN) will neither be present during the interview nor have access to raw notes or transcripts of the interview. This precaution will prevent any of the findings having personal negative repercussions for me.
- If I choose to be interviewed, I have the right to view and comment on the transcribed interview data before the findings are analysed.
- I have been given options in terms of conducting my interview, telephone call, Zoom or Teams, or face to face interviews
- I have read and understand the participant information sheet provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.
- I have been given a copy of this informed consent form.

Your participation in this research project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this survey/focus group discussion. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN.

Due to the current COVID-19 pandemic, strict COVID-19 safety protocols will be adhered to as stipulated by the Disaster management and Health and Safety Regulations. At no time will the participant be put at risk if face to face interviews is conducted, ensuring Covid-19 protocols are adhered to.

If you have any questions or concerns about participating in this study, you may contact me or my supervisor at the numbers listed above.

Sincerely,

Researcher/Investigator's signature: _____ Date: _____

CONSENT

I..... (full names of participant)
hereby confirm that I understand the contents of this document and the nature of the research project,
and I consent to participating in the research project. I understand that I am at liberty to withdraw from
the project at any time, should I so desire.

Audio Recording: Yes / No

Interview Method: Telephone Call / Zoom or Teams / Face to Face

SIGNATURE OF PARTICIPANT

DATE

.....

.....

This page is to be retained by researcher.

Page 3 of 3

APPENDIX C: GATEKEEPERS LETTER

Appendix 3: Gatekeepers Letter



TO: MRS. CAROL COETZEE
HEAD OF DEPARTMENT
KZN PROVINCIAL TREASURY

FROM: MR. LONWABO MZILENI (220019204)
MBA STUDENT UKZN
PROJECT COORDINATOR PPP UNIT

DATE: 21 APRIL 2022

SUBJECT: TO REQUEST PERMISSION TO CONDUCT RESEARCH WITHIN KZN PROVINCIAL TREASURY WITH ITS OFFICIALS

Dear HOD

I am currently a student registered at University of KwaZulu-Natal (UKZN) doing my MBA and presently also a full time employee within the department (PPP Unit). I am currently commencing on my research for my MBA and humbly request permission to conduct research (interview based). A sample of 15 participants are targeted for the interview and the average time expected for each interview would be 20 – 30 minutes. The interviews would be conducted at the convenience of the interviewees (face to face or digital platforms). I would like to mention that I had applied to conduct this research last year September 2021 and was approved by the previous HOD. Due to difficulties with my studies last year I was unable to commence my research, hence this reapplication to do the research.

Details and Motivation for Research

Research Topic

THE IMPACT OF ACCELERATION OF INNOVATION STRATEGIES IN SERVICE DELIVERY PERFORMANCE WITHIN FOURTH INDUSTRIAL REVOLUTION ERA: A CASE OF A PROVINCIAL PUBLIC INSTITUTION

Motivation for Study

The study was motivated by the changing technological advancements that are taking place in relation to the fourth industrial revolution and how organisations are adapting and taking advantage of these emerging technologies through innovation. Many Governments institutions

have embraced this technological evolution, embraced technology in their organisations but many are lagging in terms of this.

The study will look into the innovation culture in the department, innovation internally in terms of systems and processes and externally in terms of service delivery. The research also plans to identify areas of improvement and certain technologies that could be beneficial in the public sector.

The anonymity of all participants will be protected, names kept confidential and any other personal information. The participants will be allowed to choose not to participate in the interview at any given time due to whatever reason. COVID-19 regulations will be adhered to if interviews performed face to face or the option of digital platforms (Zoom or MS teams) or over the Phone will be given to participants

The Objective of The Study

- 1) To investigate the innovation culture within the institution
- 2) To determine the importance of innovation in improving the institution's internal processes and service delivery
- 3) To investigate the innovative systems and processes and how users within the institution perceive the systems and policies in place within the institution
- 4) To examine current systems in place and look at innovative ways they could be improved in terms of technologies in the fourth industrial revolution

For any further information or clarity I may be contacted at Ext 4404/ 0732809928 or my supervisor Doctor Tony Ngwenya 0734618159, ngwenyat@ukzn.ac.za

I hereby grant / do not grant that Mr Lonwabo Mzileni may conduct his research with
[REDACTED] topic related to innovation in the KZN Provincial Treasury

22/03/2022

Date

KZN Provincial Treasury

APPENDIX C: ETHICAL CLEARANCE

Appendix 4: Ethical Clearance



22 October 2021

Lonwabo Mzileni (220019204)
Grad School Of Bus & Leadership
Westville Campus

Dear L Mzileni,

Protocol reference number: HSSREC/00003497/2021

Project title: The impact of acceleration of innovation strategies in service delivery performance within fourth industrial revolution era: a case of provincial public institution

Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 07 October 2021 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. **PLEASE NOTE:** Research data should be securely stored in the discipline/department for a period of 5 years.

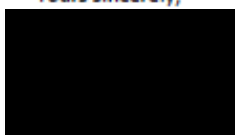
This approval is valid until 22 October 2022.

To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,



Professor Dipane Hlalele (Chair)

/dd

Humanities and Social Sciences Research Ethics Committee

Postal Address: Private Bag X54001, Durban, 4000, South Africa

Telephone: +27 (0)31 260 8350/4557/3587 Email: hssrec@ukzn.ac.za Website: <http://research.ukzn.ac.za/Research-Ethics>

Founding Campuses:  Edgewood  Howard College  Medical School  Pietermaritzburg  Westville

INSPIRING GREATNESS

APPENDIX C: TURNITIN REPORT

Appendix 5: Turnitin Report

L Mzileni

ORIGINALITY REPORT

6%

SIMILARITY INDEX

5%

INTERNET SOURCES

2%

PUBLICATIONS

4%

STUDENT PAPERS

PRIMARY SOURCES

1

www.goneboarding.co.uk

Internet Source

1%

2

luminariaz.files.wordpress.com

Internet Source

<1%

3

vital.seals.ac.za:8080

Internet Source

<1%

4

Submitted to University of South Alabama

Student Paper

<1%

5

journals.sagepub.com

Internet Source

<1%

6

openknowledge.worldbank.org

Internet Source

<1%

7

www.coursehero.com

Internet Source

<1%

8

www.co-val.eu

Internet Source

<1%

9

Submitted to University of Witwatersrand

Student Paper

<1%