Governance of digital innovation in the Public Sector in South Africa

OM Motloung

orcid.org/0000-0003-1927-8304

Thesis accepted in fulfilment of the requirements for the degree *Doctor of Philosophy in Public Management and Governance* at the North-West University

Promoter: Prof C Hofisi

Graduation: June 2022
Student number: 20200800

Abstract

Digital innovation has been a buzzword in the public sector in recent years. The public sector is doing all it can to enhance its service delivery efficiency with the modern platforms afforded by the digital economy. However, digital innovations require a governance framework for them to have meaningful results. OECD gives a model of factors that can make digital innovation possible in the public sector and they include sharing of ideas, innovation culture in the workplace, organisational structure and processes that embrace digital innovation, and regulations and framework that will support the innovative environment. The objective of the research is to investigate if South Africa has a digital governance framework to administrate the day-to-day digital processes. The research followed qualitative methodology, interpretive research philosophy, and descriptive research design. The above-mentioned methods became relevant for this study as they gave the researcher an opportunity to be more involved with the participants to record observed behaviour and also collect honest and high-quality data in the participants' natural environment. Interviews were conducted with fifteen government officials who are working in government departments that apply to the study. Findings reveal that the governance of innovation is in its infancy. The country has different national government departments working towards a digital government but it seems difficult because they do not have a central governance framework yet. Several government structures are established by the national government to foster innovations across different departments but there is a lack of coordination, which causes even more confusion for government officials because the roles of different stakeholders are not outlined anywhere to make interaction, sharing, and diffusion of ideas easy or build a well-informed ecosystem. Lastly, there are regulations and processes that speak to employee rewards but none of them is utilised. The recommended framework might go a long way in building an integrated and well-coordinated ecosystem that will encourage innovation culture in the workplace, sharing of ideas, building processes that are simple and beneficial to all. It will allow innovations to be measured as per the framework. Lack of infrastructure is one important determinant of digital innovation and it will be advisable for the national government to look into it if they aim at building a sustainable digital government that is accessible to all citizens.

Keywords: Governance; digital governance; digital innovation; digital innovation framework; public sector innovation

Declaration

I declare that this thesis titled, ‘Governance of digital innovation in the public sector in South Africa’ is my work. I have acknowledged all the sources by means of references and that I have not previously submitted this thesis at any other university for the purpose of a degree.

Oniccah Monimang Motloung

_____ _____

Signature Date

Table of Contents

List of abbreviations

ASSAF	Academy of Science of South Africa
ASGISA	Accelerated and Shared Growth Initiative of South Africa
CGICTPF	Corporate Governance of ICT Policy Framework
CPSI	Centre of Public Service Innovation
CSIR	Council of Scientific and Industrial Research
DOC	Department of Communications
DPSA	Department of Public Service and Administration
DST	Department of Science and Technology
ERP	Enterprise Resource Planning
ESSP	Education Sector Strategic Plan
ESKOM	Electricity Supply Commission
GDP	Gross Domestic Product
GEAR	Growth Empowerment and Redistribution
GITO	Government Information Technology Officer
G2B	Government to Business
G2C	Government to Customer
G2G	Government to Government
ICASA	Independent Communications Authority of South Africa
ICT	Information Communication Technology
IDP	Integrated Development Planning

IT	Information Technology
ITGI	Information Technology Government Institute
ITU	International Telecommunication Union
HR	Human Resource
HSRC	Human Science Research Council
MEC	Member of the Executive Council
MTSF	Medium Term Strategic Framework
NACI	National Advisory Council on Innovation
NDP	National Developmental Plan
NICI	National Information Communication Infrastructure
NICT	National Integrated Information Communication and Technology
NIS	National Intelligence Service
NRF	National Research Funding
NSI	National System of Innovation
ODTP	Organisational Development and Transformation Plan
OECD	Organisation for Economic Co-operation and Development
RDP	Reconstruction and Development Plan
RSA	Republic of South Africa
SALGA	South African Local Government Association
SAMRC	South African Medical Research Council
SARS	South African Revenue Services

SMART	Self-Monitoring and Analysing Technology
SITA	State Information Technology Agency
SRMP	Smart Rwanda Master Plan
TIA	Technology Innovation Agency
USASSA	Universal Service and Access Agency of South Africa
Wi-Fi	Wireless Fidelity
4IR	Fourth Industrial Revolution

Acknowledgements

I would like to appreciate the following people who made it easy for me to pursue and complete my study in time.

- The Lord that gave me direction, will, and strength even when it was difficult.
- Prof Hofisi, my promoter, and Prof Lukamba, for the opportunity to further my studies, their assistance and dedication are commendable.
- National Research Foundation (NRF) for funding my research and fieldwork consistently throughout the past three years. My grant number is 111778.
- My dear husband Sysman Motloung, stood by me and supported me even when I was expected to do something else other than studying.
- My son, Tsebo, who gave me space and allowed me to deny him time to play and go out when he really needed time with me. I owe you big time.
- My mother Maria and brother Boki, who never understood what I was doing but supported me anyway; my happiness meant everything to them.
- Lastly, my friend and now my sister, Zanele and my supportive in-laws.

CHAPTER ONE: ORIENTATION AND BACKGROUND

1.1 Introduction

Public administration is concerned with governance, which implies “decisions and processes that those in authority make to meet society’s needs and expectations” (Fasenfest, 2011:771). Governance involves “traditions for the exercise of power” in society or community (Bevir, 2009:97; Katsamunska, 2016:134). This includes people’s participation in political processes, government accountability to the people and trust in government institutions (Blind, 2006). Governance in the public sector propels better decision making, accountability and efficient use of public resources (IFAC, 2013:6). Recent literature suggests that innovation is critical for effective governance. Mulgan (2014:5) defines innovation as “the creation and utilisation of new ideas”. He emphasises that these should not only be ideas but “they should benefit the public”. Besides, Chambers *et al.,* (2013:3) view innovation as the “provision of basic services to populations that have socio-economic challenges and suffer from insecurities”. Innovation would create ways that help overcome obstacles to reach communities and help restore trust between the government and the people. According to Ndou (2004:2), “the public sector is lagging when it comes to innovation”, hence, it can use innovative means to improve service provision. Innovation will help the public sector to be more credible by keeping up with the private sector and no longer rely on “traditional ways that are not adequate or cost effective to increased demands for services” (EY, 2017:1). South African public sector appreciates the “importance of digital innovation and has increased investments in the infrastructure in the past years” (Naidoo, 2012:62).

The world has arrived in the age of digital infrastructure where computers, cell phones and broadband network connections are affordable and easy to use. Digital infrastructure refers to the “increased emergence of new Information Technologies (IT) such as social media, cloud computing, analytic and big data, wearable devices, 3D printing and intelligent autonomous systems" (Fichman *et al*., 2017:330). People are now used to digital applications and services. Most of these services support billions of users at the same time and never experience server problems. It is no longer an option but important for public service delivery to be modernised and improve its

innovation and efficiency. Citizens expect better service, not long queues at the public service counters. Therefore, the public service should make it easy to transact regardless of the user's choice of device. Digital innovation is making way for services that were almost impossible just a decade ago and citizens can participate in designing policy and regulations through social networks such as Facebook and Twitter (Institute on governance, 2017:7).

Digital innovation is defined as a product, process, mode or innovation that is empowered by IT (Fichman *et al.,* 2017:330). Also, it refers to new ICT products (Akesson, 2009 cited by OECD, 2016). Yoo et al., (2010) cited by Chowdhuy & Akesson 2011:7) define "digital innovation as carrying out of new combinations of digital and components to produce new products". Besides, he indicates that digital innovation has three unique characteristics which are, re-programmable, homogenisation of data and self-referential in nature of digital technology.

Digital innovation cannot exist without support from the government. Government creates a suitable environment for innovation by "acting as a researcher, regulator, coordinator, service provider, financier and innovator" (ASSAF, 2013:31). Government has a major role in creating a regulatory environment that will promote competition and innovation (OECD, 2007:14). Promoting innovation and competitiveness is through incentives for new ideas, partnerships among government agencies, universities and non-profits organisations (Eggers & Singh, 2009:79). This network strategy and open-source innovation enable everyone to collaborate voluntarily in creating solutions (Sirianni, 2012:2).

The study explores the governance of digital innovation in South Africa. The study seeks to understand the governance of digital innovation by focusing on the established governance framework as well as its effectiveness and weaknesses. It will identify policies and frameworks that govern digital innovations in South Africa and the extent to which they compare to those of other countries. The study will suggest a framework for the governance of digital innovation in South Africa.

1.2 Orientation and background

Hauknes and Koch (2005:9) explain public sector innovation as "a deliberate action to accomplish specific results". Its success relies on many people understanding and

accepting it. Innovation “improves the living standard of the society and determines a competitive and progressive nation” (OECD, 2007:6). Governance of innovation is defined by Deschamps (2013:1) “as a system of mechanisms to align goals, allocate resources and assign decision-making authority for innovation across the company and with external parties”. The governance of digital innovation is one important fragment of innovation as it will close the gap of misunderstanding digital platforms and misrule by stakeholders (ITU, 2017:2). Politicians and public-sector managers play an important role in the governance of innovation. They should understand the environment of digital infrastructure in which they operate and invest resources where it matters most. They must reward new ideas, recruit, retain and empower employees to take initiative, collaborate with the private sector and lastly, give political support (Leon *et al*., 2012:8). Bertot *et al.,* (2016:211) concur that most governments in developing countries fail not because of scarce resources only but also due to the problems of incentives, accountability and governance. They also maintain that these challenges can be solved by innovation in the public sector that creates and maintains an ecosystem of government, business, non-profits, universities, citizens and other actors that consume or intervene in digitising public service using new digital models (Randal, *et al*., 2018: 11).

According to Bloch and Bugge (2013:134), literature on public sector innovation is limited or scarce. Despite this, an understanding of innovation in the public sector can be studied through other theories that are relevant to help shape thinking about public sector innovation. For instance, the innovation system theory can be used to understand innovation in the public sector. The theory emphasises that innovation does not exist in isolation but it depends on different types of actors that have various roles in the innovation process. Recent literature on systemic characteristics of innovation in the public sector includes networked governance, community governance and collaboration of public and private sectors (Bommert, 2010:17). Therefore, managing their innovative activities, many public sectors would have to navigate through several internal and external actors (Bloch & Bugge, 2013:135). According to Kenya (2007:1), “Innovation is one way to bridge the gap between the service provider, the public and the business sector, especially considering that society needs increasingly become complex”. Countries like China have recognised the benefits of digital innovation. The government of China uses a mobile payment

application called WeChat to check weather forecasts, pay bills, penalties, make medical appointments, visa and licence applications (MDPI, 2017:5).

Within the domain of new public service, the researcher will use the network governance theory. Network governance means governance arrangements of various actors that form a network but are accountable to the government. Network governance theory is relevant to this study because it encourages interdependence and promotes interaction among actors even at the international level (Carrington *et al*., 2008:8). Public administration has gone through four various reforms since 1980 (Robinson, 2015:4; Thornhill & Van Dijk, 2010:99). The inaugural order was the old public administration "dominated by government decisions. It focused on central control and hierarchical organisational structure" (Robinson, 2015:5). The second transition of new public administration emerged in the 1980s, emulating private sector principles of saving costs and failing to put the needs of the citizens first (Robinson, 2015:7; Promberger & Rauskala, 2003:2; Thornhill & Van Dijk, 2010:103). From the year 2000, the third phase of new public governance emerged, making citizens the central focal point. It emphasises inter-organisational relationships where there are multiple actors and the government is just another actor in the formulation and implementing policies (Robinson, 2015:9; Runya *et al.,* 2017:14). The fourth reform of new public service took over, focusing on public servants as helpers instead of controllers of interest in the development process. In this context, citizens are not passive receivers of top-down policymaking and service delivery but they are also involved in policymaking and its implementation. Public officials facilitate the engagement of citizens in sharing responsibility, useful information and opportunities with citizens. Officials are not giving orders anymore but they involve citizens in government issues. New public service promotes digital governance to bridge the gap between the citizens and public officials. Digital innovation methods can be used to monitor the government and allow citizens to participate in policy-making processes (Robinson, 2015:10; Denhardt & Denhardt, 2007:5).

New public service is making inroads in South Africa through the digital innovation framework outlined in administrative and legal institutional designs. These are the National System of Innovation (NSI) introduced in the 1996 white paper on science and technology (Manzini, 2012). The NSI coordinates relations among organisations

involved in the complete range of innovation, from enablement, creativity processes to implementation stages (NACI, 2006:19; Sithole, 2009:9). The National Advisory Council on Innovation (NACI) established in 1997 advised the cabinet on the importance of innovation, science, technology and mathematics in achieving the objective of a better life for all, building a sustainable economy and global competitiveness (NACI, 2006; RSA, 1997). The 1997 white paper on transforming public service delivery identified eight “Batho Pele principles” to guide government officials in improving service delivery through “consultation, service standard, access, courtesy, information, openness and transparency, redress and value for money” (RSA, 1997:6). The Centre for Public Service Innovation (CPSI) was also established in 2001 to “develop innovative, sustainable and responsive models for improved service delivery” (Sithole, 2009:9). The Department of Public Service and Administration adopted a framework of public service corporate governance of ICT in 2012, which highlights the role-players and their responsibilities in ICT governance (RSA, 2012). South Africa also adopted a National Integrated Information and Communication Technology (NICT) policy white paper that facilitates a knowledge society, digital transformation and information economy (RSA, 2016).

Digital innovation is central to the objective of improved service delivery and more inclusive society in keeping with the 2030 vision or National Development Plan (NDP). Former South African President Zuma introduced NDP or the 2030 vision in 2009 after a few other socioeconomic policies (GEAR, ASGISA, RDP) seemed to lack in advancing a more inclusive society (ASSAF, 2013:19). Therefore, the NDP promotes the NSI or public-sector innovation. Innovation is one way through which government can reinvent itself to improve service delivery because innovation is open to new ideas, the usage of new technology, resources, skills and new administration (Martins & Ledimo, 2015:575). The benefits of digital innovation such as mobile applications have strengthened good responsive governance and connected societies (Arangode, 2015; OECD, 2011).

1.3 Problem Statement

The white paper on science and technology introduced the national system of innovation in South Africa. According to the OECD (2007) cited by ASSAF (2013:88), South African innovation is loosely coordinated; the review highlights the potential

governance failure due to a lack of coordination of innovation efforts. According to ASSAF (2013:89), the NSI lacked an adequate level of governance since its beginning. This is clear in many departments that have mentioned innovation as an important part but lack concomitant activities. Very few studies have been undertaken to investigate whether there is a solid governance framework for innovation in the public sector in South Africa, hence, the focus of this research. South Africa will need to strengthen the production of human capital, institutional environment for knowledge generation in collaboration with international partners but most importantly, the innovation will need policy leadership from the Department of Science and Technology and other government departments (DST, 2006:1). In keeping with the NSI, a Technology Innovation Agency (TIA) was installed to spearhead digital innovation, however, no recent major changes have happened in which tax is handled regarding incentives and the support for research and development (Anon, 2017:7, NACI, 2016: 17).

ICT development in South Africa is doing well as compared to other African countries but lacks behind its fellow BRICKS countries. Significant growth has occurred in the past two decades but the growth has not been accompanied by policy objectives of affordability for all (Gillwald *et al.*, 2012:3). As it stands, there is no clarity and coherence in South African ICT policy and a lack of policy implementation and follow up has resulted in uncompetitive markets structures, weak institutional arrangements and compromised regulatory effectiveness (Gillwald *et al.,* 2012:6). This might be due to the leadership discontinuity as ministers and director-generals of Department of Communication are changed or replaced all the time. The department has had over five minsters since 2009 (Gillwald *et al.,* 2012:5). Minister Nyanda was replaced by Minister Padayachi who was then replaced by Minister Dipuo. Minister Dipuo formed ICT policy review panel but the body was structured into a committee based on traditional broadcasting, telecommunication and postal four areas, which insinuated that there is no guiding framework on an ecosystem approach to guide the current ICT policy thinking in South Africa (Gillwald *et al.,* 2012:7).

Linkages between the problem statement and network governance theory are as follows. Digital anxiety is not such a problem on the side of citizens because shared goals and collective actions are already taking place without government pressure.

People use social media to complain against poor services by public and private institutions as well as sign online petitions. Political parties are now engaging people on social media with great success. Government institutions and ward councillors will do well to make use of the existing platforms. Network governance in the public sector concerns the integration of diverse networks as they are interrelated by the common public interest goal (Kim, 2014:21). The successful adoption of network governance in the South African setting can be achieved by operationalising *batho pele* principles and building social capital through experiences and interactions among actors (Montenegro & Bulgacov, 2014:111; Nederhand *et al.*, 2014:3-4; Larson, 2018:33). New public service reform highlights the use of networks among actors to govern innovation (Robinson, 2015:10). NSI is used in South Africa as an innovation framework and its foundation emphasises interactions among actors together from the private and public sector, universities, research institutes, NGOs and citizens. CPSI was adopted by the South African Department of Public Service and Administration in 2001 as an innovation framework; it highlights the importance of governing by the network as it will create new ideas and foster collaboration between different parties (CPSI, 2007:19). System theory as a theory that is used to understand innovation also highlights network governance as a form of governance to facilitate innovation in the public sector (Bloch & Bugge 2013:135).

Based on the problem statement, the research questions for this study are: What are the fundamentals of the governance of digital innovation in the public sector? Does South Africa possess a framework that speaks to the governance of digital innovation in the public sector?

1.4. Innovation framework

According to Daglio *et al.,* (2014:5), innovation framework for the public sector innovation highlights four aspects necessary for the success of innovation in the public sector as follows:

1.4.1 Generating and sharing ideas

This allows collection, analyses and sharing information, which lead to knowledge development and learning. The factors mentioned above are crucial to public sector innovation. How they are managed can support or hinder innovation. This describes

the ideas that are in an organisation's pipeline and the effectiveness of the associated key innovation activities such as accessing new ideas, selecting and developing ideas, implementing ideas and diffusing what works (Hughes *et al.*, 2011:46). CPSI agrees that effective leadership is open to good ideas; it does not matter if it is from the government or citizens (CPSI, 2007:17).

1.4.2 Empowering the workforce

The organisational culture speaks to how the employees are motivated to explore new ideas and experiments with new methods and it has an impact on organisational' innovation. The leadership of the organisation and how teams are selected, rewarded, socialised and managed play a vital role in the organisation's capacity. These are aspects that are within the organisation's control. It describes the organisational capabilities that can sustain the influence of innovation activity. They include management of innovation, leadership and culture and organisational enablers of innovation (Hughes *et al.*, 2011:46). The South African framework on public sector innovation noted that leadership, culture and organisational enablers of innovation are important. CPSI also promotes organisational culture that emphasises thoughts about possible solutions attained through training, performance appraisal, rewards and freedom of experiments and innovation (CPSI, 2007:17). A framework by OECD notes that organisational culture and leadership have an effect on innovation (OECD, 2017:5).

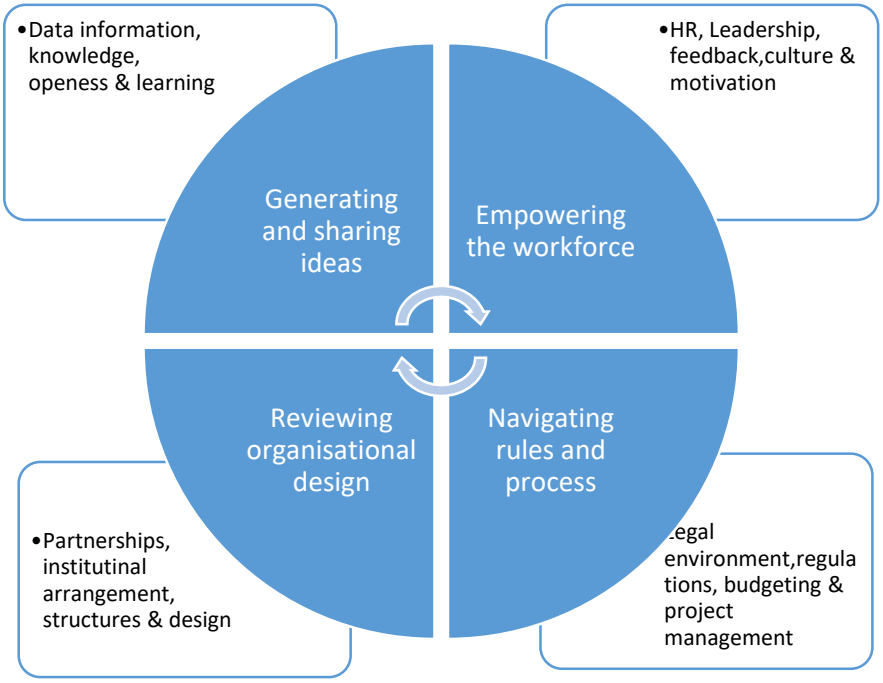
1.4.3 Navigating rules and process

Rules, legal and regulatory frameworks, budgeting and processes of projects are of importance in public sector innovation. They can offer an opportunity or block innovation. Rules and processes in public administration such as regulations, budgeting and project management can hinder or prosper innovation (OECD, 2017:5).

1.4.4 Reviewing an organisation's design

This refers to work structure across the organisations including the development of spaces and innovation methods to structure teams, breakdown silos and work in partnerships across organisations and even sectors have an impact on public sector innovation. The organisation should endlessly upgrade employees' knowledge and skills as it is impossible to introduce innovation in the public sector without allowing

employees access to recent development in their areas of expertise. CPSI also emphasises partnership, legitimacy and trust as important parts of innovation in the public sector (CPSI, 2007: 17; OECD, 2017:5).



Adapted: Framework for innovation in public sector organisations (Daglio *et al.*, 2014:5).

1.5 Research questions

The research explores the following questions:

- What is the conceptual framework for the governance and barriers to digital innovation in the South African public sector?
- What does the South African public sector do to generate and share ideas that will enhance digital innovation?
- How does the South African public sector empower the workforce to enhance digital innovation in the public sector?
- What rules and processes are available in South Africa to enhance digital innovation in the public sector?

- Does South Africa have public sector organisations that are designed to foster digital innovation in South Africa?
- Which framework is suitable for the governance of digital innovation in South Africa?

1.6 Research objectives

The following is an outline of objectives for the study:

- To examine the conceptual framework for governance and barriers to digital innovation in the South African public sector
- To outline what the South African public sector does to generate and share ideas that will enhance digital innovation
- To describe how the South African public sector empowers the workforce to enhance digital innovation in the public sector
- To investigate the rules and processes available in South Africa to enhance digital innovation in the public sector
- To review the existing organisations designed for public sector digital innovation in South Africa
- To suggest a framework for improving the governance of digital innovation in South Africa

1.7 Central theoretical statement

The government has a role to play in making sure that innovation processes are well-governed and the environment in which they occur are suitable for them to flourish. The current governance framework for digital innovations in South Africa does not create a suitable environment for innovation to flourish. Stakeholders' coordination, digital infrastructure and human capital are the main challenges that the government still faces but all these issues may be resolved if there is a solid framework for the governance of digital innovations.

1.8. Significance of the study

The study examines the governance of digital innovation in South Africa. It is evident that there are policies and government structures that are in existence to foster digital

innovation in the public sector in South Africa but there is a lack of coordination that would have been created by the formation of a central governance framework. This was declared by ASSAF when they made a review on the state of science, technology and innovation in the South African public sector in 2013. Countries such as Rwanda and Singapore are perfect examples of how digital innovations in the public sector would only work if there is a clear and well-defined central or national digital innovation framework to guide the country's objectives that are in line with the digital economy.

This study seeks to investigate if policies and frameworks that are in place to govern innovation in the country are sufficient and effective to promote a suitable environment that will influence a digital innovation in the public sector. Also, it seeks to investigate if the frameworks are in line with the requirements that will result into a successful digital innovations ecosystem in the public sector. So far, there is insufficient literature on the governance of digital innovations in the public sector in South Africa. Moreover, this study will contribute new knowledge to how the government can realign the digital innovation governance using the networked government as it is a desire posed by CPSI (CPSI, 2007:19). It is also highlighted in the NSI framework that governs innovation in the country. Currently, it seems every department is working on its own (RSA, 2012) even when CPSI launched by the Department of Public Services and Administration drafted a manifesto and submitted to every department to commit to innovation in the country (CPSI, 2007:38). Hence, there is a need to revisit the existing frameworks and government structures to assess if they contribute significantly or there is a need for the government to establish an alternative central framework to coordinate all activities that deal with digital innovation in the public sector.

1.9 Chapter layout

Chapter 1 This chapter provides an introduction and background to the governance of digital innovation in the South African public sector. The chapter delves into the problem of governance in the South African public sector, significance of the study and literature review.

Chapter 2 A theoretical exposition of digital innovation in public service. The chapter discusses the theory of governance and digital innovation and gives an overview of governance of digital innovation in the global context.

Chapter 3 Governance of public sector digital innovation in South African context. The chapter will explore how the public sector digital innovation is governed in South Africa.

Chapter 4 Research methodology. The chapter will outline the research methodology used to collect data and the techniques for analysing data in the study.

Chapter 5 Data presentation and discussions on findings: The chapter will present data and findings regarding the governance of public sector innovation in South Africa.

Chapter 6 Towards a new framework for digital innovation in the public sector. This chapter will present the new framework for digital innovation in South Africa.

CHAPTER TWO: A CONCEPTUAL FRAMEWORK FOR THE GOVERNANCE OF DIGITAL INNOVATION

2.1. Introduction

Innovation refers to the art of simplifying complicated things and creating new ways to solve complex problems through collaborations, structures of different organisations and outside participants (EY, 2017:1; Koch & Hauknes, 2005:6; Amusan, 2017:267). Innovation means being able to decide on what to do or use, be it the current resources, discarding, reinventing or bringing up something completely new. Therefore, the government can offer a service that meets the ever-changing needs of citizens and businesses efficiently through digitalisation because digital services can empower citizens and increase the interaction between government and citizens (Corydon, *et al*., 2016:3). Public administration wants to create a meaningful interaction that will influence public sector innovation agenda. The aim is to develop a linking capacity of their own or mobilise the capability of the society (Bekkers, 2011:9). OECD (2008:24) states that ICT can improve how the public sector operates, from health to social security payments and tax administration processing. The internet has offered an opportunity to collect a large volume of data, easy ways to disperse information to the community as well as client engagement and communication; for instance, the internet of things is a new technology that is embedded with sensors to capture and communicate information (Bughin, *et al.,* 2010:6). Internally, ICT can improve financial transaction payments, revenue administration and customer relationship management between government agencies (Bisong & Oguwmike, 2020:12). However, that will necessitate an appropriate ICT governance and management plan to be in place (Martin, 2008:24). The governance approach and innovation agenda that advocate for governance perspective assume that a variety of actors can help eradicate the social problems by forming networks with different stakeholders from public and private sectors (Bekkers, 2011:11). This means that the ICT governance framework in its road map to harness ICT for addressing economic and social development should not exclude the role of the private sector, civil society and government (Salman, 2009:5).

This chapter examines the conceptual framework for the governance of digital innovation. The chapter proceeds to analyse the public sector digital innovation frameworks in different countries.

2.2. Governance of digital innovation in the public sector

The governance of digital innovation is significant because of the trans-border nature of the internet, which might lead to conflicts of norms, power and culture; for instance, freedom of speech, right to privacy, consumer protection and competition can be problematic if not regulated (Brousseau, 2012:6). This implies that the government and other stakeholders responsible for the public's welfare should have an understanding of what is going on with digital means; this includes challenges and opportunities digitalisation could offer (Lovelock, 2018:6). Digital innovation can be disruptive or revolutionary; being disruptive means challenging the existing frameworks, which can be threatening to government and private sectors (OECD, 2016:23). Digital disruption occurs in many ways, for instance, product substitution such as the displacement of music on a cassette to music online, by-pass payments are done online instead of paying at the cashier. Technological paradigm shifts such as cloud computing offers less cost and access benefits (Lovelock, 2018:7). Thus, digital governance is essential in managing the human activities that are impacted by the internet (Brousseau, 2012:6).

Welchman (2017) defines digital innovation governance as a framework for establishing accountability, roles and decision-making authority for an organisation's digital presence, which means, its websites, mobile sites, social channels and any other internet and web-enabled products and services. There is a transformation in decision making and traditional political institutions are no longer managing innovations alone, which then bring a shift from government to governance (Brousseau, 2012:8). Scupola and Zanfei (2016:237) agree that public sector innovations governance reflects a network-like a model with less hierarchy. The governance avoids barriers caused by new public management in that the now digital innovation governance promotes collaborations and knowledge sharing between interdependent participants. Policy goals are at the centre of innovation processes and lastly, it advocates for a bottom-up system instead of top-down, which avoids the bureaucracy that blocks innovation (Levi-Faur, 2012:221).

There are five types or traditions of public governance: i) socio-political governance, which refers to institutional relationships in society; ii) public policy governance, which refers to the interaction between political elites and networks; iii) administrative government, which refers to effective public administration; iv) contract governance, which refers to the collection of policies regulating contracting and outsourcing practices and v) network governance, which refers to how non-governmental organisations and the government work with and without each other to promote the public interest (Anttiroiko, *et al.,* 2011:3).

The aforementioned types of public governance are comparable to public management reforms that had a major role to play in the administration of the public sector. Public service was traditionally assigned by the government and provided to citizens but citizens had the responsibility to comply with the terms of the programmes. In most cases, the government provides services directly to the public but sometimes, the government can employ their partners or parastatals to deliver services. The service is usually the same for everyone; the process is judged by outputs. Officials should comply with the rules and regulations because they form the design of the service provided especially in transactional services. The most felt was the new public management reform, which brought about increased institutional and policy complexity. New public management was formed on themes of disaggregation, competition and incentives. New public management advocated for logic and cost-effective governance. Its waves have been reversed in most leading countries; however, some countries still experience its effects.

There is a new reform in place and it focuses on themes of reintegration in governmental spheres, needs-oriented structure and digitalisation of administrative processes (Dunleavy, *et al.,* 2005:467). The recent public management reform is called new public service. The new public service reform focuses on citizen involvement and engagement in finding solutions to a societal problem. The government has an opportunity to move to a holistic approach that is citizen-centred, where citizens play a more active role. They define the service they need. Citizens can now engage and collaborate with the government using the tools that digital technology provides (Institute on Governance, 2017:17). The public administrators no longer respond to a society's demands; rather, they collaborate with citizens,

encourage shared responsibility and they also seek opportunities for citizens to take part in government activities (Robinson, 2015:10).

The public service reform emphasise digital governance, which uses technology to improve service delivery (Robinson, 2015:11). The public service reform enables the digital government to improve the relationship between government and civil society, transforming how the government transacts (Paletti, 2018:4). Digital innovations give the government a chance to open data opportunities and transparency; the society can now have access to government information and also participate in the policymaking processes through digital platforms (Ndou, 2004:4). Expanding from the logic of network governance after the new public service tradition, public governance operations in the era of digital changes and innovations in this space, necessitates the public sector to keep up with the trends for the convenience of stakeholders and efficiency in its operations (Bason, 2018:14).

The public sector needs to maximise the opportunities that digital innovations bring and be prepared to prevent the risks that make government vulnerable in the digital space. Nonetheless, governments should not only focus on introducing digital means to solve pressing issues but should also prepare toolkits for innovative governance because the existing policy environment does not help the designing, coordination and evaluation of digital innovation in the public sector (Kattel & Mazuccato, 2018:789). Digital innovation is now the core function of public governance, which creates an opportunity for effective collaboration, coordination and improves communication amongst different stakeholders. Online collaborations and social media have reshaped the public and administrator's relationship; ICT allows interactions between the two from anywhere at a lower cost (Sorrentino, *et al.,* 2018:282).

Most governance protocols focus on delivering good governance to ensure that the government acts in the interest of the public and protects human rights. Digital innovation governance framework contributes to implementing good governance in the public sector (Klijn & Koppernjan, 2016:6). Principles of good governance in the public sector are a strong commitment to integrity, ethical values and rule of law where the public sector is accountable for use of public resources derived from taxation and the standard of service delivery. ICT can make it possible for governments to account to the public through open data access (Juiz, *et al.,* 2014:12). Government has to

adhere to fair policies and the official's interests should not interfere with decisions made. All decisions should be made in the public interest (CIPFA & IFAC, 2013:13; Prinsloo, 2013:11).

There should be openness and comprehensive stakeholder engagement where the public sector is open about their criteria for decision making, plans and the use of resources. Regular consultation with stakeholders is essential to engage the public concerning the outcomes of the services to improve them (Prinsloo, 2013:10). The governing body should give reports and feedback to the public. Information should be readily available to those concerned with public services (CIPFA & IFAC, 2013:17). Besides, sustainable economic, social and environmental benefits underpin public sector interventions and outcomes. Service provision should be within the available resource limits and with input from citizens, users and institutional stakeholders (CIPFA & IFAC, 2013:21). Principles of good governance in the public sector should develop the capacity of the entity including the leadership to achieve outcomes efficiently and effectively. The right structures, leadership and skilled human resource should be in place; there is a need to continuously develop the public sector capacity, leadership and human resource skills (Agere, 2000:11).

The governance structures and staffing must be fit for purpose; this means they must be able to provide public service and also respond to the ever-changing legal, policy, economic and political demands (CIPFA & IFAC, 2013:27). Principles of good governance in the public sector should manage risks and performance through continuous robust internal control and strong public financial management systems. Regular monitoring and reviewing should be done to provide progress reports that provide performance analyses and indicate whether the public sector is performing below or above targets. These reports will help manage the risks that might range from operational, financial, societal, human rights and independence of the judiciary. The public sector must ensure that the public money is used appropriately, economically, efficiently and effectively. Their financial management should ensure a long-term achievement and short-term operational performance intended to identify and address risks concerning the achievement of public sector plans (CIPFA & IFAC, 2013:33).

Lastly, principles of good governance in the public sector should implement good practices in transparency and reporting to deliver effective accountability for

stakeholders to understand and respond to service delivery levels. The public sector should be open and accessible to its stakeholders and citizens. Any type of communication and reports should be made available via different channels such as the web or social media. This is to satisfy transparency and openness (CIPFA & IFAC, 2013:39).

2.3. A conceptual framework for the governance of digital innovation in the public sector

The governance of digital innovation includes not only the introduction of digital technologies but also an allocation of tasks to different actors, usage of new skills and efficient management of funding, collaboration and partnerships with the private sector as well as regulations or frameworks. This is understood as the ecosystem in which participants consider the requirements for innovation system (Dodgson, *et al.,* 2014:215). Decision-makers at different stages of the design must be clear about the governance framework, having the right team, relevant mechanisms for project measurement and involving the user, public servants, professionals and people at all levels of government (Nylen & Holmstrom, 2015:58). Communication practices should be maintained through networks to support collaboration (OECD, 2016:40). Government managers and officials should ask themselves a question on how they will develop a method to turn their old, bureaucratic organisations into organisations that are open to change, ready to accept and embrace new ways of implementing policies and processes (McNabb, 2007:155). According to Martin and Gregor (2008:22), the definition of digital innovation governance, as derived from the information technology governance institute (ITGI), is a framework that consists of the leadership and organisational structures and processes that ensure that the organisation's information and communication technology system sustain and extend the organisations' strategies and objectives. It should ensure that employees understand the organisational processes as part of the organisations' structures and have a strong leadership that will help achieve the objectives of the organisation. The governance framework must help the organisation in achieving its goals and objectives especially those that are related to e-government activities. This is enabled by creating an ecosystem that fosters digital innovations and innovation culture that employees can form part of such as startups, incubators, and an easy-to-use platform within the

organisation (Haines, 2014:282). ICT governance framework serves as a guidance and direction on how ICT policies, resources, and infrastructure projects will be established, used, and managed. Organisations can use the governance framework to develop standards, procedures and practices within the public sector, formulate relevant policies that will support innovation, gather resources to support innovation, establish required infrastructure and manage innovation projects and teams (Martin & Gregor, 2008:22).

2.3.1. Generating and sharing ideas

The public prefers to interact with the government and therefore, demands that the government must copy the private sector and transform their services with digital technologies. However, the public sector is still struggling with digitalisation while some of their attempts have fallen short (Heeks, 2001:4). Public services necessitate a close interaction with its clients or citizens and innovation is not only about what they can offer but is also about how and by who the service is being offered. As a result, governments have begun borrowing digital approaches and ideas from the private sector and other governments that have progressed in their digital transformation. Hence, the world has moved from the traditional way of doing things.

Digital transformation has increased communication and interaction borders, which subject public administration to change from its traditional roles (Heeks, 2001:11). The online interaction between government and the public has been about improving real-time interaction with citizens and promoting information sharing, service provision, changing the decision making patterns by involving citizens in issues such as policy changes and innovative ways of providing services. But recently, social media and other online interaction have been seen as a platform to foster the formation of new collaborations and attract people with a shared interest to exchange ideas at a larger scale and also make it possible to manage the group at a lower cost and within time (Chu & Luna-Reyes, 2012:5).

Innovation diffuses easily through social networks; different actors in an organisation should adopt it and play a role in diffusing it to other organisations (Currie & Spyridonidis, 2019:1211). For innovation to maintain its faithfulness or originality, it should align with pre-existing organisational routines. Frontline employees should also

partake in its implementation while managers have a role to create a climate that supports innovation. For instance, they should encourage employees to generate innovative ideas and ensure that the ideas are developed, adopted and implemented.

Managers should also reward ideas, risk-taking and trying new things through the organisations' innovative performance (Currie & Spyridonidis, 2019:1212). Online interactions with the public are evident in Chile where citizens can transact and file for their tax returns online; this system has reduced costs and increased accuracy and saved time and printing material (Heeks, 2001:11). ICT is driving change in different governments globally. Even when most government departments and agencies are reluctant to change, they struggle with adoptions and diffusion of new ideas of digital innovations (West, 2005:31). Therefore, If the public sector wants to be part of the digital world, then, the government must be willing to open up formerly closed processes to new inputs, sharing ideas and innovation (Institute on Governance, 2017:10).

Until the 1980s and early 1990, innovation was more prevalent in the private sector but the public sector gradually introduced a few opportunities for utilising innovation in its processes. The main focus in public sector innovation has been to offer low cost, low risk and minor upgrades to already existing services or processes (Bason, 2018: 14). Before the global governance reform in 1990, government managers and officials had less opportunity to innovate mainly because the public sector offers services that are intangible typically to citizens. This limited their opportunity for innovation but things have changed. Today, government agencies and departments are expected to innovate or would have to explain why they cannot innovate (Altshuler & Behn cited by McNabb, 2007:151).

According to Lee (*et al.,* 2011:448), most countries are forced to create e-government systems where citizens can interact with the government. The pressure can be from citizens or neighboring countries but governments like any other organisation had to move from the industrial age management thinking that was traditional to cope with the current information age society and environment (Schwab, 2016:2). Government departments and agencies were forced to collaborate and learn from all expertise available inside and outside their department and also share their views in relation to new technologies (Schwab, 2016:2). Organisational culture has become more open

to new ideas and new ways of functioning (Anggadwita & Dhewanto, 2013. 308). This is the reason why most governments are determined to purchase and install new technology and also train their employees on how to use the new technology (McNabb, 2007:154).

The diffusion and absorption of innovations require a complex technical ability and managerial skills that will help with coordinating different employees and organisational routines as well as integrating external expertise with internal ones, hence, this cannot be achieved overnight but it is a process that will unfold as evolution through stages (Bessant *et al.,* 2012:1090). Innovation processes amount to transforming tools, norms and cognitive frameworks that interrupt regular patterns, de-structuring, restructuring and bringing up new routines and capabilities that are brought up from new ideas. These ideas aim at improving the quality of life such as better education and enhancement of human welfare (Pol & Ville, 2009:881). One stage is a better understanding of opportunities and problems, which are social crises or political demands. Most governments innovate because of the outside pressure while the best governments innovate systematically. They adjust to new trends, customer demands and technologies. Innovation teams around the world want to understand how the society lives and how society uses the public service. The aim is to identify the real need and clearly define the problem to respond appropriately (Mulgan, 2014:7).

The second stage is generating more useful ideas through incentives because public organisations often find it hard to generate ideas. The other barrier to idea generation is senior managers who are too quick to decide on what will or will not work. This kills ideas rather than nurturing them (Mulgan, 2014:7). Hence, the third stage is about measuring and testing to identify what works and what does not. Innovation generates various possibilities but only a few succeed. Therefore, measuring the success of innovation is important to persuade funders. Evidence can also be used to guide innovation as employees are likely to come up with effective new ideas if they are aware of what already exists (Mulgan, 2014:10).

The fourth stage is effective implementation through enablement by legislation and directives for agencies. Policymakers must be persuaded that implementing ideas is the actual expression of innovation, otherwise, ideas remain just ideas (Mulgan,

2014:11). The fifth stage is the essence of scalling things up and improving the adoption of innovation at early stages. The public sector is known for delaying to adopt new ideas even when there is enough evidence to support innovation (Mulgan, 2014:12). Innovation increases and becomes prevalent when more public sector agencies are willing to pay and support new ideas. The last stage is prioritising system change through multiple related innovations that change the way the whole system works including social norms and behaviours, new technologies, laws, products and services (Mulgan, 2014:13). The main goal for innovation is to reshape the whole system (Bland, *et al.,* 2010:2).

Government should create a suitable environment that accommodates everyone's innovative ideas especially if they would positively contribute to the whole digital innovation ecosystem. Therefore, sharing of innovative ideas should not be limited to government employees only but citizens and the private sector should be encouraged to contribute to the ever-changing public-sector environment (Hana, 2013:90). The network is a basis for many innovations because ideas can diffuse with ease and knowledge is passed onto another as people have different occupations and understanding. For instance, another one might be a civic leader while the other might be an inventor or entrepreneur. The network will help attract potential inventors, funders and adopters and every one of them would have some knowledge on how a specific innovation works (Goldsmith, *et al.,* 2010:10).

The public sector in Indonesia encourages citizens to be creative and develop skills and ideas for innovation outside the public sector consequently assisting in easing the burden of the public sector. This is known as an open innovation system whereby the public or private sector engage and collaborate with external innovators to acquire missing knowledge from different experts (Hamdani & Wirawan, 2012:229). Citizens are encouraged to develop solutions in line with services. Also, partnerships with the public sector and developers are empowered to bring innovative solutions to improve healthcare and education, fight corruption and manage disasters. The government gained an opportunity to engage with potential users and further understand the dynamics in their needs. However, these digital initiatives and designs require the development of governance frameworks, standards and guidelines to assist the public officials with mechanisms to develop, prototype, test and give service effectively

Because without regulation connections, there will be difficulties in the governance of innovation system (Pratama, 2018:4). The governance framework should be supported by policy levers, co-ordination mechanism and institutional capacity to implement. Thus, the government would have to be equipped with relevant skills, tools and rewards to promote engagement with relevant stakeholders in a more coordinated way (OECD, 2016:198).

In Singapore, there are many startups who found a home for their ideas because of ease of innovation regulations, high concentration of networks and funders as well as an innovation-friendly ecosystem. But beyond these reasons, Singapore is a small country, with foreign talent access and the government has projections they are focusing on (Cheah, *et al.,* 2016:78). The smart nation and smart city government initiatives make Singapore one of the most innovation-driven countries (Albino, *et al.,* 2015:16). The country is seen embracing smart city notions that necessitate that the city should use technological infrastructure infused with human and business networks to improve economic and political efficiency (Sanchez, *et al.,* 2019: 2).

In Singapore, efforts and funds are mainly directed towards digital government and every government institution is contributing towards these efforts. From education institutions, universities, government agencies and private businesses, they have developed programmes, centre incubators and accelerators to strengthen the innovation ecosystem. The efforts are not only made by the government, instead, it is different organisations that generate and share ideas with the government and then government improves its services through innovative ideas (Ho, 2016:3202).

2.3.2 Empowering the workforce

According to Winston and Edelbach (2012:6), early human society was dependent on agriculture. They gathered edible plants and hunted animals. In the 18th century, the industrial revolution replaced the agricultural revolution with coal steam energy, which caused a massive change in economic and social relations (Wessels, 2010:27). People migrated from rural to cities in search of jobs in the factories. The third transformation followed in mid-1970, which introduced the information age. Computers, communication satellites, and fibre optic cables are some of the visible developments. The 4th industrial revolution made it possible for computers and

computer programmes to be improved. Achievements were noted in areas like expert systems for medical diagnosis. Being flexible, modifiable and reprogrammable tools, it has become easy to switch from one task to another (Winston & Edelbach, 2012:8). The 4th industrial revolution has become a significant economic catalyst mainly because it is enabled by technologies applicable to various sections of different industries such as data-driven industries, mining, agriculture, healthcare, law and media (Turner, 2018:9).

The information revolution has decreased the importance of large infrastructures to deliver services to the public, meaning even the public sector can offer services to citizens from the comfort of their homes and the government does not necessarily need physical infrastructure (Kuye & Naidoo, 2018:3). The availability of broadband and its usage can promote economic growth and improve the standard of living. Countries with high ICT usage are likely to achieve more economically than those that do not use ICT. Digital innovation is seen as the enabler for economic development; it can reduce poverty and enforce an inclusive society. It creates more opportunities across industries and is also more applicable to a wide range of industries. For instance, data capturing technologies such as tracking systems, the internet of things and geospatial sensors allow the analogue sectors to become digital. This will simply require human resource with technological skills (Naidoo *et al.*, 2019:7).

Farms, mines and construction sites can gain from digital connectivity and innovation through data intelligent systems and robotics (Turner, 2018:17). Healthcare benefits from digital innovation as doctors can use laboratory testing to get a clearer understanding of an individual's genetic makeup and the risk to develop a complex disease such as cancer. Early diagnosis can enable doctors to develop more targeted treatment and approaches to prevent diseases (Turner, 2018:20). Digital innovation further created innovation collaborations by actors with different goals and capabilities and a new breed of innovation processes was produced, thus, the entire industry has been transformed (Nambisan, *et al*., 2017:223). The definition of digital innovation in this regard emphasised the outcomes, which include new products, platforms, services and new customer experiences. Other new products include digital tools and infrastructure such as 3D printing, data analytics, mobile, and computing. Also, digital innovation highlights the possibility of outcomes being diffused, assimilated, or

adopted by different actors such as the government departments or agencies and the private sector (Nambisan, *et al.,* 2017:224).

The reasons mentioned above show the significance of digital innovation and why governments should take advantage of digital innovation. Digital innovation has changed the nature and structure of products and services by building the capacity and technological skills of its employees. Digital technology has changed the way society connects and organises its knowledge. It fosters a low cost of connectivity across borders, provides rich bundle of data, tools and techniques that transform how the society solves its problems (Shenglin, *et al.,* 2017:4). Government or organisational innovation capacity building is key in realising digital innovations in the public sector. This means organisations can generate and implement ideas that will solve tomorrow's problems. Innovative capacity in the public sector is concerned with organisational design and ecosystem, which have an influence on the work environment and culture as well as the institutional framework (Bason, 2010:28). Innovation capacity in the public sector is presented in a pyramid structure that has political context on top and people's culture at the bottom. This pyramid shows that managers on top are responsible for regulations and administrative frameworks of the organisations. Thus, t, while the general employees including the managers should create the culture to innovate and embrace new ideas or else the innovation, will not get off the ground. The organisational culture focuses on how innovation is promoted and if talent management, incentives and rewards from performance management outcomes are supported by the organisations because employees are generally motivated by incentives and support from the managers (Bason, 2010:29).

The environment is changing fast and governments can no longer provide services in the old conventional manner. They need to be innovative. ICT is known to be the enabler of public service that is efficient and effective. It facilitates communication and coordination within the public sector's departments but the world is faced with a challenge of speed and scope of technological changes. Therefore, governments should be more responsible by creating policies that encourage transformation but protect the planet, keep the citizens safe but also provide services and end poverty (Szabo, 2019:60). It is noticeable that the public sector bureaucrats have accepted the challenge of improving their performance and want to compete with the private sector

(Nowacki & Monk, 2018:1). One perspective of improved service delivery by the public sector draws attention to innovation in the public sector. This perspective emerges from an understanding that competence, skills, knowledge, product services and branding that are not of a private sector standard may lead to poor service provision (Amusan, *et al.*, 2017:266). Therefore, governments need to continue building the skills of their employees. The skills necessary for e-government include analytical skills, information management skills, technical skills, communication skills and project management skills. Analytical skills will help examine customer satisfaction, the user needs and make research on how other organisations are solving similar issues. They help in designing a system for solutions that will be tested and implemented. Information management skills are important in creating data and organising information as well as creating security to ensure accessibility and storage of that same data.

Communication skills will help officials share exactly what they intended to without oversimplifying the message. Officials should have the ability to use emails, newsletters, writing formal reports and making virtual presentations. Project management skills include the ability to plan, allocate resources, negotiate and handle time, cost and risk or the project. This is important in measuring the outcomes of a digital innovation project. Government should provide training for citizens as well so that they can use and benefit from the efficiency provided by ICT. An integrated network should be built to reach all citizens even those that are in remote areas and continue to expand on citizens' expectations especially for those who already can transact online (Rabee, 2006:6)

Improved relations and coordination among different levels of government have a positive impact as government institutions share tools, best practices and build capacity. Digital innovation overcomes organisational silos to provide access to information and improves service delivery even when government debts are increasing and budgets are decreasing (Jenkins & Barrenechea, 2014:27). The public sector can lead digital innovation by allowing citizens to use their open data initiatives, which increase government's openness, transparency and accountability, consequently boosting the society's trust in government (OECD, 2016:12). Factors influencing public trust in government and its employees include among others,

competence and honesty of government officials, transformation, and e-government (Mahmood, 2019:19). ICT has changed the way the public sector has been providing services; it has challenged the typical way of service production, making it possible to push things beyond the margins of the public sector. It further helps make resources accessible and shared, consequently public policies and services are effectively implemented (Cordella & Paletti, 2018:13).

There are four transformational stages of digital public services. They are significant in reflecting the development of digital public service and the capacity of government: emergent, enhanced, transactional and connected stage (Bertot *et al.*, 2016:213). The emergent stage is when the government officials treat the website as a static billboard to provide information on policies, laws, regulations, documentations and any other available government services (West, 2005:9). Enhanced stage is one-way communication between the government and citizens. Citizens can download forms, audios and videos in multiple languages. Transactional stage is two-way communication with citizens. Citizens can complete license applications, permit applications and tax filing on-line (Rabee, 2006:6). Connected stage is when the government is involved in cross-agency e-services; the government uses multiple technologies, platforms and engages extensively with citizens (Bounabat, 2017:6). Each stage necessitates a government to have delivery capabilities and citizens to have access to devices, know how to use the devices and lastly, for both government and citizens to have a technical infrastructure.

Telecommunication infrastructure, political and governance issues are very important in the above stages. Each successive stage in public service delivery requires an increase in technology, cross-government, integration, organisational policy and citizen abilities and complexity (Bertot, *et al.,* 2016:215). Welchman (2015) identifies five stages to organisational digital governance as compared to (Bertot, *et al.,* 2016:214) who identified four stages. Welchman (2015) noted that the third stage of digital governance maturity before the transactional stage or basic management stage would be chaos whereby senior management of organisations are informed about digital channels but have delegated the development of a digital strategy to junior officials. It is in this stage where organisations are not able to account for all their digital asset. They might not be able to identify who is responsible to execute digital

development and to account for its funding. IT policies are formalised in this stage but they are sometimes separated from the influence of the corporate legal teams. Some standard procedures are documented in this stage but most central digital standards are missing.

According to Yin Lin (2016), Singapore's government is ranked among the world's best countries with digital capabilities and achievements. The city state is a place of inspiration for digitally-minded public servants. For instance, the Singapore public service uses Facebook as a professional platform for internal communications. Every public official and agency is challenged to devote sufficient creativity, effort and resources to achieve this goal. Government officials are aligning themselves with digital efforts. The Prime minister has been a strong advocate of Singapore's digital government efforts. He initiated the Singapore Smart Nation programme and housed it in his office. The leadership's ambition, commitment and broad-based strategy for digitisation had made it possible for the government to digitise most of its interactions with businesses and citizens, consequently saving cost and bringing about efficiency in government services (Yin Lin, 2016).

Since the establishment of Smart Nation in 2014, in Singapore, the country is working hard to push ahead even in this fast moving revolution. Singapore has always believed in research, innovation and enterprise. They continue to invest in these cornerstones as they are aligned with the country's national priorities to tackle national challenges such as improving healthcare and transforming the urban landscape. The investment in research and innovation continues to grow. The government has set aside 400 million US dollars to support research, innovation and enterprise for the year 2016 to 2010. Progammes include driving digital innovation in urban mobility, healthcare, ICT, services productivity and also the building of AI, IoT and cybersecurity. The government has established the startup SG programme to provide support on funding, mentorship, talent attraction and internationalisation. The public and private sectors will work together to form a strong ecosystem that can attract top talent and capital (Smart Nation and digital Government office, 2018:27). Individuals are encouraged to think like customers but are active co-creators and contributors.

In Singapore, society is already using digital tools like WhatsApp and Facebook to solve community issues. The nation should develop a dare-to-try-mindset and be open

to new experiments and ideas and be willing to take reasonable risks. The government will allocate resources to promote technological projects and public sector innovation. It will also adopt a balanced regulatory means to support innovation and only get involved when is required (Smart Nation and Digital Government Office, 2018:22). The government will constantly review the school curriculum to ensure that it is relevant for the future workplace and society (Smart Nation and digital Government office, 2018:23). The government will make sure that they work with the public and private sectors to deliver on the digital readiness blueprint that emphasises that the government will help all Singaporeans regardless of age or ability to have digital access and literacy to take part in the Smart Nation (Smart Nation and digital Government office, 2018:25).

The government of Malaysia is also among the most governments who realised the importance of the internet and ICT. They are doing all they can to invest in this sector and reap the benefits. Apart from investing in ICT infrastructural developments, the government has collaborated with different sectors such as academic institutions to provide scholarships, workshops and training to those who are disadvantaged such as women so that they have skills to participate and benefit from technological advancements in the country (Salman, 2009:6). Nonetheless, there is a lack of ICT competencies and skills among the government officials, therefore, training will have to be provided continuously to meet the workforce requirements to provide customer-based services to citizens (Salman, 2009:7).

2.3.3 Reviewing organisations' design

Governance simply refers to the government in practice or "the execution of authority state institutions and political leaders for the good of their state interests and the common good of the citizens" (Tamayao, 2017). It refers to the "institutional capacity of the public sector to provide goods demanded by a country's citizens in an effective, transparent, impartial and accountable manner, subject to resource constraints" (Katsamunska, 2016:134). Governance affects the allocation of public resources and the degree of "effectiveness and efficiency of their activities" (Scupola & Zanfei, 2016:238). The appropriate concept for the allocation of public resources by public institutions is public governance. Public governance is bigger than government because of the different actors involved; it underscores that government cannot do

everything for its people and the state (Tamayao, 2017). Public governance involves the public sector, private sector and civil society as stakeholders interacting as a network for the common good of the society where government acts as a facilitator or regulator not authoritarian mainly because policy issues are complex and demanding (Rhodes & Stoker cited by Toikka 2011). The state is no longer monopolistic but public-private partnerships characterise a new order/approach of regulation that promotes interdependence within different types of stakeholders such as citizens, experts, professionals, organised groups and the state (Brousseau, 2012:8).

The above is evident in Austria when the government saw it fit to collaborate or form a network between different ministries to create a common concept that will be used to coordinate their information society and ICT programmes (Polt & Schinder, 2005:16). They first conducted a study on the governance of Austrian information society to understand why the previous policies were not successful to establish the roles of actors and interactions and coordination mechanisms and this helped them to create a coherent strategy for information society policy (Polt & Schinder, 2005:16). While coordination was difficult, they managed to identify the key actors in building the information society policy and among them, there was a Ministry of Economic Affairs and Labour and Ministry of Education. An Austrian Research Counsel, chief information officer, was also among them and was entrusted to coordinate the horizontal e-government activities, development of strategies and solutions and creating e-government platforms (Polt & Schinder, 2005:17).

Public governance is about controlling and coordinating the network of stakeholders in terms of public policy context (Amy & Rahayu, 2018:2). For instance, in Norway, there is a coordination body that is the department of IT aiming to motivate information society and liaison with other ministries. Coordination, in this case, implies the establishment of communication platforms, routines between stakeholders, designing measures of interactions, opening doors to digital solutions and corresponding network requirements (Perdersen, 2005:76). Stakeholders in this country include the following ministries: modernisations, labour which is trusted for skills and training, Ministry of Education will be responsible for research, Communications would have to formulate ICT policies and Ministry of Finance that will have to track and give tax incentives to companies that are to participate in the creation of digital innovations.

The government formed a network which will be coordinated by the Department of IT (Perdersen, 2005:76).

The category of stakeholders differs in that electorates and their political representatives are the most important ones in the government system. They have a mandate and powers to make political decisions within the given community whilst civil servants or public officials are the ones responsible for implementing political decisions (Anttiroiko*, et al.,* 2011). Middle managers and front-line officials are the most active innovators within public governance who have the capacity or expertise to simplify decisions and complex environment of policy implementation (Bingham, *et al.,* 2005:555). The high quality of policy formulation and implementation requires hands-on policy processes that are handled by general and specialised competence in the staff of the coordinating body (Perdersen, 2005: 66).

Organisational structure of governance differs per country. Countries like Hong Kong concur with the state centred theory, which believes that government interventions can distort the market and lead to corruption. Therefore, the state should only play a strategic role by taming the market forces and directing them to the country's economic interests. Government interventions can distort the market while Singapore is known for its support for government interventions that include funding R&D and innovative activities. For instance, Hong Kong government financed 0.9 billion US dollars while Singapore was able to provide 2.3 billion US dollars to innovation and research (Wang, 2018:400). Each country decides on how they would design their governance structure like government departments in Finland operate per department; ministries are autonomous and they decide on their own (Oskanen, 2005:36). But, the government appreciates that they need a solid innovation policy that will encourage collaborations between different government departments, the private sector and civil society because it is difficult for the department to diffuse or exchange ideas if they have independent administrations (Oskanen, 2005: 38)

ICT is a cross-cutting issue that is under constant evolution and in some instances, it is difficult to place it under a specific government ministry or an agency and even explain how it should be coordinated. For example, ICT and R&D policies in Brazil are placed under the ministries of science and technology while in other countries, the mandate is being to agencies created specifically to lead digital or e-government

strategies. The Ministry of Science and Technology in Brazil acts as a funder for public-private partnership but the agency that handles this funding is the National Projects and Studies Financing Agency (FINEP), which also works via the National Council for Scientific and Technological Development or National Research Council (Cassiolato, 2011:54). The Ministry of Development, Industry, and Foreign Trade is also involved via its funding agency called the National Economic and Social Development Bank. This acts as the funder and policy designer for innovation.

There are many structures involved in the development of ICT in Brazil. They include the Ministry of Culture who is the main funder for ICT projects and research in digital tv, digital divide and cultural heritage. There is an internet steering committee in Brazil, which coordinates the activities of internet services in the country. The members include among others the academic community, government departments such science and technology, communications, industry and foreign trade, the Ministry of Planning, Budget and Management and the Ministry of Defense, National Telecommunication Agency, National Council of Scientific and Technological Development, hardware and software industries, internet experts and NGOs (Reynolds, *et al.,* 2019). The government of the State of Sao Paulo, the Technological Research Institute is the leader in public and private applications in engineering and applied science while the State of Sao Paulo Research Foundation is one of the main funding agencies in terms of scientific and technological research in the country (USP, 2011:15).

Integration and collaboration among government, private businesses and universities is the recommended model to achieve a favorable ecosystem for effective innovation. Sadly, in Brazil, the ecosystem has been uneven due to low levels of integration ad collaboration between government and businesses. The most visible collaboration is mostly between universities and businesses while the government and private sector had a distant relationship (Reynolds, *et al.,* 2019). Brazil put more emphasis on a large network of technological incubators related to National Associations of Technological Parks with various entities aiming at promoting ICT innovations. The country continues to spend more on social support such as pensions more than they spend on innovation; innovation policies do not enjoy the support that pensions and health sectors have (Reynolds, *et al.,* 2019). Digital contents such as digital TV, mobile

transactions and digital libraries are seen as Brazil supporting the world library project; this helps prosper the digital government they desire (USP, 2011:19.

In Singapore, the Smart Nation focuses on digital transformation and involves the entire nation and the whole government approach to digitising the multiple facets of urban life. It put emphasis on collaborations with industries and societal partners (Jie Woo (2017). Chouhury (2017 cited by Jie Woo, 2017) notes that in its initial stages, Smart Nation focused on transport, home, environment, business productivity, health, and the public sector. However, the narrative has changed due to the emphasis on artificial intelligence. The government of Singapore further established a government technology agency called GovTech in 2016 under the Ministry of Communication and Information. The main role of the agency was to develop Smart Nation applications, architect and the infrastructure to support these applications, to drive digital transformation in Singapore's public service as well to work with other government agencies to develop and deliver secure digital services to the public (Govtech, 2016).

A smart Nation in Singapore means that people will be increasingly empowered to live their lives in a meaningful and fulfilling manner. It will allow collaborations with international partners to deliver digital solutions that will benefit people and businesses (Smart Nation and digital Government office, 2018:5). The Smart Nation programme office, in 2016, note that digitisation in this regard can be achieved through a set of enablers and it will be made possible by efforts of different organisations or structures of government.

- ✓ Collaborations with industry and research institutions
- ✓ An open data portal to allow coordination and sharing of government data
- ✓ Investment in research and development
- ✓ Laboratories for the development and piloting of technological solutions
- ✓ Start-up accelerators to innovation
- ✓ Cybersecurity measures to safeguard data, systems and network
- ✓ Building computational capabilities among citizens through education programs
- ✓ Policy and regulatory sandbox

2.3.3.1 Digital innovation governance through network structures

Government, private sector and civil society are gradually faced with complex societal problems and dealing with these problems may cause complex governance challenges but the current environment of technology gives governments a chance to respond innovatively (Janssen & Van der Voort, 2016:1). Governments are expected to decide about maintaining the public infrastructure like power plants but sometimes, they would be challenged by various stakeholders from interest groups. These issues need in-depth knowledge and possible solutions. They also involve various stakeholders, which may result in chaotic processes with unexpected results. No organizsation can deal with these issues by itself mainly because of a lack of resources and capabilities to solve problems (Klijn & kopernjan, 2016:1; Rondinelli, 2007:3). Governance network connects policymakers with citizens and stakeholders and has the potential to help overcome party politics and put forward innovative models that promise good governance whereby the boundaries between organisations, private and public sector are penetrable (McCallum, *et al.,* 2016:65). Networks present a new way, which incorporates private actors in public decisions, to address complex societal problems and this led to decentering of political power (Sorensen & Torfing, 2012:4).

Governance networks emerge because of the complexity of societal issues and interdependence between actors that benefits from the network in that they can collaborate and become innovative when addressing complex societal issues and increasing governance capabilities (Gray & Purdy, 2018:1). Public voices can be heard within horizontal relations where actors are interdependent and act collectively to steer the development and implementation of policy. Network governance is usually compared to bureaucracy, which is insufficient and lumbering, in contrast to governance, which is flexible and efficient way of dealing with public issues (Larsson, 2019:8). Governance network is defined by Klijn and kopernjan (2016:11) as interactions within networks to address a specific problem, policy, programme or public service. Networks are unique; they are a result of interactions and collaborations. They differ in how they start and function.

According to Klijn and Kopernjan (2016:11), there are four broad paradigms of networks as an instrument of coordination. Firstly, positivism believe that networks evolve because there is a need for collaboration to solve societal issues. The second

group is interpretivists. They believe that networks are shaped and created by individual beliefs and practices. The third group is a critical realist perspective, which believes that the role of the state is to regulate networks. Lastly, the functionalist assumes that networks are because of failures of markets and hierarchical coordination and are an instrument that can produce positive results and solve current societal problems (Ouden, 2015:6). Sorensen and Torfing (cited by Montenegro and Bulgacov 2014:111) want to prompt research into governance from a network perspective because of the potential networks have on proactive governance. Multiple actors can quickly identify a new opportunity or problematic policies but also find flexible alternative responses. Different actors may have information, knowledge and evaluation that can help make decisions. Usually, there is a framework to deal with conflict between stakeholders. Lastly, governance network reduces the risk of resistance to implement as actors are involved, therefore, more likely to be supportive.

Network governance can be identified by the following characteristics: they are normally interdependent because resources to solve problems are owned by different actors. They have complex policy problems that need collective efforts by several actors. They have complex interactions caused by autonomy and individual perceptions of problems and solutions and their interactions show stability over time (Klijn & Kopernjan, 2016:11). Ouden (2015:10) observations are that the concept of interactions can be used to understand governance. Interactions involve an intentional level of interactions, which is about the intentions of actors informed by their aims, interests and identities and the structural level, which is the context in which interactions take place. Structural level consists of conditions that limit or broaden interactions and conditions the intentional level. It consists of institutions, patterns of communication, material and technological possibilities as well as societal power distribution. The structural level of interactions has the ability to structure the intentional level of interactions. Values, norms and principles, institutions and legal practices may be stable but they are regularly shaped and reshaped. These interactions have goals that are informed by the actor's interest. Governance is complex and the interactions are often met with unexpected results at the intentional level. The structural level of interaction has a role to structure the intended interactions. The structural theory argues that structural levels shape individual action but these actions, in return, shape the structure (Lovan, *et al.,* 2017).

According to Provan and Kenis (2008:236), network interaction effectiveness depends on four key structural contingencies and these are: trust, size, goal consensus and the nature of the task. These are not the only contingencies that determine the effectiveness of networks but they are the most important as per the network literature. Trust is crucial for network interaction. It should be deep but should be consistent in its level of density across the network governance. Perceptions of trust will be shared among the members if trust ties are dense. The density of trust means that members of the network trust one another. Shared governance will not be effective if there are no dense trust ties amongst the members. Consequently, there will be a little foundation for collaboration among network members (Provan & Kenis, 2008:237).

The number of network participants/size that is the size of a network can make it difficult to govern as the number of participants grows. It is easy to interact with members in a small network because when there are problems to be addressed, members can participate face to face. Larger groups experience problems and shared governance becomes ineffective due to spending more time trying to coordinate across 10, 20 or more organisations. It is even more difficult when participants are in different locations, not affording a chance for members to meet frequently or not all (Bodin, 2017:2).

Network goal consensus implies that common goals and similarities allow a better performance by organisational participants than when there is conflict. However, conflict can be viewed as a stimulant of innovation. Organisations collaborate based on goal consensus. Goals might include addressing community needs or providing improved client service. Network goals may also be concerned with processes, for example, working to reduce competition among participants. This is when there is an understanding or consensus among members of the network regarding both the goal and process and when hierarchy does not exist, then, members of the network are most likely to be involved and committed to the network. Thus, the network coordinator should be able to encourage the members to build commitment to the goal of the network (Cristofoli, *et al.,* 2012:81).

Need for network-level competencies implies that organisations want to achieve various things and most join networks for the reason that they want to achieve some end that they could not if they remained independent. Different network governance

puts a burden on network members to provide these competencies, hence people who want to become part of the network governance must show that they can contribute resources and skills to the network (Sorensen & Torfing, 2016:9). Governance should facilitate the interdependence of members. If interdependence task requirements are high and each member is required to have skills they may not possess, then, shared governance will be less effective. Another issue is an external task, which may include roles of protecting the network from environmental shocks such as a shift in funding or new regulations (Provan & Kenis, 2008:236).

2.3.3.2 General observations

There are two “different but not incompatible perspectives to understand the linkage between ICT and public institutions” (Lanzara, 2009:13). The first outlook is that technology works the same way as traditional institutions because it produces normative, cognitive and regulative tools and objects that help administrate the society at large. This means the authority to enforce and regulate social conduct is increasingly passed onto technology while compliance and proper conduct are managed through technology, take speed cameras, for example. In other words, ICT is an institution through technological artefacts that society uses. The second perspective is that public institutions become more technical as they adapt to technology for service delivery and data exchange (Lanzara, 2009:15).

Technology does not only support social institutions; it is a self-contained system. It has its language and standards to which traditional institutions should adapt. When traditional administrative and legal procedures are too extraordinary, part of them will be discarded by technology or be arranged so they are used as offline backup (Lanzara, 2009:14). The two perspectives occasionally converge to the same outcome based on two different theoretical frameworks. The first one is actor network theory and the other one is social system theory. The actor network theory emphasises inscription and delegation of institutions and their administration to technological objects, which assume authority on behalf of institutional agents and enforce laws. It refers to the network between human agents and technical artefacts where technology has the same authority as the institutional agents. Social system theory focuses on what technology does to institutional and normative frameworks. There is a reduction of institutional to technological input to simplify administrative processes by harnessing

technology. Not all complex human administration can be reduced and simplified into technology but only those that admit to technological codes (Lanzara, 2009:14).

2.3.4 Navigating rules and processes

Government is currently responsible for developing laws, regulations, frameworks, defining societal norms and providing social services to communities (McNabb, 2007:156). The legitimacy of every government is grounded on its democratic processes, transparency and accountability (Institute on Governance, 2017:10). Literature on digital government indicates that ICT has the potential to improve how public service delivery is offered but it can also augment public officials' accountability to society. ICT will increase transparency, which as the result, will modernise government officials' behavior and how decision-making takes place (Putra, *et al.,* 2013:181). The government will be accountable to the public and not only to the political representatives and legal institutions (Meijer, 2007:101). The public has new expectations on government and this drives public sector modernisation that requires systematic and consistent efficiency and an increase in productivity.

Digital transformation plays a major role in modernising public services, increasing service productivity, reducing labour intensity, increasing the level of satisfaction and openness, trust and engagement within government and other actors. The digital government environment encourages users to make their demands known and thereby, making contributions towards shaping the government's policy agenda (OECD, 2016:9). Several countries have adopted digital innovation frameworks to foster innovation in the public sector. Few international countries such as Singapore, Brazil and Indonesia have seen progress in the right direction in terms of implementation of their national digital innovation frameworks.

In Africa, Rwanda has made exceptional progress in becoming a leading Smart Nation in Africa. Finland is one country with a weak or no innovation policy or strategy but they realised that they will need a strategy to get things right. Thus, in 1990, the Ministry of Finance developed the first national information society strategy (Oskanen, 2005:42. The ministry introduced ICT solutions on the public sector and coordinated the development of e-government activities while the Ministry of Education helped with doing research, promoting competitiveness and offering technical training and basic

skills to citizens. This gave effect to the development of a new strategy for an information society that will now encompass different actors such as business sector, civil society and government administration (Oskanen, 2005:55). OECD (2008:23) advocates that government has the responsibility to remove legislative, regulatory, budgetary and social barriers to e-government.

Government must guarantee that the entire public, especially those from regional and social disadvantaged communities, has access to their electronic services and products. Therefore, ICT governance process must include the removal of barriers that might be forced by regulatory requirements (Blind, *et al.,* 2017:250). The report made by OECD (2003) in Martin and Gregor (2008:25) admitted that e-government is risky, expensive and difficult especially with unrealistic political demands, project management deficiencies, the cost to run it as well as technology failures. These call for coordination and collaboration amongst different actors such as government agencies and private sectors as well as the public to lessen the burden from the government. The report also suggested that there should be suitable channels in pursuit of ICT governance.

2.3.4.1 Reflection on Digital Innovation Governance Framework (Singapore, Brazil, Indonesia and Rwanda)

The government of Singapore has outlined plans to transform its economy, government and society through a digital economy framework for action, digital government blueprint and digital readiness blueprint. Singapore's digital governance framework is called the digital government blueprint. The digital government blueprint sets out targets to be achieved by 2023. It is based on three questions: how will they digitalise the public service, who will be the stakeholder or actors and what do they want to achieve (Smart Nation and Digital Government Office, 2018:9).

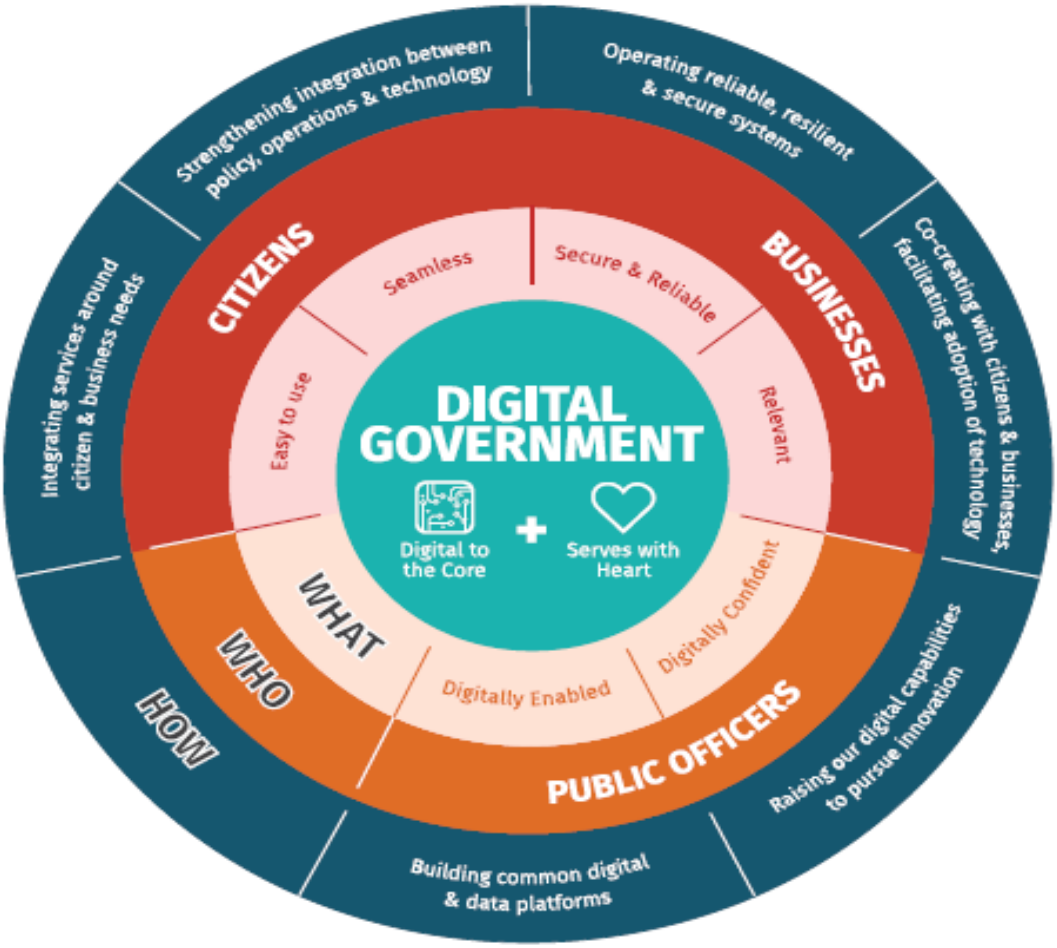
What: The government provides a digital service that is easy to use, accessible on any device, secure because it is built on reliable infrastructure and built to cater for the needs of citizens and businesses.

Who: The public and businesses are benefiting from the public services but they also collaborate with the government to bring about an understanding as well as create new services that can be adopted. Public officials should work in an environment

where they have access to data, digital technologies and are free to collaborate with other public officials from different government departments. It is an environment that allows an employee to design programmes. A workforce will be people who have basic digital literacy, trained and can use data and digital technologies in their workplace.

How: The government developed six strategies on how they aimed to achieve digital government and they are: Integrating services around citizen and business needs, strengthening integration between policy, operations and technology, operating reliable, resilient and secure systems, co-creating with citizens and businesses, facilitating the adoption of technology, raising our digital capabilities to pursue innovation, building common digital and data platforms.

Figure 2: Digital government blueprint adapted from (Smart Nation Singapore & Digital Government, 2019:10).



Singapore has plans to build a digital government and digital society and this involves the public, private and public sectors. System foundations should be in place, for instance, digital infrastructures are important to benefit efficiently from digital technologies as well as cybersecurity to secure the digital efforts. Technology culture on the public or people should be encouraged and the right environment for opportunities for collaborations and experimentation with technologies should be provided for (Smart Nation and Digital Government Office, 2018:9).

The government of Brazil executed its digital transformation a little differently from the Singapore government. They have been adopting the new information and communication technologies at all levels of their public administration. They have made them a priority to promote modernisation of public administration and improve the efficiency and quality of services provided. Most citizens use technology to access public services. The increase in the number of citizens in Brazil using the internet in their daily lives and the growth of internet access in households and businesses has made a difference in the development of a new economic and social situation in Brazil. Government, businesses and citizens can interact sufficiently in virtual environments formed by web applications. There are priorities related to ICT and R&D that are set at the national level of government. They are the efficiency of tax collection, e-voting infrastructure, education and research projects, aviation, agribusiness and transportation, promotion of broadband access and public funding and regulation (USP, 2011:23). According to USP (2011 :7), ICT is among the many priorities on science, technology and innovation. Brazil promotes strategies that will allow researchers, universities and industries are to participate in programmes related to R&D and ICT. The programmes include open-source software, grid computing, environmental and climate change, health and medical application, digital TV and ICT applications and testbeds (USP, 2011:24).

The Blue Book is a Brazilian science, technology and innovation framework and it gives an understanding of ICT priorities in the country. Its key requirements are the adoption of an agenda that encompasses among other things the consolidation of the national system of Science, Technology and Innovation, strengthening coordination among various sectors, reviewing the legal frameworks hampering technology development, business and educational institutions and research. They also include

the support of science and technology for social inclusion, encouraging innovation, improving quality of education at all levels of school and higher education, increasing number of researchers in different companies, institutes and universities. Lastly, it is the intensification of programmes designed to reduce the country's imbalances in science and technology activities. The Blue Book also makes recommendations for ICT policies and strategies since ICT policies are seen as a challenge. There is a need for a continuous effort to move at the same time in different directions of the country's regions. The effective use of the opportunities offered by ICT depends on the universalisation of skills and digital literacy as well as access to an efficient communication infrastructure (USP, 2011:6).

Things are unfolding a little differently in Indonesia as compared to Singapore and Brazil. Indonesia is located in Southeast Asia and is the fourth largest country in the world. It recorded 267 million in 2017 (Edamadaka & Seike, 2019:20). The country has risen to become a middle-income economy but its economy relied mostly on the exportation of natural resources. The country has the fastest growing economy in the world with 5.1% GDP growth annually (Edamadaka & Seike, 2019:20). Until recently, the government neglected the development of scientific and technological base and framework conditions for innovation but there is a new emphasis on policies and mechanisms to inspire innovation and its coordination (Mugrodo *et al.*, :153).

Indonesia is ranked number 46 in the World Economic Forum's Global competitiveness in 2011-2012. ICT infrastructure in terms of individuals using the internet moved from 10.9% in 2010 to 18% in 2011. This is still low as compared to countries like Singapore but it represents growth in the past few years (Mugrodo *et al.*, :159). According to the national census in 2010 (cited by OECD, 2016:191), the Indonesian population is mostly made of young people with 46% being under 25 years and is mainly urban. The government will have to adopt a broadband ecosystem that aims to establish a suitable legal and regulatory environment and market conditions that support competition and high-quality services (OECD, 2016:193).

The Ministry of Communication and Informatics realises the essential role government has concerning the information society of digital innovation in the country. The Indonesian government has realised the need to strengthen its governance framework. They understand that the government is an enabler of the ecosystem for

the digital economy. To support this, a Ministry of Administrative and Bureaucratic Reform launched a strategic plan 2015-2019, which identifies digital government as an important tool to have a successful and more transparent government that support sustainable development in Indonesia (OECD, 2016:201). The framework proposes the development of an E-Government Master Plan. The master plan should be developed in collaboration with other public institutions and should include ICT projects, their timelines, KPI and funding in agreement with national strategic planning mechanism and annual budgeting (OECD, 2016:206). The Ministry of Administrative and Bureaucratic Reform sees the need to improve the coordination between national and subnational governments concerning digital government for them to be able to deliver the anticipated results (OECD, 2016:207). A whole government approach built on the political commitment to a shared vision will allow policy and coordination at the strategic and operational levels. It is evident in other countries that securing political support for transformation agenda is an important factor (OECD, 2016:208).

Rwanda is in Africa and has made tremendous progress in terms of digital transformation. Similar to Singapore, the country's digital transformation is initiated from the President's office. Most countries in Africa are underdeveloped and lack internet access, the same resource that is driving today's economy and available in most developed countries. Rwanda realises an opportunity that is provided by ICT as a platform for them to become a leader in the knowledge-based internet economy in Africa (Harrsion, 2005:2). Rwanda's economy is mainly agrarian; almost everyone is involved in agriculture but the country sees ICT as the best tool to transform their economy and develop the nation (Harrison, 2005:3). Under President Paul Kagame, the country launched a plan for Rwanda's social and economic development called Vision 2020. A prosperous knowledge-based economy is central to the plan. The plan has six pillars and four cross-cutting domains. One of its six pillars is science and technologies and ICT. This shows how the government is serious about ICT. The plan identifies the government as the promoter of infrastructure and development initiatives and the private sector as the investor and manager of ICT development and distribution (Harrison, 2005: 5).

Rwanda's digital innovation framework is found on the vision 2020, which incorporated various policies, strategies and different actors to support the vision 2020. The ICT

sector has initiated different policies, strategies and programmes since the year 2000. They comprise the national information and communication infrastructure plan (NICI-1-3) and NICI 4 that incorporated the SMART Rwanda Master Plan (SRMP). SRMP is aligned with the National Strategy for Transformation (2017-2024) (NST-1) and three pillars that emphasise economic, social and governance transformation. This initiative will expand on the SRMP (Ministry of Information Technology and Communication, 2017:5). The government departments responsible for vision 2020 are the Ministry of Science, Technology and Research, the Ministry of Infrastructure, Rwanda Utility and Regulatory Agency (RURA) and Rwanda Development Board (RDB), all included as actors in this development (Usengumukisa, 2009).

However, Vision 2020 would not be a success if different and more stakeholders do not collaborate and honour their roles. Stakeholders included civil societies, academic institutions, government ministries, PSF ICT chambers, Telecom operators and RISA (Ministry of Information Technology and Communication, 2017:12). President Paul Kagame established a committee to facilitate the process of NICI and it included universities, labour unions and different agencies from the public and private sector (UN, 2008:15). Rwanda's NICI process started in 1998 as part of the African Information Society Initiative (AISI). The first phase of the NICI process focused mainly on a comprehensive ICT led integrated socio-economic development framework from 1999 until 2005 (UN, 2008: 14).

The goals of NICI 2010 were to build upon the successes of NICI 2005, which meant, some of the programmes and projects were incorporated into the NICI 2010 to continue with NICI 2005. The two are not too different except for a few additional projects made onto the NICI 2010 (UN, 2008:15). The government launched the first NICI plan in 2001 followed by the second, third and fourth phase plans. The first phase focused on developing knowledge-based economy around ICT. The second phase of the plan, which was from 2006 until 2010, focused on strengthening the new economic base. The third phase of the plan aimed at sustaining these developments and also competing in the global market of information-based services.

The final stage was in 2016-2020 and focused on how these developed processes could bring Rwanda to a middle income position (Harrison, 2005:6). The fourth phase is the start of a smart Rwanda 2020 plan, which will unfold from 2016 until 2020. The

phase built on all the other phases as well as the 2013-2018 ICT sector strategic plan. SRMP took its shape from the Smart Africa manifesto that was launched in 2013 during the Transform Africa summit where the African Union head of states signed a manifesto for SMART Africa. The SMART Rwanda vision statement is “towards a knowledge-based society”. Rwanda’s NICI process is regarded as the most successful in Africa and remains relevant in the success of SMART Rwanda. The lessons learnt that should continue in the SRMP are: The need for high-level political leadership, resource mobilisation to implement the policy and the plan, stakeholder participation in the policy and plan development process and lastly, a clear vision, mission and strategy as well as a scheduled implementation plan.

NICI 1-3 achieved the development of infrastructure by adopting ICT for educational institutions and framework for regulation and systems but lacked the development of private sector capacity and the integration of public service delivery between the central and local government that is weak. Low ICT access and inadequate distribution of key networks and other access channels hinder the accomplishment of a higher ICT maturity level (MYICT, 2015:17).

NICI provides the framework within which ICTs are incorporated into the national planning processes for countries to achieve national developmental key plans. It is an ongoing process whereby the country plans are aligned to citizens’ needs, achieved and evaluated through the use of projects and programmes. ICT is used to direct and shape policies, decisions and plans under this framework (UN, 2008:5). NICI is made of three components, which are framework, policy and plan (UN, 2008: 14). The framework documents, ICT-led integrated socio-economic development policy and plan framework for Rwanda provided the basis for developing suitable policies and plans. The framework gave a review and breakdown of the government’s socio developmental vision, policies and programmes. It also gave evaluation outcomes on Rwanda’s general ICT standing and infrastructure, ICT development, use and issues related to it (UN, 2008:15). To have a clear view of things, phase one incorporated different stakeholders from government, private sector and civil society to build one national understanding and the way to progress in terms of main issues of the policies and plans.

The cabinet approved Rwanda's ICT4D in 2000. The government appreciated the important part that ICT can contribute to fast-track the process of socio-economic development, which is directed to information and knowledge-based economy. The government made policy commitments to fast-track the development and use of ICT in the economy and society. The following are among various commitments that the government made: creating an enabling environment, introduction to incentives and special tax programmes, deployment and development of the human resources. It also includes the deployment and ICT usage in the public sector and education system, encourage physical infrastructure of ICT, creation of necessary ICT frameworks and policies, setting of national ICT structures, promotion of access to ICT and promotion and support of research and development initiatives (UN, 2008, 17).

All these four countries have benefited from their well-established digital innovation frameworks, which emphasise sharing of ideas with different stakeholders, building the capacity and skills of government by allowing the input of citizens and the private sector. Lastly, it formed regulations that will govern the space of digital innovations and create a well-suited ecosystem. Singapore is a home for many startups mainly because of ease of regulations, high concentration of networks and funders as well as an innovation-friendly ecosystem. But beyond these reasons, Singapore is a small country, with foreign talent access and the government has projections they are focusing on. The Smart Nation and Smart City government initiatives make Singapore one of the most innovation-driven country. Efforts and funds are mainly directed towards digital government. Every government institution is contributing towards these efforts from education institutions, universities, government agencies and private businesses. They have developed programmes, centre incubators and accelerators to strengthen the innovation ecosystem.

Smart Nation's ambitious project is aimed at improving service delivery by collecting data from smart sensors and devices across Singapore. Singaporeans now have access to personalised health records. They can declare and pay tax on imported goods, can build online communities for first responders to medical emergencies and can report crime and municipal issues directly to relevant authorities in minutes. They even pay for city parking using mobile devices. Government has collaborated with private businesses and Singapore's digitally apt population and that is one of the

reasons why Singapore has been successful in digital transformation. Singapore's collective digital transformation has earned them a position in many digital transformation indexes but it is still regarded as lagging as it faces competition from countries such as China, Hong Kong, Japan and South Korea in terms of human capital. Nonetheless, the country continues to invest in its people. The government announced that it will invest 2 billion US dollar over the next four years towards digital transformation to become a serious player in the new space (Reid, 2018).

Brazil is currently the largest ICT market in Latin America. The government's spending on ICT went up to $1 billion between January and July 2009. The growth in e-government and government functions led to increased data flow, driving demand for renewal of outdated networks, systems and servers. E-government, health or telemedicine, telecommunication and social or cultural inclusion stand out in their ICT policies. The government initiated the creation of information and business telecentres to foster ICT penetration and social inclusion. These telecentres are equipped with computers and the internet and there are instructors to provide training to the users (USP, 2011:9).

Indonesia has also seen a trend of successful applications enabled by digital innovation. Greater Jarkata is the second mega city in the world. The city is in Indonesia and has a challenge of floods. Forty percent of Jarkata is below sea level. Flooding affects 30 million people and has a serious impact on business and government services. As a result, the risk managers struggle to give support and sufficient information to citizens as the situation develops. The city has the highest concentration of Twitter users in the world. Therefore, it is easy for people to share the information as the situation unfolds. Citizens share everything and not only flood situations but traffic disruptions, school closures and other daily activities. The developers of PedaBencana.id saw an opportunity to channel the information and decrease confusion in the community. They draw their information from human sensors on the ground and scientific data from hydraulic sensors to construct real-time report. Then, the report is made to all citizens who have access to online media, the risk officials and government agencies (OECD, 2017:24). PedaBencana.id is the first online tool to give real-time maps of urban flooding, unlike the traditional one which

gave a report once in 6 hours. It has improved service delivery in terms of gathering and disseminating information to the public and government officials.

This app (PedaBencana.id) is based on CogniCity free open-source software; it is readily available online. It was initially developed for Jarkata but now spreading to other cities in Indonesia as well as other countries such as Australia and India. The developers emphasise that collaborations and partnership among users, government and private sector are key in sustaining this system. Government buys in and trust among different users is important (OECD, 2017:26). Among other innovations, the government has developed a digital public service that promotes transparency and citizen engagement. SISKOHAT is an application developed by the Ministry of Religious Affairs to assist citizens to monitor their status with regard to Hajj Pilgrimage, an annual religious event. The app improves the transparency of the application process. Citizens can prepare their travelling arrangements as well as follow their payments using this electronic method. The government has launched a 2020 Go Digital vision and Indonesia's e-Commerce Road Map in pursuit of becoming the most advanced digital economy country in the Southeast Asia by 2020. The government aims to support an e-Commerce ecosystem that includes fishery, agriculture and SMEs by expanding their market, digitising and increasing employment in those sectors (Edamadaka & Seike, 2019:21). In addition, the government will fund e-Commerce startups and increase online transactions and toughen up cybersecurity (Edamadaka & Seike, 2019:22).

Rwanda's educational institutions are increasing and expanding the curriculum to match the new knowledge-based economic plan but they lack enough qualified facilitators to teach in schools and universities. The country has shown massive growth, especially in the education sector (Harrison, 2005:10). The country launched Rwanda's education sector strategic plan for 2018/2019 to 2023/20124 (ESSP). The previous plan highlighted a few important elements related to the use of ICT in the education system; One laptop per child signifies that the government will invest in ICT but the government realised this tool should go with the skills to use it as well as the relevant infrastructure. Therefore, the current ESSP includes the building of smart classrooms, computers, projectors, digitised content and internet connectivity. The plan also includes the development of teachers so that they can use ICT. Teaching

should not only be physical; the plan is to incorporate online and distance learning, especially for children in rural areas. This will increase the quality of educational content (Zeitlin &Bower, 2018: 2).

Rwanda reflects main ICT development trends and among important ones Rwanda recorded the following. Firstly, it is the internet. It is the important source for economic growth and Rwanda has recorded an increase in internet connections from 5.3% in 2008 to 38.9 in 2010. Mobile applications, online payments via mobile applications are a global trend and Rwanda seems to be doing well with more than 3.4 million mobile subscribers in Rwanda who purchase airtime and electricity online. The second one is cloud computing. This service aims to use cloud computing as an idea to offer everything to their clients and Rwanda has built a national data centre to optimise the ability of cloud computing; this is done to prepare the way for increased service development (MINICT, 2015: 11). The third one is convergence. This trend lowers the barriers to entry, creating a conducive environment for service providers to try new business models, promoting competition, reducing cost for service providers and users as well as expanding the types of technologies existing to the consumer.

For developing countries to compete in a global market, ICT should be available in all sectors of the economy. This requires the development of infrastructures, capacity building and a conducive policy environment that will foster innovation growth. Rwanda established NICI and as a result, created a suitable environment and has deployed the necessary infrastructure for ICT growth and development (MINICT, 2015:12). Austria, Finland and Norway based their innovation plan on having a coordination body that will guide a network of stakeholders that is made of government ministries, the private sector and civil societies. The network will then formulate an innovation strategy guide to information society. However, even when they have an innovation plan, it does not work because of lack of leadership and diffusion, hence, they resorted to forming a network or collaborations so that they have one central framework to guide every sector (OECD, 2005).

2.4. Challenges towards digital innovation in most countries

ICT infrastructure is seen as the main challenge for e-government because sharing of information and internetworking is enabled by ICT infrastructure. This is the course of

the digital divide in most developing countries where access is not given to remote areas (Ndou, 2004:12). Policy issue is another challenge in that processes that occur in e-government require new policies, rules, laws and legislations to address electronic activities such as electronic signatures, freedom of information, data protection, intellectual property rights and many others. Governments need to develop key public infrastructures that are secure to be utilised by organisations and individuals (Ndou, 2004: 13). Human capital development is another challenge. It is also key to e-government; hybrid human capacities, technological, designing and implementation of ICT infrastructure. Lack of ICT skills in the public sector and qualified staff have been a problem in most developing countries. Training and workshops are required to forge basic skills for e-government.

Change management is another obstacle to digital innovation. The: e-government saves costs and improves service quality but it also reinvents government processes and functions that require a change in the culture of an organisation. The culture of hierarchy is predominant in most governments. Therefore, organisations should challenge this culture and form networks that can benefit from ICT infrastructures. Partnerships and collaborations can be another challenge. Most governments form resistance to openness and transparency as they want to safeguard their authority and power (Ndou, 2004:14).

Collaborations and partnerships pause a threat to digital innovation. The public and private sector would help fill the gaps and skills where the government might be lacking. Universities can provide training, while the private sector provides the technical skills and infrastructure needed. The government and its agencies can provide the data, information flow and knowledge sharing platforms. The government is also having a challenge of strategy for most governments do not have a clear tailored strategy for e-governance. The government must have a clear understanding of the current situation, the reality on the ground and the cost thereof. They must also be willing to borrow lessons from the private sector especially on customer service, meeting the needs of the citizen and improving the quality of life for its citizens.

Leadership is also important for the success of e-governance (Ndou, 2004:15). The leader should manage and support the project. Top management involvement is key in defeating resistance to change (Ndou, 2004:16).

Bertot *et al.*, (2016) point that lack of investment can also hamper digital innovations in the public sector. Innovation in the public sector is required because of the increasing challenges and the needs of the society that have become diverse. The population is digitally informed and there is an increase in economic pressure. Most developing countries are failing to provide services not because of scarce resources but due to lack of incentives, accountability and governance problems. This challenge requires innovation in the public service. Innovation will encourage collaborations of different actors such as governments, businesses, non-profits organizations, universities and citizens. Different actors will help provide public services and help bring services closer to the citizens.

Multi-service centres are one example of a public service that can be tailored to the local needs through digital technology (Bertot *et al.*, 2016). Innovation in developing countries faces various challenges such as none investments in the right ideas, lack of structures and processes in place, no methods to measure innovation, lack of coordination and limited opportunities for employees to contribute (Amusan, 2017:267). Bekkers et al., (Cited by Bekkers, 2011:18), argue that there are situations that make it hard for the public sector to innovate. The public sector lacks competition, which is a prerequisite of innovation. Government embraces bureaucratic culture in which standardisation and formalisation are important values and the rule of law is an important asset because they all add to stability and predictability but they also hamper individuals to come up with risky ideas. Political nature of public administration is founded on representative democracy and this can obstruct innovation. Political cultures are risk avoiding cultures (Bekkers, 2011:20).

The digital divide has also posed a challenge to most countries that aspire to transform into modernisation. This digital divide can range from geography, age, physical disability, gender, ethnicity and culture. Geography could be because of telecommunication infrastructure. In Europe, rich industrialised countries in the north are different from countries in the periphery. Within individual countries, it is mostly rural communities that are excluded because of their dispersed population that increases the cost of ICT infrastructure. It is ironic because it is mainly those in remote areas that need electronic services as it might save them the cost of travelling to access services (Brookes, 2007:182).

Age is another factor for ICT exclusion, for instance, internet is used by young people whereas the older regard themselves as too old for the internet. It is unfortunate because this age group is the one that needs access and could most likely benefit from the internet as they might suffer from a disability or transport accessibility. ICT has the potential to assist disabled people overcome social exclusion. Examples include developments such as voice recognition and simple facilities such as the ability to change font size and colour and the use of abbreviations to reduce typing efforts. They are provided as normal utilities. However, lack of training has become a barrier to usage.

Gender is another factor as more men are internet users than women. The research in the United Kingdom shows that the number of females studying ICT courses is increasing. In many countries, ethnicity is a source of exclusion. Research has shown that internet content is of less importance to predominantly western culture. In some communities, computers are regarded to be for brainy people or the middle class (Brookes, 2007:185). Innovation requires mobilisation of resources, therefore, for innovation to be achieved, old practices and structures must be suspended and technological designs must be tried out. However, the changes might create instability and the old systems become more resilient and hold on to something solid and reliable than to hold onto uncertainty and unstable.

Less tolerance on uncertainty will interrupt innovation and make it roll back to safety and familiar routines. There is an ongoing tension and opposing pressure between innovation and conservation, in efforts made to develop new ICT configurations to deliver services in different organisations. Technical systems and institutional frameworks offer selective incentives to agencies that produce systems that are compatible with their current systems, operations and logic. Long-established patterns, routines and systems and skills become embedded or engraved, which makes it difficult for innovation (Lanzara, 2009:23).

According to Brookes 92007:182), ICT has the potential to transform economies and societies by developing ways to make wealth and addressing social issues. However, it is not untainted as it can present challenges. For example, people who have no ICT skills and knowledge and fail to acquire them will not be able to participate in the technology transformed society. This means that ICT would be assisting to address

social inequality but it will be exacerbating it because most people without the skills and access to technology will not benefit from the opportunities presented through ICT such as knowledge and better services. Any form of exclusion has economic and social consequences. The quality of democracy will be affected due to individuals who are unable to participate in social, cultural and political activities. E-government initiatives that promote the increased use of technology to improve service delivery will be delayed by individuals who are not technologically inclined.

Indonesia experiences challenges like any other country. The digital divide is the most visible. The population in the urban areas has more access than the ones in the remote areas; this is due to delayed development of technologies outside urban areas. Lack of transportation and information technology infrastructure are some of the challenges that the country is facing in digital transformation. Transportation has an impact on production increase rates, consumption rates, investment and tax (Edamadaka & Seike, 2019:22). The business environment is not conducive for innovation; bureaucratic inefficiency and corruption are high.

Access to finance is another factor that is limiting innovation. The banks are the only sources of finance for businesses. Lack of transparency and weak implementation of tax regulations are also preventing investors in innovation in Indonesia (Mugrodo *et al*: 161). Coordination and clarity are absent on roles of different participants, which could temper with coherence in policy framework, clarity in institutional design as well as accountability of public officials (OECD, 2016:202).

It is recommendable that Brazil should continue to invest in digital innovation policies, universities as well as an organisational culture that promotes digital innovations. This will have a positive impact on the ICT agenda (USP, 2011: 24). It must be emphasised that the country's telecom and broadcasting system are still in the reformation stages due to massive changes in capital property structures, market share and strategic alliances by main European stakeholders such as Telefonica and Portugal telecom who are tougher than public investments, regulatory conflicts and industrial concerns. Ad-hoc policies and uncertain implementations remain at their high levels and digital inclusion loses its effectiveness as the private sector gains its momentum. This means, despite the government investments and public policies which promote telecentres

and innovative culture, there is an unwarranted supply of broadband by the public sector (USP, 2011:18).

Rwanda is no exception because 90% of its population lives in the rural areas, which makes it difficult for the diffusion of ICT. Even if the government increases technologies, the people in the rural areas will still lag due to a lack of awareness or literacy to use these technologies. At the beginning of Vision 2020, Rwanda had almost no ICT infrastructure. The tele density was 1.1% while the internet density was 0.06%. The country has a government-owned, Rwandatel, which aims to reduce internet prices and increase the speed and reliability of the internet (Harrsion, 2005:12).

In its quest to become a knowledge-based country and regional ICT hub, the government of Rwanda established institutions and methods that will create a suitable environment to enable ICT development by the beginning of the year 2000. The government created a world-class infrastructure and is continuously developing human resource to match the skills needed for ICT development. Conducive legal and regulatory frameworks, relevant ICT infrastructure as well as an innovative human resource, are helping Rwanda to become the regional ICT hub (MINICT, 2015:6). Rwanda has proven itself by becoming the top global reformer in the world bank doing business reports and it became the second global reformer out of 183 countries in 2011. According to the world economic forum global competitive report, the country was rated the 6th most competitive economy in Sub-Saharan Africa and this was as a result of a few initiatives such as conducting business online, which made the environment more conducive for businesses. The achievement of a long-term economic development plan, Vision 2020, its medium-term strategy, development poverty reduction strategy and the NICI plan, gave a direction on how Rwanda will transition from poverty to a middle income or knowledge-based economy and as a result, the country's GDP growth went from 2.2% in 2003 to 7.2% in 2007 (MINICT, 2015:10).

2.5. Summary

The chapter provided a theoretical understanding of government, governance, governance network through which governance of digital innovation should be

understood. Governance of digital innovation in the public sector can be achieved through a framework that comprises generating and sharing ideas, building capacity and skills, public sector organisations and structures and formation of regulations and policies. The chapter expanded on this framework and reflected on what different countries have done concerning the framework that led to their progress in public sector digital transformation. The chapter continued to give an understanding of what public sector digital innovation entails and to which extent digital innovation has been embraced by the public sector in different countries. Digital innovation in the public sector mostly requires political will and commitment to adopt the new technological transformation and adapt to a new information society. This can only be achieved if political leaders are informed about the benefits and opportunities that come with digital technologies (Corydon *et al.*, 2016:10). Collaboration or networks between government, private sector and civil society also presented some benefits in every framework developed for digital innovation (Bommert, 2010:16). A well-coordinated and structured organisation with dedicated responsibilities, which are outlined in the framework, would also be useful.

Lastly, regulations and policies that promote the innovation ecosystem is key to digital innovation governance. Citizens are already transacting online, therefore, expect the same interaction with the government (Kadar, *et al.,* 2014:1085). A constant interaction between the government and its people and a transparent government will improve accountability from the government and trust from the society in its government (CIPFA & IFAC, 2013:39). Governments in different countries are finding ways to fast-track service provision and have found digital innovation key to a less costly and fast service, thus, adopting new technologies and ICT mechanisms to align their processes and services to the 4th industrial revolution methods (OECD, 2017:4).

CHAPTER 3: GOVERNANCE OF DIGITAL INNOVATION IN THE PUBLIC SECTOR IN SOUTH AFRICA

3.1 Introduction

This chapter gives an overview of how South Africa approaches the governance of digital innovation in the public sector. Governance in this regard refers to a framework that outlines accountability, roles by different stakeholders and decision-making authority for an organisational digital presence (Welchman, 2017). International frameworks on digital innovation highlight the diffusion of ideas, capacity of an organisation in terms of skills and organisational policies and structures as fundamental to the success of public sector digital innovation governance. Literature support the fact that digital innovation requires policies and other mechanisms such as training education, ICT infrastructure and cyber security to help usher the 4th industrial revolution (OECD, 2019:12).

Unfortunately, South Africa is an emerging democracy and still in the development phase. There are challenges that prevent the country from improving the quality of life for all through digital innovations (Kroukamp, 2004:53). However digital innovations are known to not only transform the administration of government but also the political system, which is known as e-democracy. It encompasses the idea of better service delivery by shortening the internal processes of administration (Mahrer & Krimmer, 2005:28). Hence, governments must use electronic technology in all public service segments as this is mandatory in the 21st century. It will allow citizens to have access to all government information and processes and this improves the relationship between the government and South Africans. Citizens should be able to access governments documents, pay their rates and taxes and renew various licenses from the comfort of their homes (Kroukamp, 2004:53). Moreso, South Africans are already familiar with online transacting. They order items online and expect to receive them in few days, therefore, citizens expect the same interactions from government, that is, fulfilling their needs within a short time (Steyn & Mawela, 2020:2). Thus, the government should also put systems in place to respond timely to the needs of their citizens (Kaisara & Pather, 2011:213). The system should also encourage an innovation culture that supports network formations and the diffusion of ideas.

3.2 An overview of digital innovation in the public sector in South Africa

The public sector has the responsibility to provide basic essential services to the public to ensure the wellbeing of all citizens (Ramakrishnan, 2013) and South Africa is not different from other countries (Crous, 2002:7). The only difference is the scope it has as compared to other countries, the diversity of the population with different social, political and economic challenges across its provinces (World Bank, 2018). Since 1994, the government has improved service delivery especially for those in rural areas, for women, the disabled and children (NDP, 2012:14). South Africa is seen moving from the traditional way of providing services that used existing infrastructure. The public sector is now experimenting with new organisational models such as electronics to provide services to those who were previously denied basic access like communities in the rural areas (Kuye & Naidoo, 2020:3; Infodev, 2008).

The country has worked tirelessly to bridge the gap between the rich and the poor. The government has over the last decade recognised the importance of digital innovation and that the e-government has improved the standard of service quality and government's efficiency. Consequently, there has been a growth in ICT infrastructure investment (Mutula & Mostert, 2015: 3; Naidoo, 2012: 62). In 2009, the Department of Home Affairs introduced mobile trucks to provide services to people in rural areas (Department of Home Affairs, 2009:27). I had an opportunity to apply for an identity document where I stayed in the North West via the same mobile office that travelled to the rural areas on certain days.

The information revolution offers the government an opportunity to provide services to the previously disadvantaged in a seamless way without the need for large physical infrastructure (Gunasekaran & Harmantzis, 2007:24). Online forms are discriminatory, faceless and consistent, replicable and empowering to the then disadvantaged and this type of governance will affirm citizens. Furthermore, there is a possibility of an ongoing interaction between the government and citizens (Kuye & Naidoo, 2018:3). Public sector innovation ensures that all citizens enjoy the benefits brought by the information revolution, irrespective of their income and social status (CPSI, 2017:9; NACI, 2017:60). It is understood that innovation in government is about re-engineering the current methods of delivering service by collaborating processes to improve the quality of citizens' lives and promoting competition and innovation, thus, empowering

citizens and promoting inclusive participation in the general economy (Kuye & Naidoo, 2020:1). This means that the government should ensure that all citizens have access to broadband infrastructure with free public WI-FI at certain points and have the skills to use the internet. The skills should include transacting online, emailing and reading government policies on government website. The method of service delivery can be online and citizens would be empowered and able to participate in the general economy.

Several interventions can be noticed since 1994 and they include telecentres established by the government to provide training and ICT equipment to people in rural areas, internet kiosks in post offices and installing cyber-laboratories in schools (NPC, 2012, 171). The government has installed 1 500 km of fibre in Johannesburg to allow citizens to have access to free WiFi. They have also established eKasiLabs innovation centres in Gauteng and Cape Town. This will provide access to computers and free internet. Furthermore, the Department of Education in Gauteng introduced an online applications system in 2015 to manage the queues. SunWard Park public high school transformed their paper-based learning to digitally based platform; all their textbooks were put on digital systems (Nel & Masilela, 2020:41).

The use of ICT in public management and administration has changed the way governments in different spheres interact with one another and with their citizens. For instance, the government used to communicate to their masses using public meetings, printed media, radio and television but recently, governments use modern information and communication technologies such as the internet to deliver the message to their citizens (Kroukamp, 2004:53). The government now has mobile applications such as izimbizo, GovChats and Namola, which are the popular ones. Namola application is used by citizens to alert emergency services such as the police that they need help in their areas. GovChats uses WhatsApp application to send a message directly to the police for assistance (Nel & Masilela, 2020:41).

The recent web-based tool called VESA was launched by corruption watch to report corruption or misconduct in the SAPS. This tool allows members of the community to report any acts of corruption ranging from bribery to sextortion by the police and it also allows citizens to rate and review the services of the specific police station, which will then be compared with other different police stations. The head of the corruption watch

reiterated that the tool is not a mobile app, therefore, does not need data to log on and use it. It is data free. The tool will help create more accountability and transparency from the SAPS. Some of these applications are the products of CPSI. Even though there is not much literature on the governance or sustainability of these digital innovations in South Africa, CPSI continues to launch digital innovations. The organisation hosts an annual award to recognise innovations in the public sector and encourage public servants to be innovative in solving the service delivery problems. For instance, the SMS track-and-trace from home affairs was their initiative. This allows citizens to send SMS to a centralised number and find out about their marital status as well as the status on the new passport and identity document (CPSI, 2015:21).

South Africa has made investments in ICT infrastructure, policies and frameworks. Nonetheless, the country still experiences challenges with regard to the roll-out of e-government (Manda & Dhaou, 2019:249). Despite the investments made in the ICT infrastructure, the communication and ICT infrastructure remain poor (Maumbe *et al*., 2008:759). The poor infrastructure has lowered the country's e-government index score especially when it is paired with the high cost of broadband internet. This places South Africa at a disadvantage when it competes with other countries (Ndukwe, 2020:4). The country spends less on ICT infrastructure as compared to social infrastructure such as schools and health facilities. There has been evidence of budget cuts on projects related to ICT Infrastructure and non-prioritisation of digital transformation agenda. This will have an impact on the ability of the government to achieve its goal to build an inclusive digital society by 2030 (Manda & Dhaou, 2019:249). It seems government organisations are unwilling to invest sufficient money in technological innovation. This is mainly constrained by the legal environment that does not favour digital innovations in the public sector (Molla & Licker, 2005:887).

Research shows that there is a lack of understanding of how powerful a website could be for the South African government other than being just a brochure. It is evident in developed countries that citizens can communicate with the government because forms, news and legislations are readily available on their website unlike in South Africa where most government websites are not empowering. There is no marketing about the organisations or even a client consideration on their websites (Basu,

2004:110). Another visible challenge is that the government has not ensured public privacy over the internet through legal methods. They have not provided enough training and education on the usage of technology. Lastly, the government has not addressed the lack of preparedness by its institutions, citizens and businesses and how they will manage the negative impact of technologies on socio-economic traits such as job losses (Kuye & Naidoo, 2018:10).

In 2019, the Minister of Finance noted that the country should prepare itself for the 4th industrial revolution and the budget should include building digital and technological skills and this will necessitate renovating and improving previously disadvantaged schools (Govender, 2019:5). The President in 2018 acknowledged that to take advantage of 4th industrial revolution, the country should build its capability on science, technology and innovation. That would mean, the government should look into their policy and how to allow citizens to participate freely in policy formations through digital platforms as well as allowing collaborations between government, civil society and private sector (Govender, 2019:5). The 4th industrial commission brings a different approach especially on coordination and governance of digital innovation in the public sector in South Africa. This should result in a well-informed governance framework that will help every government department understand its role about digital innovation.

3.3 Governance of digital innovation in the South African public service

The public sector is an institution that was setup mainly for governance to manage the public resource for social and economic development (Kroukamp, 2005:53). According to Turner, cited by (Kroukamp, 2004:53), governance means all activities that derive from the common goal and the goal may or may not carry legally prescribed responsibilities. Thus, digital innovation promises benefits that are parallel to public sector reforms such as client centred government that embraces partnerships from different stakeholders in the private and public sectors and an improved public administration rising from the use of online applications and information technologies. This is what Kroukamp (2004:54) calls e-government, that is, the use of technology by the government to provide information and services to citizens and different organisations in a more convenient way. Nkomo (2020:3) accepts that e-government uses innovative information communication technologies and web-based internet

applications to provide access to quality services and enhance participation in democratic institutions and processes.

The public sector has the responsibility to enable innovation. It has the role to create a framework for innovation; the framework should entail enabling science, technology and innovation policies suitable strategies for science, technology and innovation. STI institutions should produce knowledge, funding of research and development (R&D), development of human capital and the formation of strategic collaborations and partnerships (NACI, 2017:21). Weill, *et a*l.*,* cited by (Kroukamp, 2004: 54) emphasise that in a digital world, governance calls for multi-level processes and improved coordination across separate systems.

In South Africa, digital innovation and ICT activities and responsibilities are divided across different government departments, government agencies, research institutions, universities and the private sector. This study, however, focused on the main relevant government departments that include the Department of Communications (DoC) that is responsible for ICT policy and strategic plans and the Department of Science and Innovation (DSI), which is mandated with research, development and innovation policies in the public sector. Lastly, it includes the Department of Public Service and Administration (DPSA), which is responsible for operations in the public sector as well as the rollout of e-government (Mawela *et al.,* 2017:354). The same department houses the Centre for Public Service Innovation (CPSI), which guides the South African innovation framework. CPSI is responsible for developing innovative models for improved service delivery but still follows the framework developed by OECD in 2015. OECD makes note of four pillars which are: innovation culture of sharing ideas, human capacity, rules and regulations and organisational structures (NACI, 2017:60). The following pointers will describe the South African government's efforts in the governance of digital innovation as described before according to OECD 2015 requirements or standards.

3.3.1 Generating and sharing ideas

Innovation or generation of ideas is considered useless if there is no adoption and adoption is influenced by diffusion or sharing of ideas (Chigona & Lickers, 2008:57). Diffusion is a process whereby continuous communication about innovation is carried

out among members of a social system (Rogers, 2003:5). Innovation can be diffused through mass media or interpersonal communication. Even when most people might hear about innovation through mass media, it is the interpersonal method that would motivate adoption due to others demonstrating the effect or communicating the results of the innovation, which can influence those that are observing (Chigona & Licker, 2008:60).

The South African government acknowledges and appreciates that innovation is the result of ideas and sharing those ideas among different government departments and agencies would help replicate the working ones. For that reason, the CPSI was established. CPSI is a government component formed under the Department of Public Service and Administration (DPSA). The DPSA established CPSI in 2001 to generate and share ideas across government departments and agencies as well as the private sector and the public (Nel & Masilela, 2020:39). Besides CPSI, there is also GovTech, which was launched by the State Information and Technology Agency (SITA). GovTech is a conference where different officials from private and public sectors, innovators and investors meet to address issues of ICT and digital innovation in South Africa. For instance, there was a conference in 2015 mainly to address the use of ICT to promote service delivery in the public sector (Hlungwani, 2015).

CPSI is the main custodian in terms of sharing and diffusing of innovative working ideas in the South African public sector. This organisation holds the responsibility to unlock, nurture and deploy innovation to improve public service offered to the citizens, the NDP (National Developmental Plan) adopted in 2012 further highlights this notion. The NDP demands that the public sector strengthens intergovernmental relations for integrated, collaborative and seamless service delivery at all levels of government and is supported by other government institutions working together (Mawela, *et al.,* 2017:353). The CPSI is well positioned to activate the cross sectoral and inter-sphere collaboration as well as co-innovation in the public sector (CPSI, 2015:6). The organisation advocates for committed and professional staff to usher in public sector modernisation that will meet the needs of all South Africans (CPSI, 2012:3).

For CPSI to achieve its mandate, it is entrusted to create a climate in which innovation is prized, encouraged, rewarded, implemented and mainstreamed. It creates a platform and products, which aim at establishing the culture of innovation in the public

sector to improve service delivery. This is done by training the public sector officials about public sector innovation management (Puttick, *et al.,* 2014:24). They facilitate the birth, development and implementation of ideas across the public service. This includes ideas from citizens of the country with the support of the private sector funding. Sponsors in many instances include Capitec Bank, MTN, Eskom, Gems and Mail and Guardian newspaper (CPSI, 2012:3). The organisation further helps the award winners to source funding for their innovations. For instance, in 2008, a finalist was given 1 million by the City of Cape Town government to expand the diabetic retinal screening project. The award-winning now has an impact on government employees. It encourages the culture of innovation. In 2013, a government agency won the competition after they were encouraged to be innovative and this was followed by other government departments entering the competition in the following years (Puttick, *et al.,* 2014:24).

CPSI is mandated to test, adapt, demonstrate and pilot the innovative solutions to the public sector. This means the organisation tests innovative solutions before they are fully adopted across the governmental departments. This is done to ensure that the correct solution is mandated to a correct environment and can solve the problem at hand. These innovative solutions come from different sources such as the public, public servants, CPSI research and development unit and through networking with local and international public organisations (CPSI, 2012:22). CPSI organises an annual conference whereby more than 500 delegates from government departments attend, mainly to share innovative ideas and assess if the innovations cannot be replicated across other government departments and agencies (Puttick, *et al.,* 2014:24).

CPSI helped the right to care organisations that saw an increase in the number of pharmacy dispensing units in the country, to lessen the work of professionals in hospitals so that they can spend more time with patients than dispensing medication (Nel & Masilela, 2020:41). There are already a few pharmacy dispensing units in several hospitals such as Themba Lethu clinic in Helen Joseph Hospital in Johannesburg and other four in shopping malls. The plan is to install the same kind of units at Chris Hani Baragwaneth Hospital, which is one of the biggest hospitals in the world. These units' function like an ATM and offer many benefits that include patient

convenience, stock control for the hospital as well as shortening queues and waiting periods at the hospital (CPSI, 2018:14). This kind of innovation should be copied and used in different health facilities to assist with the queues and waiting time for elderly patients.

CPSI identified some objectives in the strategic plan for 2012/2015 (CPSI, 2015:16). They include effective and efficient systems and processes of public administration through innovation, enhanced innovation capabilities and the use of ICT dedicated to service delivery. Furthermore, they include promoting a favourable environment that encourages innovation, reward it and mainstream it through annual awards programme where public sector innovators are recognised and a walk-in multimedia innovation centre that will be used by public sector officials to examine challenges, analyse business processes for revision and improvement. Lastly, the objective is to have access to public sector innovation sources and initiate the development of new solutions and developing the sources of innovative solutions through reputable knowledge platforms such as conferences on public sector innovation.

CPSI is organised in work streams. Corporate services stream is to ensure the overall administration and governance of the CPSI. This stream focuses on all fiscal management, procurement and human resource-related activities. Their objectives include developing, implementing policies and providing office support services to CPSI staff (CPSI, 2015:17). The research and development stream aims to understand the causes of service delivery challenges to improve and develop solutions. Collaborations with other departments will help to investigate and confirm service delivery challenges and policy failures (CPSI, 2015:17). Solution support and incubation stream is another objective whose mandate is to test, pilot, demonstrate and facilitate the replication and mainstreaming of innovative solutions made for the public sector. This stream is also responsible for the management of the multi-media innovation centre, which provides a platform for public officials to examine their exact challenges and to discover and protect their solutions (CPSI, 2015:18).

Another objective is to create and sustain an environment, which encourages culture and practice of innovation in the public sector. The environment is established to change the mindset of public sector officials. This stream inspires the uninterrupted development of public officials to build effective and innovative leaders that are

creative and responsible risk-takers. Their functions include among others to establish, maintain and collaborate on local and international innovation platforms. Other objectives include to facilitate the building of innovation capacity through partnerships with stakeholders, to promote awareness and to advocate for the importance of innovation in the public sector. Lastly, it serves to identify, recognise and reward innovative projects through annual awards programme (CPSI, 2015:19)**.**

3.3.2 Empowering the workforce

Since the early 2000s, the focus in Africa has been to bridge the digital divide but in the early 2010s, the focus changed to fostering digital opportunities through capacity building and empowerment to strengthen scientific research, innovation culture and information sharing because challenges are no longer limited to technological connections only but also innovation culture and education capacity (Ponelis & Holmner, 2015:163). Higher education and policy makers must play their role in making sure that their citizens acquire the skills to innovate to be able to respond to complex social issues. This means governments should invest in innovation hubs and prioritise higher education funding for students at the doctoral level because currently, most students leave African countries such as South Africa and Nigeria to pursue their post graduate in a different country (Ponelis & Holmner, 2015:166).

South Africa is not doing well in this area as the government spends around 0.75% of their GDP on research, development and innovation, which is lower compared to BRICS partners like Brazil who spend 1.24%. Regardless, all the efforts of the country remain below its BRICKS Partners with a GDP research and development expenditure of 0.73% (Shashnov & Kotsemir, 2018). The country lacks personnel with ICT skills and some are leaving the country due to lower incomes (Mutula & Mostert, 2010:44). The Department of Communication has pointed out that central to the challenges, they have a shortage of ICT skills for the state to deliver necessary services. The education sector is also not able to produce enough task force with the necessary skills (Manda & Dhaou, 2019:249) because only a few university students are registering for ICT courses while most schools in the country do not have access internet. This affects qualifications that are produced in universities (Gringarten, 2013:85), Nonetheless, there are efforts made to turn this around throughout the country. These efforts are

being led by different people across the public, private, academic and the civil society (RIIS, 2016: 2).

The government launched a few programmes to build the capacity and curb ICT skills shortage. The e-Skills Institute was established in 2009 to give ICT knowledge and skills to students. The Department of Communication collaborated with Telkom and introduced ICT career expo to provide skills and training to young people including digital and broadcasting skills. The department further collaborated with universities and colleges to provide information technology training to the public; this was done in cooperation with the e-Skills institute (Gringarten, 2013:86). The National Integrated ICT policy white paper (2016:125) gives emphasis to interventions that the government will make to include everyone in the digital transformation and e-literacy seems to be key in realising a digital society. Therefore, the government will form a collaboration with other sectors to provide training and education to both men and women to ensure that they have the skills and capabilities to participate and benefit from ICT services and also apply new technologies in their everyday lives.

The country has its successes that highlight capacity and efforts made in the public sector concerning digital innovation. Many examples of such capabilities include enabling voters to send a message to the independent electoral commission (IEC) and enquire about their voter registration status and voter's voting station. There is a satellite-enabled network in every voting station to register voters and scan their bar-coded ID books. Even the IEC chairperson admitted that in the year 2021, the organisation is not ready to conduct votes online. They have certainly improved their systems. They have introduced a tablet to register the voters, which proved to be more effective and faster than the older machine they used before. The chairperson admitted that digital means are not available to all areas in the country especially in the rural areas and that would not constitute a fair and open process (Chimombe, 2021).

South African revenue services (SARS) department has a system that allows businesses and citizens to conduct transactions related to tax returns on the internet. This system was very effective and helpful during the lockdown. Citizens are now able to use the National traffic information system to apply for driving and learner’s licenses as well as registration of motor vehicles. This is one digital innovation appreciated by

most South Africans because it saves them time and young people do not have time to stand in the lines the whole day to do things that could be done while at work or home.

The Department of Labour web site is regarded as a fully-featured site that is a one-stop for labour issues including vacancies (Naidoo, 2012:66). The Department of Health, Medical Research Council and National Health Information System committee on South Africa developed the e-health strategy to assist patients and monitor public health using ICT. The strategy includes electronic health records, computerised registration of deaths and births, telemedicine, virtual health care and health research. In the year 2000, the Department of Communication launched the e-school cyber lab programme. They provided computers and internet services to under-serviced areas through computer centres in public schools. The universal service access agency of South Africa was given the responsibility of rolling out the programme (Naidoo, 2012:66).

The Department of Home Affairs has launched a smart card using an online identification system (Department of Communication, 2017:4). South Africa has invented the world-class science facilities including the fastest computer on the continent, the largest telescope in the world, CAT scan and the tellurometer (Buckley, *et al.,* 2015:1; CSIR, 2013). One of South Africa's areas of strength is excellence in academia and public research, which can provide a foundation for innovation in the public sector (The World Bank, 2012: 33). Tshwane (capital city of South Africa) has launched a project called Isizwe; the project was developed to roll out public Wi-Fi. The City of Tshwane funds the project and is operated by Herotel (Gillwald *et al.,* 2016:38).

The country has a project called E-cadre that is mastered by the South African Post Office. The project is to use IT graduates as volunteers to teach the public about ICT. The government formed the African Advanced Institute for ICT called MERAKA Institute to focus on research and application developments. In 2006, the government launched an Inter-Governmental Relations Forum to speed up communication and ICT deployment across the nine provinces. Subsequent to that, the government deployed wireless broadband to 500 Dinaledi schools, clinics, hospitals, libraries,

community centres and post offices. This was to assist in increasing ICT uptake, usage and bridging the gap in the digital divide (Mutula & Mostert, 2010:41).

To encourage more innovation in the public sector, the government of South Africa has established various organisations through governments departments to fund research and monitor the funding processes and results thereof. These organisations would have to fund research and technological innovations. The major funding organisations or agencies are National Research Funding (NRF), Water Research Commission, South African National Energy Development Institute, South African Medical Research Council and Technology Innovation Agency. The government has made funding available to higher learning institutions, science councils, public entities as well as private research institutions. NRF was established in 1998 and it is the biggest research funding agency, with a revenue of R4.1 billion by 2016. Its main purpose is to fund research in higher education institutions. Its beneficiaries comprise post graduate students who focus on innovation, rated researchers, human development, emerging researchers and scarce skill funding (NACI, 2017:29). South African Medical Research Council, has a responsibility to improve the health quality of South African lives. The organisation conducts research on subjects such as public health innovation, health promotion and disease prevention among others.

Technology Innovation Agency (TIA) was established to support technological innovations across the economy. The agency had a grant of 385 million rands in 2016. This funding should assist in the early developmental stages to support the business, mainly the higher learning institutions, small and medium enterprises to advance their research output and ideas into a full prototype that can be used for further development (NACI, 2017:32). Some of the digital innovations such as the WI-FI in Tshwane and e-school cyber lab programme might have not made it far but the government does not get tired and continue to launch more digital innovations such as GovChats. GovChats is a government social media platform used to communicate with its citizens on issues of corona virus and empower government agencies to work on the establishment of new digital innovations, which reflect on their capacity as the public sector.

3.3.3 Reviewing Organization's design

The South African government understands that innovative research and development capacity are central for a government to achieve its vision of stimulating growth in the economy through advanced manufacturing and beneficiation of mineral resources (Manda & Dhaou, 2019:250). The government has built intensive national systems to support innovation, research and development. Subsequently, the country's economy has been labelled the most innovative in Africa (World Economic Forum, 2016). Some of the noticeable national institutions that were established as mechanisms to advance innovation, research and development are Council for Science and Industrial Research (CSIR) and TIA. CSIR is one of the leading sciences and technology research development and implementation organisations in Africa and TIA serves as the intervention institution for promoting innovation in critical areas of the economy such as manufacturing (Groenewald & Durham, 2014).

The government further built an ICT taskforce to support e-government. The government established three taskforces to lead the distribution of ICT in the country and they were: the presidential international task force on information society, which was responsible for global ICT markets and initiatives, the national information technology taskforce responsible for national and local ICT initiatives and lastly, the IT council tasked with provincial and local municipality information technology and digital initiatives (Maumbe & Okello, 2013:121).

As a result, the establishment of these taskforces led to the development of various strategy papers and policies that guided the effectiveness of e-government processes in South Africa. The following strategies and papers are some of them (Maumbe & Okello 2013:122): information communication year 2025, that is, the country's e-government initiatives and divided in projects. This project is made of building blocks that will be implemented in the coming years to improve public service delivery. This includes among others the installation of internet and email access terminals in rural community centers, the formation of a State Information Technology Agency (SITA) to modernise the existing technologies and further introduce new systems in all government departments (Van der Waldt, 2002:7).

The second phase involved the green paper on electronic commerce for South Africa that was published in November 2000. The paper gives an effect on how to transact online; it gives an understanding of how individuals should relate when it comes to online transactions. These relationships include government institutions and employees, businesses and citizens as well as other government departments (Van der Waldt, 2002:8). The Department of Public Services and Administration launched a document in 2001 called the electronic government: the digital future; a public service IT policy framework (RSA 2001). The framework produced by this document is key in building government institutions to transform into the digital age and enabling the country to be more competitive (Kroukamp, 2004:62). Batho pele gateway is a government portal managed by the Government Communication and Information System (GCIS) (Kaisara & Panther, 2011:213). The portal was set to provide government services and any other information that include legislation and policies. The GCIS' has a mandate to ensure that the public is informed about governments plans. SITA a shared service provider between different government departments, was established by the government in 1999, to coordinate IT resources in government (Mutula & Mostert, 2010:41).

The Universal Service and Access Agency of South Africa (USASSA) is one of the many agencies in the country that was mandated with improving national access to ICT services. It is one of the portfolios of the Department of Telecommunication and Postal Service but they also work with the Department of Communications on issues of broadcasting and digital migration (USASSA, 2015:17). The agency is currently faced with a challenge of broadcast digital migration and they will assist in giving out the TV boxes to qualifying households. According to the board chairperson, Mrs. Radebe, the USASSA 2015-2020 strategic plan was to ensure that the country falls among the best in giving ICT access to all citizens. This will be achieved by collaborating with other stakeholders but first, the agency will have to ascertain the governance structures to reassure the different stakeholders that the organisation is effective and transparent in its functions. USASSA is guided by medium-term strategic framework (MTSF), National Developmental Plan (NDP) and South Africa Connect, which is a policy document gazetted in December 2013 (USASSA, 2015:12). The agency is directly involved in the ICT sector and prioritised ICT needs in the country. The country needs to expand its broadband infrastructure and decrease the cost of

communication, ensure that all schools, public health facilities and all other government infrastructures are connected to broadband by 2020 and Wi-Fi should be accessible to all in the cities as well as rural areas (USASSA, 2025:11).

The South African government always had a desire to develop social and economic infrastructure since the inception of democracy. The constitution of 1996 as well as Reconstruction and Developmental Programme (RDP) of 1994 show that the government had intentions to focus on the promotion of social and economic development of the community (Bond, 1998:44). The country's expenditure on infrastructure between 1992 and 2012 was 4.9% and exceeded those of developed countries like Canada at 3.0% and Russia at 4.1%. (Manda & Dhaou, 2019:248). Cell phone infrastructure has not been explored enough in the country to provide e-services, even when there has been a growth in the cellphone industry following the liberation of the telecommunication sector (Hodge, 2010:376).

The country has four mobile phone operators, which are MTN, Vodacom and Cell C. There are virgin active and Heita, which are registered under Telkom (Naidoo, 2012, :64). The growing demand in bandwidth has exposed the inability of the South African government to match the international standards of high speed to the local access networks. There is an absence of policy adoption or regulations that support new entrants to compete in the existing broadband markets (Ali, 2003:126). Due to policy failures and implementation problems to come up with an alternative fixed broadband network, the Department of Public Enterprise sort to establish an alternative broadband infrastructure state-owned company called Broadband Infraco from Neotel in 2007. Sadly, just when the deal was about to be finalised and the terms of what it would offer were agreed upon, Broadband Infraco invested in WACS, which is a national and international network (Gillwald *et al.*, 2012:16).

Lack of coordination by the state and the delay in signing of Broadband Infraco prevented the ability for the country to have an open-access broadband operating model. As a result, MTN, NEOTEL and Vodacom partnered to build an alternative intercity infrastructure network (Gillwald *et al*, 2012:17). The country remains the leader in Africa when it comes to ICT development. Its network is 99% digital and this includes fixed-lines, wireless and satellite communications. The country has experienced massive growth in the cellular phone industry due to the liberation in the

telecommunication sector. Nonetheless, the South African government has not fully explored cell phone infrastructure in providing e-government services (Mutula & Mostert, 2010:41). The Department of Communication confirmed that South Africa has formed partnerships with other African countries to make sure that the country is receiving enough network or internet (Mutula & Mostert, 2010:42). This necessitated that they get involved in different projects to build broadband fibre optic undersea cables that will link the continent to Europe and Asia (Malcalm, 2020:7). In 2009, they built the Eastern African Submarine cable system (Eassy) to link South Africa from Durban to Sudan and provide access for other countries on the coast of East Africa and countries outside the continent.

The government is also involved in the building of a west Coats Submarine cable called UhuruNet. It will link South Africa to Europe and another cable to America. This undersea broadband fibre optic cable will use a two-fibre link, which will run from Nigeria and Portugal. Furthermore, another undersea fibre optic cable system is called SEACOM and is being built on the East Coast of Africa to connect South and East Africa to global networks in India (Mutula & Mostert, 2010:42). SEACOM will connect South Africa, Mozambique, Madagascar, Tanzania and Kenya to India and Italy (Pater, 2005:38). South Atlantic 3/West Africa submarine cables that link Portugal and Spain to South Africa already existed before the recent infrastructure. The anticipation is that these developments will provide affordable prices and inspire bandwidth growth that the continent needs (Mutula & Mostert, 2010:42) because South Africans pay more when it comes to mobile prepaid bundles compared to other countries. It is seven times more expensive than the cheapest country, Sudan (Gillwald *et al.*, 2012:26). Network infrastructure company called Dark Fibre Africa has also started rolling out its infrastructure in South Africa from 2007. They mainly lease their already existing infrastructure to licensed operators such MTN, Vodacom and Telkom, who are their clients among others and this seems to lower the costs of the operator's expenditure (Gillwald *et al.*, 2012:17).

There seem to be problems regarding organisational structures in the South African digital sector. It seems every department is contributing its piece to complete a puzzle and because of that, nothing gets completed. According to the information above, it looks like the government has not found its grasp on what public sector digital

innovation is and who should be responsible for it even when in the public service administration ACT of 2014. The cooperate governance of ICT policy framework of 2012 placed the responsibility under government's political heads of government institutions meaning the ministers of departments but the political leadership support has been low (Manda & Backhouse, 2017:9).

It is commendable that the South African Government has established relevant agencies to foster and coordinate innovation in the public sector such as CSIR, TIA and USASSA but most of these agencies exist at the national level. This seems to be the epicentre of digital innovations and most of the projects that were initiated do not really materialise. There is no mention of any organisational structures or agencies that are based in the provincial government or if the same organisations are duplicated or within reach to people in the local governments. For instance, CSIR and TIA exist at the national level and their offices are based in key metropolitan municipalities only like Durban, Western Cape and Pretoria. The question remains: how does this help the population in Limpopo and Northern Cape to bring forth their innovations that might also qualify for funding?

USASSA was entrusted with digital migration; this has been going on since 2015. The rural population has not received this service from the government as promised. Digital innovation is keen on using digital means to provide public service from municipalities, traffic departments, home affairs and health departments. Therefore, the government would need to explore the mobile networks to improve service delivery and access to service especially to those in rural areas. This means building sufficient network infrastructure in remote South African areas and educating the user (Evans, 2019:281). The public should be encouraged to use mobile phones to make driver's license testing appointments, access their health files online without visiting the departments. However, this would necessitate government to have a well-coordinated organisational structure whereby the mobile networks teams, government's policy makers and the innovators as well as private sector work together and in some instances collaborate to foster digital innovations that will benefit the public and government departments (Kuye & Naidoo, 2003).

Government should create a suitable environment for network service providers and innovators but policies should favour the public so that they can use and afford the

mobile tariffs. Innovators should have the freedom to explore different solutions without too many regulation barriers from the government while the private sector organisations can assist with free WI-FI centres and with providing technology literacy to the public. President Ramaphosa established 4IR Commission in 2018 to respond to the question of coordination and organisational structure. The 4IR Commission will play a centralised role as a central structure for consultation and coordination. This is to create a space where government departments that play a role in public sectors' digital innovation such as the Department of Science and Innovation and Department of Public Service and Administration. These departments can coordinate their policies and strategies and align them to the national processes. The commission will establish the role of stakeholders and also create a framework that will advocate for the governance of digital innovation in the public sector in South Africa (Gastrow, 2018:33).

3.3.4 Navigating rules and processes

ICT is one other component of the 4th industrial revolution that cannot be ignored but then again, broadband will enable the access of ICT services more so when it is affordable (Gastrow, 2006:308). To support the latter, the Department of Telecommunications and Postal Services developed national integrated ICT policy white paper in 2016, mainly to address service access for all, digital innovation, ICT infrastructure and fair competition (NACI, 2017:58). According to Commonwealth Telecommunication Organisation (2010:40), policy and regulatory frameworks are requirements for digital inclusion in an information society and the South African government has made efforts in establishing policies that will complement these requirements. The policies include among others Freedom of Information Policy (FOI), Universal Access Policy, Vision 2014 Development Strategy and the Universal Service and Access Policy and e-government vision (Batho Pele). FOI gives the constitutional rights to individuals, access to information and also allows the sharing of information with the public and across different government departments (Farelo & Morris, 2002). Universal service and access policy have plans to achieve universal service delivery to the country. This policy is headed by USAASA.

The main aim of these policies in most countries is to create a suitable environment that will activate public awareness about ICT services and its benefits. It also ensures

that the disadvantaged can afford basic telephone services and have access to new technologies and networks (Hudson, 2006:308). ICT policies give attention to how the government should interact with its citizens through e-government, e-services and e-business. It is through ICT policies that the government was able to foster a suitable environment for telecommunication; for instance, the competition was increased and prices were decreased in that sector in most countries after they followed a monopoly model for long (Gastrow, 2006:209). The government further developed the Public Service Corporate Governance of ICT policy framework in 2012, NDP 2030 in 2012, and the 2016 National integrated ICT policy white paper in 2016.

Every South African National government department has a mandate to contribute to digital transformation and some departments formulated policies and regulations as a guide to digital transformation. The researcher selected a few of these policies that are central to the study of the governance of digital innovation to highlight what has been done so far. The policies are:

3.3.4.1 National developmental Plan

The National developmental plan 2030 is a blueprint of a long-term development plan of the country. It was created by the National Planning Commission in collaboration with South African citizens. It emphasises science, technology and innovation (NACI, 2017:11). NDP 2030 recognises ICT as an economic enabler more so that the world is becoming more dependent on networks. ICT can create easy ways of communications that create a flow of information and improve productivity (NDP, 2012:189). South Africa has lost its status as the number one country in the continent in terms of internet connectivity and broadband. This is due to its broadband prices and lack of competition in the telecommunication sector (Gillwald, 2012:1). NDPs' goal is to make sure that ICT structures support the needs of the economy where all parties participate and compete in a broadband market (NDP, 2012:190). For instance, the fact that Telkom still dominates the telecommunication market should be regulated because it results in high cost for business and prevents investments in the ICT sector (Gillwald & Rademan, 2012:35).

The National Planning Commission vision 2020 stipulates that South Africa will have a seamless information infrastructure that will meet the demands and needs of all

South Africans including the public sector and businesses by 2030. This will provide access to various government services and allow social and economic participation for all citizens (Gringarten, 2013:86). The vision emphasises ICT infrastructure with a widespread digital communications system, an ecosystem of networks, innovations and applications that will bring about economic development, job creation, nation building and social cohesion (NDP, 2018:170). E-government will help government improve from its traditional service provision methods, making it easier for people to have access to government information and thereby reducing exclusions of other distant communities. ICT will allow seamless participation from users but also developers of applications and innovators and businesses (NDP, 2018:170).

All the challenges that the country has regarding ICT will be solved by having new policy framework. The main issue will be to decide the role of the state and their infrastructure intervention to achieve the goal, which is affordable and universal access to communication services. In the future, the state should be the facilitator of the competition and limit its direct involvement in the telecommunication market and only intervene to ensure universal access and to assist the marginalised develop the capacity to use ICT. NDP 2012 acknowledges that there is a need for a national e-strategy that cut through all government departments and sectors (NDP, 2012:191). According to NDP 2012, all public sectors such as schools and health facilities and social institutions should have 100 percent access by 2020 as the country aims at regaining its position as the leader in the continent with both quality and cost of ICT services (NDP, 2012:195).

The government wants to make sure that by 2030, all citizens should have access and enjoy public services provided through ICT. The services will include information, entertainment and education. Collaborations between government and academic institutions and the private sector remain central to ICT developments in the country as they will stimulate innovation and research and also promote local content (NDP, 2012:196). It is now 2021 and not all the plans of development have been met; the vision is not yet realised. The public health sector still uses the paper files in hospitals and public schools do not have full access to ICT. For instance, teachers are cannot conduct online learning even when there is a need. During the COVID-19 pandemic in South Africa, learners had to stay away from school and arguably, no plans were

available to continue with learning. This shows that public schools and health are not equipped with the necessary resources to continue with life empowered with digital means. Furthermore, social institutions such as home affairs, traffic departments and municipal offices had to remain closed and citizens could not access the services online. NDP stretches out to 2030; the entire vision should be accomplished by then.

3.3.4.2 The National integrated ICT policy white paper of 2016

The National Integrated ICT policy white paper was launched and amended by the Department of Telecommunications and Postal Services in 2016. The department had a few aims to achieve through this white paper and among others were to ensure that all citizens have access to ICT services and infrastructure, to promote a digital society and to create an environment that will encourage ICT innovation and fair competition throughout the society (NACI, 2017:13). The integrated ICT policy white paper (2016:3) emphasises the government's role in facilitating the multi-stakeholders in the pursuit to achieve an inclusive digital transformation, intervention to forge a fair competition and facilitate innovation environment, policies to address digital divide and interventions to facilitate open access and infrastructure roll-out. It replaces the white paper on telecommunications of 1996 and postal service of 1998. This is mainly because government realises that people have changed the way they want to interact with the government. People now use electronic devices and not only telephone lines to access government service. The government's approaches to social, political and economic transformation and inclusion are changing and ICT policies should also be improved (Integrated ICT policy white paper, 2016:6).

3.3.4.3 Public service corporate Governance of ICT policy framework (2012)

The Presidential Review Commission, in 1998, noted that few things would have to be changed to foster ICT services in government. Some of the issues the commission noted are that ICT decisions should not be delegated to the ICT management but should come from the senior political and managerial leadership. Nonetheless, ICT management should be on the same level as those of other resources. This will help them align ICT services with the department's strategic goal. The commission also noted that there is a need for a common governance framework. Consequent to the commission's recommendation, parliament accepted the creation of a Government Information Technology Officer (GITO) position in every government department in

2000. GITO had the responsibility to align the department's ICT strategic plan, strategic direction and management plan. GITO should be part of the executive management team and report directly to the HoD of a given department.

The auditor general reported in 2008/2009 and 2010 as well that since the report given by the PRC in 2000, nothing has changed in terms of governance of ICT in the public service. The Auditor General made further recommendations that the government should formulate governance of ICT framework to implement national ICT strategy and also define and implement the roles and responsibilities in the governance of ICT to ensure effective public service through ICT (CGICTPF, 2012:3).

The auditor general found again in 2010/2011 that there a little progress in different government departments with regards to governance controls. GITOs were not fulfilling their responsibilities due to a lack of accountability structures, while in some departments, there was adequate governance control but not sustainable enough. In pursuit to address ICT governance issues in government, the Department of Public Service and Administration collaborated with the Department of Auditor General and GITO to formulate the Corporate Governance of Information Communication Technology Policy Framework (CGICTPF). CGICTPF is supported by the international standards and practices in the form of KING III code of good governance, ISO 38500 standards and COBIT, which is a comprehensive governance ICT process framework (CGICTPF, 2012:4).

According to the public service act and regulations, the Department of Public Service and Administration and its minister is responsible for the governance and management of electronic government or ICT. Corporate governance of ICT policy framework aims at providing the department with direction to implement corporate governance of ICT within their parameters of accountability and responsibility. The policy framework does not allow ICT decisions to be delegated to ICT management but to come from the senior political and managerial leadership. This will help align ICT services with the department's strategic goal (CGICTPF, 2012:2). The policy framework for corporate governance of ICT is relevant to public administration in all government spheres, organs of state as well as public enterprises. Therefore, every department should develop its system of corporate governance and governance of ICT in line with CGICTPF principles (CGICTPF, 2012:2). The purpose of this policy framework is to

improve service delivery through ICT-enabled access to government services, improve the achievement of public sector departmental goals, improve stakeholder communications and lower the costs (CGICTPF, 2012:8).

3.3.4.4 Fourth industrial revolution commission (4IR Commission)

Fourth industrial revolution requires every country to develop policies and strategic plans for innovation to enable an inclusive society and government in a leadership role. While South Africa has multiple initiatives across government departments, it lacks a single blueprint that brings together all key stakeholders. 4IR manifests itself through technological innovations and is seen in every aspect of the society. Therefore, a broader approach is required (DTPS, 2018:5). President Ramaphosa launched the 4IR commission in 2018 (Sutherland, 2019:234) The commission is tasked among other things with determining and developing a national strategy, policies and plans for digital innovation that will help position the country among the leading countries in terms of the 4th industrial revolution, advise the country on strategies that will help the country being able to compete globally and advise on a research programme that will lead to 4IR and skills development. They will recommend on the infrastructure needed to enable the country's participation in the digital economy, framework, mechanisms to curb digital divide and measurement methods for the impact of the 4IR interventions. Lastly, it mobilises resources to support the 4IR (DTPS, 2018:6).

The Department of Telecommunication Services was entrusted as the coordinator of this commission, the 4IR commission. The Commission is created to bridge the gap between government departments, private sectors and civil society. There is not a framework currently available to bring all different stakeholders together. A team from the Department of Telecommunication will develop a strategy and framework for the country. It comprises 30 role players are from different sectors, the balance of gender and with input from youth, businesses, digital startups and the head being the president of the country. Central to the framework are basic rules of how the ICT infrastructure will be rolled out, market issues such as how to curb monopolies and how the government will manage 4IR in general (Lekhanya, 2019:3). The president will lead the commission; they should ensure the alignment of their activities to the

national development plan, they will meet twice a year and report at least once a year to parliament (DTPS, 2018:7).

Even after all these efforts, there is still a lack of a well-developed framework in South Africa. The government has not adopted a framework that will drive the implementation. The country requires an integrated policy framework that will emphasise different government departments collaboration. This will result in policy certainty and cohesiveness among government departments and spheres to foster digital evolution (NACI, 2017:59).

3.4 A review on South African provinces

South Africa has nine provinces and each has its history, landscape, population, language, economy, cities and government. Each province has a legislature that has the power to pass laws (ANON, 2016:184). Digital innovation framework should be expected in every province but be aligned with the national digital innovation framework because the country is said to be interdependent (RSA, 1996:21). Provinces have not created digital innovation frameworks but they are seen incorporating innovation plans into their province's developmental plans and economic strategies except in North West (NW), Northern Cape (NC) and Free State (FS) where they have innovation strategies. NW province is regarded better than NC because the province has research capability to contribute to the country's research and innovation. Sadly, Northern Cape has one new university that still needs to build on its efforts to contribute to research and innovation but the national government and science council are working well in investing on their research and innovation and capabilities. This can be linked to the SKA project, to build the largest telescope in the world (NACI, 2017: 69).

So far, only Gauteng and Western Cape are working towards a provincial framework. They do not have it yet but their metropolitan municipalities already have digital innovation units that are focused on digital innovation in government. As a result, the City of Johannesburg launched a digital innovation framework in 2019 and the City of Cape Town would be expected to do the same in no time because they have already established a unit.

South Africa as a whole is faced with challenges concerning digital innovations especially in terms of implementation and this is reflected in most provinces if not all. Most government employees are not technologically skilled, which affect the level of access and intake of e-governance. For instance, each province has its electronic portal but now, none is functioning well except for Gauteng and Western Cape provincial governments. The Western Cape government portal can be regarded as one of the best but it has its own challenges. This is so because more contents still needed to be loaded; there is also a lack of central management due to lack of skilled human resource and a lack of electronic culture. Besides, employees find it difficult to upgrade and maintain the system because they do not have the necessary ICT skills. Even basic information like contacts is not regularly updated and other important government documentations are not loaded in time (Maramura & Thakhathi, 2016: 254).

The above is similar to Gauteng province, which launched shared service centre responsible for providing IT services and introducing provincial broadband infrastructure to support educational and healthcare department. This created high expectations in the beginning as it promised a one-stop-shop access to services provided by the province but has collapsed and most part of it has been incorporated into the provincial finance department (Cloete, 2012: 134). Technological skills should have contributed much to maintaining the sites of these two provinces, hence the capacity of human resources in government should include technological skill and innovation culture.

Gauteng is known to be the smallest province of the nine but hosts more people than all the nine per square metre. Its economy is based on a few industries such as telecommunication, financial services and property. The province is transitioning from a haphazard way of doing things to a more integrated urban centre, with a diversity of digital networks, economic and social connections. This calls for a coherent information society and ICT governance within Gauteng that will cut across the province, municipalities and other sectors to make sure that the province is inclusive of its geographical planning and functioning (Abrahams & Burke, 2020:2). The province adopted the use of technology in a variety of town planning and environment planning. The technology used include among others aerial photography, satellite

data, 3D digital simulation and 3D fully interactive virtual reality. 3D virtual reality means that one can see artificial reality performed digitally via computer without being at the physical geography (Macagnano, 2002:159). Furthermore, the province established an innovation hub in Pretoria to connect various participants with solutions. It is a web-based innovation network and connects experts from businesses, research scientists and government across Gauteng. Businesses or government entities post their challenges on the platform and innovators and other experts respond with possible solutions (Mohalejeng & Kroon, 2016:3).

The South African digital transformation extends to local government and so far, the best progammes are demonstrated in metropolitan municipalities, which are the City of Cape Town, the City of Johannesburg and eThekwini. The metropolitan government system in South Africa was established because of the Local Government Transition Act of 1993. Now. the country has eight metropolitan municipalities. All these metropolitan municipalities have prioritised innovation, which is always addressed at a national level but political will has proven to be critical for innovation at this level as it will help integrate and coordinate different policies with internal processes (Gomez-Alvarez, *et al.,* 2017:251). For this study, the focus will be given to three metropolitan municipalities that include the City of Cape Town, the City of Johannesburg and the eThekwini metropolitan. The focus will be on digital governance frameworks and the impact of a well-coordinated department.

3.4.1 City of Cape Town

The City of Cape Town is a leading city in Africa in terms of tech innovation start-ups. According to the 2016-2017 index on innovation cities, the city was ranked the most innovative city in Africa. The city formed partnerships, set up strategies and structures that assist in the implementation processes and foster innovation culture. The well-coordinated tech ecosystem allows them to be the best even in South Africa, with Gauteng being second. The director responsible for innovation in Cape Town says, they continuously market Cape Town as the best option for start-ups and innovation, locally and internationally. The city formed a high education consortium with four universities found in the city and one business school as well one research council, mainly for research and innovation. The six organisations interact with the government and have agreements grounded in research. In 2009-2015, universities patents were

48.6% of the city's patents (SALGA, 2018:16). The city acknowledges that they need new reformed models to address the needs of the citizens especially now that the environment is dynamic and competitive as compared to the private sector (SALGA, 2018:17). The key factors the city has learnt from the other leading smart cities across the world include fostering city entrepreneurship, nurturing collaborative and interactive culture among different businesses and government, prioritising citizen centricity and lastly, supporting the government with relevant expertise (SALGA, 2018:18). The city committed in its IDP 2017-2020 to create a platform for innovation where innovative approaches will be followed to provide services and form new ways to engage with the public. Therefore, the Organisational Development and Transformation Plan was developed in 2016 to accommodate the innovation platform. As a result, a structure had to be in place to drive the objectives of ODTP. Then, the Organisational Effectiveness and Innovation Department or unit was initiated in 2017/2018.

The innovation unit had a mandate to lead the development and implementation of innovative strategies and projects that promote clients centric in the city and the collaborations with other stakeholders. The idea was to see that the city delivers services through innovative means and lead the city to a modern city that is prepared to future challenges. For example, it is through innovation that the city managed to save water by installing water saving fittings, reducing water pressure and also installing a programme of leak detection and repair at the department of public work's 20 largest facilities (SALGA, 2018:21). According to Engineering News (Musakwa, *et al*., 2017), Cape Town embraces smart city ideas and has started on some projects that reflect a smart city. Smart city initiatives include among others, public Wi-Fi hotspots, internet access in public libraries and over 560 cameras around the city. Ukutinga enterprise resource planning usually known as back-office system is the largest ERP system so far that can manage finances, revenue, human resource and all other services. This system is comprehensive but managed in a single IT system. (Musakwa, *et al.,* 2017).

3.4.2 Johannesburg municipality

The Johannesburg IDP strategic priority number eight is to encourage innovation and efficiency through the smart city programme. According to the IDP 2019/2020, the city

is in the progress of becoming a smart city; This will be achieved by forming partnerships with universities, research institutions and technology companies that are involved in research and development. Information and resource management as well as monitoring of service delivery and those working in the municipality are key to improve service delivery. The city will establish an information technology that will ensure that they collect required data, use the information and share it effectively (IDP, 2019:35).

The City of Johannesburg has a smart city strategy for 2019/2021, which highlights how the city will engage with its citizens in an improved and efficient manner. The smart city strategy gives effect to Smart City Office that will be responsible for providing strategic and operational leadership, coordinate and manage programmes and new initiatives as well as assessing the performance of each programme concerning the City of Johannesburg Smart City. The main objective for this office is to ensure that the transformation plan is developed and implemented, consequently ensuring that the city can provide services that are people-centric, available and accessible to all. The achievement of a smart city will then place the city at a competitive level to even address its threats efficiently and become a sustainable city that will attract people to live in it (CoJ, 2019:5).

The city's road map to smart city began with putting in place strategies, policies and frameworks that will drive its aim and plans. The city declared to become a smart city in 2013, then, established a strategy that was approved in 2014. The second step was when the city scaled up initiatives across different departments and initiatives included public WiFi, eHealth, eLearning and Smart meters. The next step is mainstreaming a smart city method as a way of life and lastly, will be the realisation of a smart city and its maintenance (CoJ, 2019:6). Johannesburg smart city strategy of 2019/2020 has six strategic: smart citizen and citizen centricity, which places the citizens at the centre of all developments and help empower citizens with technology skills and knowledge and connectivity and universal access for this will ensure that citizens have an access to digital infrastructure and broadband to curb digital divide. Also included is a digital economy, which is about citizens learning new skills of living and transacting online to be able to function in a new digital age and smart governance, implying, it will build a government that is open and accessible to its people through technology means.

Besides, it includes smart services meaning a government that understands the citizen's needs and efficiently providing services 24/7. The last one is the green and sustainable built environment, taking advantage of technology and becoming innovative in providing service efficiently and conveniently and also protecting the environment (CoJ, 2019:17).

The Joburg city's smart city initiatives include connecting its people to the internet. Some of the projects include connecting fibre to the public libraries and free WiFi hotspot in the city. The city also provided ICT training to the youth, smart policing through CCTV surveillance, digital ambassadors providing e-literacy training to households and eHealth projects deployed in 15 clinics (Musakwa, 2017). The province has an enterprise portal that provides online services to its people. Citizens have access to matric results and are also able to apply for jobs online. They can also access the website, which enables them to report faults around the city, lodge complaints or query their accounts; they also have access to news and a range of government documents (Manoharan & Holzer, .2012: 266).

3.4.3 eThekwini Municipality

The city views innovation as an important part of economic development, therefore, Durban municipality launched a comprehensive innovation programme in 2013. The innovation programme aims to support and drive the local innovation ecosystem to prosper. This will be employed through various economic sectors. There is visibility of various programmes such as the youth innovation challenge aimed at giving an opportunity to the youth of Durban to develop innovative solutions to societal problems. There are innovation labs aimed at bridging the gap in society by providing the tools required for research and development (SALGA, 2019:27). In this municipality, innovation should be interpreted as a network of innovative actors, hence, the city established an innovation forum in 2014 to harness the existence of this network. To drive the forum and its innovations, the city developed a brand called "Innovate Durban." This will be an organisation that guides and promotes innovation in eThekwini. Innovate Durban aims at providing a platform for innovation activities within the eThekwini region (SALGA, 2019:23). Innovate Durban is made of various partners made of public and private sectors; they include among others University of Kwazulu-Natal, Transnet, The maker space, Krisp, FNB and Technology Innovation

Agency. Innovate Durban runs various projects purposed to create awareness, build capacity, encourage community involvement, boost public and private innovation and create connections between innovators and tools. Durban municipality is the core funder of Innovate Durban (SALGA, 2019:24).

Even if the three metropolitan municipalities do not have the digital innovation framework, they seem to agree on one thing that collaboration is key to digital innovations. All of them collaborate with universities and the private sector to make it possible to innovate and provide public service via technology. They also run programmes that will encourage the public to innovate. All the three metropolitans acknowledge the importance of digital innovation in government in this era as a result, they established units within their municipalities to manage the innovation projects.

3.5 Challenges of digital innovation in South Africa

According to Meerman (2010:13), SITA identified and summarised challenges that might be the cause of delay in adopting e-government in South Africa. E-government and digital innovation are interrelated and influence one another. The implications of adopting e-government are equally important when adopting digital innovations in the public sector and factors that influence the delay in adoption are similar in most cases. Challenges are summarised as follows:

- lack of common vision across different government departments and spheres, lack of consultation with business and citizens to assess the need and the help they can provide
- the country has no budget dedicated to e-government/digital innovations projects
- the existing e-government services are only focused on the government to customer (G2C) services and do not outline on the government to government (G2G) as well as government to business (G2BC)
- lack of skilled human resource
- the culture in the public sector does not support knowledge sharing, which would advance innovative ideas diffused to different government departments when available in one department
- procurement processes are long and frustrating for government officials

- government tends to duplicate e-government services, which costs time and money
- Government processes are not integrated across different departments

Affordability for both fixed and mobile wireless connections is also a concern; prices remain higher as compared to international standards (Chetty, *et al.,* 2013:1). The infrastructure and mobile penetration are growing but the country still has high broadband costs and monopolies (Chetty, *et al*., 2013:1) although there was a drop-in price in 2006 after the SEACOM and WACS cable construction (Bornman, 2016:269). A cheaper and faster broadband connection is vital for the modern economy to enable business and efficient service delivery of public service but South Africa has a low level of penetration and slow internet that can frustrate the consumer and deter businesses to go online (Oyekemi, 2015:15).

South African customers pay more for broadband services that have lower speed than other emerging African countries (Gillwald & Esselaar, 2004:19). Telkom is abusing its power by charging their clients more compared to what other countries are charging their clients. This then will continue to propagate the urban-rural digital divide; until it is eliminated, the country will never be an information society (Gringarten, 2013:86). A survey made across Africa shows that South Africa pays five times more for 1GB than Egypt. This is influenced by outmoded regulatory approaches and a lack of competition among telecommunication service providers (The World Bank 2012: 51). Naidoo (2018:7) agrees that the adoption, diffusion and use of broadband in South Africa are poor and laggard as compared to other developing countries and this is due to weaknesses in competition. It seems the regulator's capacity is constrained. The country has not developed an effective policy and regulatory framework for ICT infrastructure to roll out e-government programmes that will improve the living standards of its people. Perhaps, government departments as well as the private sector are scared to use technology as a method of providing services (Basu, 2004:118). Batho Pele Principles serve as a policy and legislative framework for service delivery in South Africa. Regardless of how loud and well-articulated these principles are, the country is faced with various challenges such as poverty, corruption, inequality, illiteracy and skills shortages (Mofolo *et al*., 2020:9).

Like most countries, South Africa has also experienced digital divide, which results from the country's population that is widely dispersed; it creates a challenge for access to the distribution of and the use of ICT (Bornman, 2016:266). It is reported that 45% of South Africa's population lives in rural areas where ICT infrastructure is less developed (May, 1998:2; Hoogeveen & Ozler, 2005:4). The population in the rural areas has no access to the internet and the internet is costly if available; they travel a long distance to have access to a well-developed ICT infrastructure (Mutula & Mostert, 2010:44). They have a shortage of skills to use the internet while some cannot read or understand the contents (Naidoo, 2012: 64). There is also a problem with management of records or archives due to political, historical, cultural and technological factors (Manda & Dhaou, 2019:249). Rural areas have limited connectivity, limited soft infrastructure and cannot afford the means of communication; this hampers the development of relevant social services such as health services (Department of Telecommunication and Postal Services and ITU, 2018) Provisions made should be suitable for every market found in these areas (Telkom Business, 2015:8).

There are deeper dimensions of inequality in South Africa as compared to other countries (Chigona *et al*., 2009:5). Income, skills and education determine the usage of the internet in South Africa. The study shows that whites, educated and males have more access to ICT; most whites have computers and internet in their houses and that allows the use of ICT to the greatest extent (Polikanov & Abramova, 2011:43). More males attested to using computers and the internet every day as compared to females and those with tertiary and high school education used the internet daily as compared to those with no schooling (Bornman, 2016:272). While the digital divide is narrowing in developed countries due to infrastructure developments, South Africa's digital divide as compared to international countries is attributed to among other things the deteriorating and insufficient infrastructure (Fourie, 2008:482). Bornman (2016: 269) blames this condition on a policy environment characterised by a lack of strategic direction, limited competition and regulatory failure.

The NDP 2030 acknowledges that there are challenges that need to be conquered before service delivery is broadly provided via ICT (NDP, 2012:191). More significant factors are that there is no evidence that South Africa has a strategy to ensure that it

keeps up with its peers (Maumbe *et al.,* 2008:759). Some policies contradict each other and regulations are failing; there are no institutional arrangements in place and the independent communications authority of South Africa (ICASA) seems to lack capacity and expertise (Singh, 2010:210), Therefore, a single strategy is needed to enable the ICT diffusion in all areas of the county and its economy (NDP, 2012:191). President Ramaphosa recently launched a 4IR commission to develop and determine a national strategy that will give focus to 4IR (Sutherland, 2019:234). The 4IR acknowledges that the country has different initiatives across different government departments but currently, there is no blueprint that bridges all role players and joins them to function as one (Lekhanya, 2019: 3).

3.6 Summary

The government of South Africa seems to be working tirelessly to develop an ecosystem that would place them on top of every African country and possibly in a competitive space globally on issues of the digital economy through ICT. The government has put in place various mechanisms to foster digital innovation in its departments and agencies and access to public service through ICT. Almost every government department has a role to play in building the capacity of the government to provide an innovative service to the public. The Department of Public Service and Administration is said to be the champion in facilitating innovation in public service. This he department established an agency called CPSI to oversee the development of innovations in the public sector, to engage with different stakeholders who would, in return, bring about innovative ideas. The Department of Science and Innovation is the main influencer through its agencies such as CSIR and TIA who are constantly involved in development and research of digital innovations in the public sector.

Meanwhile, the Department of Telecommunications and Postal Services is directing digital innovations through policies and strategies that speak to innovations and access to ICT such as South Africa Connect and the 2016 National integrated ICT policy white paper. In 2018, the president launched the 4th industrial commission, which is said to be a changing agent in the governance of digital innovation space in the public sector. The commission will be expected to develop a framework that will coordinate all government departments and different stakeholders that have been fostering public sector innovations in South Africa. The country has seen various

benefits in the space of digital innovation in the public sector. For instance, the Department of Home Affairs has rolled out the digital identity documents and the applicants of learner’s and driver's licenses can now make an application online.

The Department of Health has also seen advancement and changes as they deal with COVID-19. This department had to comply with the world's standard of developing a vaccine certificate for those who have been vaccinated against COVID-19 and would like to travel abroad or gain discounts from participating local stores. The certificate was developed by the Department of Health and CSIR and it can be accessed by anyone who has received COVID-19 vaccines through a web portal. However, the country still has so much to do. Technological infrastructure to those rural areas is still a problem and those that are in town and in proximity to the infrastructure still need to be encouraged to transact online while the government employees should be given technological training to maintain government websites as well as assist the public online. Those in charge should give priority to policies that will give ICT access for those in the remote areas, create education platforms and skills building and vouch for a well-coordinated organisational structure that will promote intergovernmental relations and deliver public service via digital means.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1. Introduction

The chapter provide details on the research design and methodology, sampling procedures, data collection methods and data analysis. It speaks to ethical considerations and challenges experienced in the study.

4.2. Research philosophy

Research philosophies assist the researcher to determine the appropriate research methodology for the chosen study. It will build an understanding of the limitation and strengths of a methodology before embarking on research (Kakia, 2013:33). The various aspects involved in each philosophy will help the researcher decide on a relevant methodology for his study, whether it should be qualitative, quantitative or both (Kakia, 2013:33). It will continue to shape the study and determine other elements that the study will follow such as research design, sampling procedures, data collection methods, data analysis and ethical considerations (Tuli, 2010:99). This study followed an interpretive research philosophy as it seemed relevant to what the researcher wanted to accomplish because it allowed the researcher to be more involved with participants. The researcher was able to have access to respondents to interview them, observe them and gain an in-depth understanding of various government systems, issues and data, but had to do so without being biased towards any other organisation as required (Walsham, 2006:322).

The researcher not belong to any organisation aligned with the study area. The researcher was purely a university student who interviewed government officials; therefore, she was neutral in her conduct and had no prior opinions about how government systems work in terms of governance of digital innovation. According to Andrade (2009:43), this approach determines the interaction between the researcher and the participants, therefore, the researcher had to follow a strict ethical consideration route to interact with the respondents. The researcher was granted ethics approval and signed a code of conduct for researchers at North-West University. She acquired a permission from every respondent and issued a consent form to all respondents to sign. The researcher did not bribe or use any deception to

obtain an interview. All respondents were adults and in a good state to answer questions and no official name was used in the report to protect the identity and privacy of all that were interviewed. All these are requirements for interpretative research philosophy that the researcher followed as advised by Welsham, 2006:327).

4.3 Research methodology

According to Sahu (2013:3), “a systematic process of solving research problems is known as research methodology”. It is through the research methodology that the researcher can understand how to answer the research question, the steps to follow and which methods to use to attain research objectives (Open University, 2016). The following section explains the data collection instruments and analysis strategies during the research project. This project is inclined to qualitative research methods because of its emphasis on “purposive and snowball sampling, personal engagement and situational limitations and dynamics that shape inquiry” (Blanche *at al.,* 2006:287; Labaree, 2009). Data collection techniques in qualitative research that resonate with this research include document reviews and interviews (structured, semi-structured, or unstructured) with individuals (Jackson *et al*., 2007:25).

The study followed a qualitative research methodology precisely because the qualitative method would allow the researcher to engage more with respondents through semi structured interviews (Denzin & Lincoln, 2008:4). Qualitative research methods yield “thick descriptions of lived experiences and encourage openness and sensitivity by the researcher, (Labaree, 2009; Patton & Cochran, 2002:2; Masson, 2002:1; Brynard & Hanekom, 2006:37). Qualitative methodology allows the researcher to identify issues from the participant's perspective and then gives understanding and meaning as the participant gives their interpretations through behaviour and culture or norms (Ajagbe*, et al.,* 2015: 320). This method helps the researcher contextualise the setting of participants and their experiences and how that would influence their behaviour concerning the study. This is the information that one might not get easily when one conducts a quantitative study (Butina, 2015:191). The researcher can make sense and interpret the phenomena as the respondent brings about the meaning of the subject (Hennink, *et al.,* 2020:12). Therefore, the study used literature review and semi-structured interviews to gather data and went on to use content analysis to analyse data collected.

4.3.1 Research design

A research design is the plan of the research project, the structure that the researcher envisages using in fulfilling the research results. The plan includes the time frame to complete the study, the decisions related to the methods that are going to be used to obtain the results, methods of collecting data, processing it and analysing it (Lune & Berg, 2017:33). The research design should answer the study purpose, sources of data, area of the study, type of sampling and many other questions (Akhtah, 2016:69). It is at this stage where the researcher sketches out the whole research project on a drawing board. This will help in identifying any foreseeable glitches that might hamper the study. The researcher will be able to know if ethical considerations should be included now that he/she is about to choose the research methodology and if respondents will be willing to participate in the study and how will they be willing to participate (Lune & Berg, 2017:34).

The study utilised a descriptive research design because it allowed the research to be conducted in the respondent's natural environment, which ensured that honest and high-quality data were collected and also allowed the researcher to record certain behaviors that were observed during the interviews (Nassaji, 2015:131). The aim was to identify the existing frameworks and see if they were in any way effective and helpful and this was achieved through interviews, observations and literature reviews. The study started in 2018 with an interest in governance of digital innovation in the public sector in South Africa.

The research followed a qualitative methodology as it was a method that would produce sufficient data for this kind of study. The project plan was for three years and that included collecting data from a set of interviews as well as literature review from reputable academic sources. The research used a snowball sampling to recruit the respondents from national government officials in relevant government departments, government agencies that work together to foster digital innovation in South Africa, the private sector and South African local municipalities that showed progress in terms of digital innovation such as the City of Johannesburg. Ethical procedures were followed as it wa a requirement in qualitative methodology. The researcher received approval from the Department of Humanities after receiving all the required permissions from the respondents.

4.4. Study area

South Africa is a country found in the sub-Saharan region of Africa; it is among the most competitive and innovative countries in Africa. The country scores 4.96 out of 10 on the ICT development index of ITU and its ICT contributes 2.7% to economic activity (Gillwald & Stork, 2008). While the country is doing well compared to other African countries, the underdeveloped infrastructure in rural areas poses a major threat to the move into information society (Kyobe, 2011: 258). South Africa has nine provinces but most of its population resides in the rural areas where ICT infrastructure is limited. This hampers other economic developments that are dependent on the internet and broadband (Herselman, 2003:945). SA has a vision, political and robust policies but the vision is not shared by all stakeholders, hence, a lack of clarity on what innovation might mean, what the 4th industrial revolution requires, who should be innovating and lastly, how governmental policies can adapt to a future share vision (DTPS & ITU, 2018).

There seem to be no understanding of the concept innovation as there was no communication from the authorities on the vision across the government and other actors (OECD, 2007). The public sector fails to play a leading role in coordinating social, political and economic interests. Instead, it lags the private sector that deploys digital innovation and infrastructure in its service provision (Department of Telecommunication and Postal Services and ITU, 2018). Some government policies are lagging especially those that should build future talents, which should align curriculum changes to the vision of the 4th industrial revolution, promote fair and inclusive secure data policies and technology transfer (Avgerou, et *al.*, 2008:120). The NACI report in 2006 created an impression that innovation is directed by the government using policy, governance and resources with a top-down approach. In this case, businesses, public and private users are the recipients. The report considered that the Department of Science and Technology should take the direct management responsibility for science and technology but said little about the importance of interaction among participants to create a supportive environment for innovation to thrive (NACI, 2006:82).

The research was focused on South Africa but all the respondents were based in Pretoria, in government departments and agencies. Pretoria is the country's capital

city and houses all government national departments. Most of the stakeholders in the governance of digital innovation in South Africa are officials in national government departments, which means, most digital innovations developments that affect every citizen are initiated in Pretoria, then to other provinces. Innovators have more chance to get in touch with funders in government agencies if they are based in Pretoria because they will be close to government agencies that fund, influence and nurture innovations such as TIA, CSIR and CPSI. All these agencies are working together and are based in the same city.

4.4.1. Study population

Blanche *et al*., 2006:133) explain population as a larger group from which the sample will be carefully chosen with the purpose to generalise the researcher's findings. According to Brynard (2006:54), population refers to activities, phenomena and subjects the researcher is interested in to establish new knowledge. The population in this research were relevant national government departments, agencies and organisations that work closely with government departments to foster innovation in the country. The study focused specifically on officials from DPSA, Department of Communication and Digital Technology, TIA, HSRC, Meraka Institute, NACI, and SALGA.The interviews were conducted in Pretoria where all national government departments are based, that included DPSA, which is the main custodian of public sector innovation in the country. DPSA houses a government agency that is responsible for driving and directing public sector innovation in South Africa, the Centre for Public Service Innovation (CPSI). The primary respondents were officials from CPSI, the Department of Science and Innovation and CSIR.

The first interview was conducted at CPSI offices, then, they referred the researcher to other stakeholders where more interviews were conducted with officials in government departments and agencies as respondents. This is because the study used a snowball sample, which emphasises main contacts recommending other participants in the system that can be contacted for more details on the subject. The snowball sampling method led the researcher to more respondents that included officials from the DPSA, Department of Communication and Digital Technology, TIA, HSRC, Meraka Institute, NACI and SALGA. The research stretched to the private sector to understand their input in the governance of digital innovation in the public

sector as well as the City of Johannesburg as one of the municipalities that is doing well in advancing the call for an information society.

4.4.2. Sampling procedures

Sampling is a method used to select a small group from a larger pool to determine the characteristics of a larger group. A sample should represent a larger group; it should have all elements and characteristics of a larger group. Sampling is used to save time, simplify the research, and cut costs. The researcher cannot interview the whole population as it can be time consuming and costly (Brynard, 2006:54) The researcher used convenience, purposive and snowball sampling.

Convenience sampling refers to those who volunteered to take part in the research. Purposive sampling means the cases that are specific to a group are selected. Snowball sampling is when participants give references or contacts of their colleagues or other people we can contact for research (Blanche *et al.,* 2006:139). Therefore, on purposive sampling, the researcher focussed on conducting interviews with national government departments that directly deal with innovation and government agencies that work with these departments. Through intense literature review, the researcher identified a key organisation and visited their offices in Pretoria.

The key respondents in this study were officials at CPSI as the organisation entrusted with public sector innovation in South Africa. The researcher used purposive sampling to certify that the organisation would be fit for the research. Once there was an understanding, the researcher requested that they help identify other stakeholders. A snowball sampling was then used to identify and interview more respondents. The main respondent referred the researcher to other stakeholders that he worked with and could assist with further information. The researcher followed the same pattern to identify, contact and interview other respondents.

The sample composed of three main respondents but the researcher expected more respondents. As the initial respondents referred to more stakeholders which included officials in different but relevant national government departments and private institutions, the number increased. The study followed convenience, purposive and snowball sampling methods, the fifteen respondents are those that the researcher was referred to as per the purpose of the study and eventually exhausted the referrals.

Department of Public Service and Administration	2
Department of Science and Innovation	1
Department of Communications and Digital Technologies	1
Government agencies established to foster innovation in the public sector in South Africa NACI, TIA, HSRC, CPSI, SALGA and CSIR	10
TIA	2
CPSI	2
HSRC	1
NACI	2
South African Local Government Agency (SALGA)	1
CSIR	2
Gauteng provincial government	1

4.4.2.1. Sample size

The proposed sample comprised 15 respondents as follows: National government departments N =4, National government agencies N =8, Private sector N=2 and local government N=1, thus, total sample size N=15.

4.5. Data collection methods

The two methods that were used to collect data are literature study and semi-structured interviews. This was to make sure that enough data were collected to find answers. The methods are based on the research methodology followed in this study.

The research used interviews as the primary data generation strategy. A semi-structured interview is a very useful strategy to collect data more interactively and purposely to gain more valid and reliable data. Interviews can help the researcher collect a large amount of data in a short space. It also bridges the gap easily because it allows immediate clarification on any misunderstanding (Marshall & Rossman 1980:82). Semi-structured interviews can also be in-depth or loosely structured forms of interviews (Mason, 2002:62).

In-depth interviews were conducted with 15 respondents who are practitioners in digital governance both in the private and public sectors. The officials were best positioned to provide valid and reliable information suitable to meet the objectives of the study. The respondents' knowledge, views, understanding, interpretation and experiences about the governance of digital innovation in the public sector are essential (Mason, 200:63). Interviews were conducted for forty minutes with each respondent in the respondent's office and some were conducted online via zoom due to COVID-19 regulations. Most officials were working remotely at this time and were unable to meet face to face for an interview.

The interviews were conducted at the time that was preferred by the respondent. This was when they had confirmed their availability with the researcher. To supplement interviews, the researcher used document review database to gain more insight into the subject. The following sites and more were used notably google scholar, North-West University institutional repository, OECD, researchgate, science direct, sage pub journals, apolitical, IOS press, Palgrave Macmillan, Oxford handbooks, Taylor & Francis, Emerald Insight, Elsevier and Wiley online library springer link.

4.6. Data analysis

Data analysis is a crucial step in research that follows after data have been collected; it means the transfer of raw data to interpretations. The aim of data analysis is to describe a phenomenon in detail and to compare variables (Flick, 2013:6). Qualitative research has several methods that can be used to analyse data and for this study, content analysis was employed mainly because of its flexibility and uniqueness in that it can be used in all types of written text no matter the source of the data. It can be

used to analyse text data from any kind of interviews, books as well as observations (Hsieh & Shannon, 2005:1278).

Content analysis is a research method that refers to text intending to deduct knowledge, new insight, facts and a guide to action (Elo & Kyngas, 2007:108). Firstly, the researcher read through the interviews to identify errors, get familiar with the data, identify patterns and understand what the participant said. Secondly, the researcher identifies issues, themes of meaning and their relevance to research questions. Thirdly, the researcher built up themes to describe narratives, behaviours, identify negative or positive responses or the essence of the interviews collectively. Fourthly, the researcher incorporates the themes and narratives into a framework of digital governance in South Africa's public sector and lastly, supplements the interviews and the framework with literature for further validation or critique.

The study stands a good chance of producing consistent content because it follows qualitative methodology. This is said to be a better method when employing content analysis because of the in-depth information given during the interviews by the respondents, as compared to content analysis in quantitative methodology that uses questionnaires (Bengtsson, 2015:10). This is the method that this study will follow, the aim is not to misinterpret the respondent but stay close to their words and describe the obvious similarities. Nonetheless, latent analysis is also important because it will notice some respondents' reactions like sigh and laughter (Bengtsson, 2015:10). Data analysis will be transcribed from text sourced from the interviews and documents.

4.7. Ethics considerations

According to Blanche *et al.,* (2006:61), scientists or researchers have an ethical responsibility to protect the research participants when conducting research. Therefore, the researcher observed the research ethics to preserve her work, the university and the respondents. All respondents were informed and voluntarily gave consent to participate (Blanche *et al.,* 2006: 67). The researcher first requested permission from NWU to conduct the research and from the institutions that she planned to visit for interviews and made sure that every respondent signed a consent form. People that were interviewed were adults who could write and read. The researcher was respectful towards all the respondents' privacy and did not

compromise their positions. The researcher has to guarantee that no harm will occur to participants as a result of the research conducted (Blanche *et al.,* 2006: 67).

The researchers' experience helped her predict when the respondent was uncomfortable or unwilling to continue with the interview and asked the respondent to continue on another day when it was convenient. The researcher did not harm or use deception and coercion to attain information (Pruzan, 2016:279). Trustworthiness is another element in research ethics the researcher should uphold and this can be done by keeping the research data safe (Pruzan, 2016:282). Therefore, the interview transcript will be locked in a storage that is safe and can only be opened by the researcher unless mandated by the NWU ethics committee to give access to the records. The researcher will not release the results of the interview to the media or anyone irrelevant to the research.

For ethical clearance, all respondents signed a consent form to show that they were informed about the contents of the interview and were not compelled to participate. The scheduled interview took place at a time and venue preferred by the respondent. The interview took about 40 minutes and was transcribed by hand for no audio or video recordings was used. This is because the respondents in these interviews are high profile national government officials and the interview would have been compromised if you could not assure them that their names and organisations would not be detailed in the research report but the researcher recorded them. They were already showing hesitance in being interviewed, hence most of the letters took long to be submitted to the ethics committee. There were no language barriers in the process. The researcher explained the purpose of the research, the data management process, privacy and confidentiality issues. The interviews were face-to-face but some were conducted via an online application, zoom, due to COVID-19 regulations that led to lockdown and officials not being available in their offices.

No financial remuneration for participation was included. The wellbeing of participants become a priority and the research problem become less important. To this effect, the researcher emphasised that the human dignity of the respondent minimised any form of risks. For example, some respondents were unwilling to participate if their names would be used in the final reports of interviews and the researcher affirmed them that no names would be used to protect them. No employer would be notified about their

responses to protect their employment status as well as their relationship with their employer. Some respondents were willing to participate but unwilling to give the permission letter that had their signatures attached to it because it would be the same as admitting to the interview. Thus, the researcher had to accept the interview because it was a reference from the main respondents; the permission letter was not considered.

The researcher completed the online ethics training and attended the ethics workshops organised by the NWU. All respondents signed informed consent forms, which were well explained before signing. This would mean that they understood what it meant to participate in particular research and made a conscious decision thereof. The researcher in this study followed the research ethics. The researcher requested permission to conduct research, therefore, no respondent was compelled to participate in this research. All respondents volunteered to participate after being given a request to participate. They fully understood what the study was about as they were given enough time to accept the interview. The researcher did not bribe or deceive the respondents.

4.8. Limitations of the study

The researcher experienced some difficulties during the fieldwork research. Most officials were unavailable while some did not respond to their emails and cell phones/telephones. The researcher made efforts to even visit different national government departments in Pretoria to request to conduct an interview but officials were not on duty in most cases. Some officials kept shifting the responsibility up to the point that no one could be interviewed in some departments. Another challenge was that the area where most government officials are based is far from the researcher's residence, which implied that the researcher would find accommodation the night before to be on time to conduct interviews with the respondents. This is because most officials preferred to be interviewed in the morning and that was going to be a problem if the researcher had to travel in the morning of the interview.

The researcher had to obtain a gatekeeping letter for every department she wished to conduct an interview. In most cases, this was acquired from the director's office or heads of departments. These officials were normally busy for an appointment or not

in office to draft a letter that permitted the researcher to conduct an interview. Some officials were writing end-of-the-year examinations and could not make it on time for the interview. Some officials from government agencies showed interest when the researcher visited their offices to request permission to conduct an interview but responded otherwise when they were supposed to meet for that interview. Most of them, when responding to the interview, they needed to know the date and time suitable for an interview. They promised to get back to the researcher but they never did so even after a follow-up email and phone call were made. Most officials were reluctant to give a permission letter that had their signature because they were concerned about their relationships with their co-workers. They felt that permission is as good as using their real names on the researcher's findings. The researcher had to make sure that they understood the importance of the permission letters because they had no problem participating in the study but they preferred not to be revealed in any way. They did not want to reveal their identity and needed a leg to stand on should they be pressured to admit that they gave confidential information to a researcher. The official's response caused a delay from the ethics committee.

The researcher was required to seek and find permission from all respondents for her to obtain an ethics certificate of approval but it took a bit longer when the country was placed under lockdown. This compelled most government offices especially in the national sphere to close, therefore, the national government offices and officials were inaccessible. Some officials were available for interviews because they were at home with their phones but most of them left the office stationery in their offices, so, they could not send the permission letters as promised. Besides, people were caught off guard; no one was prepared for lockdown. Some people were still in shock and did not know what to do. The researcher had to put the study on hold even when some had already provided the permission letters. They were unsure if it was advisable to conduct an online interview. Due to strict lockdown measures, the researcher had to make provisions for the interviews to continue even when it was behind the scheduled time.

All respondents gave consent to the online interviews and the interviews were scheduled online using the zoom application. Most of the time, the respondents were struggling with the network maybe because they were not in their offices or sometimes,

they were struggling with meeting at the time they agreed on. Often, some interviews had to be rescheduled to accommodate the respondent. The consent form made it clear that no recorders would be used during the interviews to protect the respondents' identity as their positions might be compromised even when the researcher did not use their names to report the study results. Measures had to be taken to make sure that they felt free and safe even during the online interviews. The researcher had to give them her word that they were not been recorded as assured before.

4.9. Summary

The chapter explained the research design employed by the researcher. The researcher explained the research methodology that was used and why it was used. The research project followed a qualitative methodology to acquire the research results and the chapter explained the benefits of qualitative methodology in this kind of study. The researcher collected data from two sources: the interviews and literature study and the study followed a contents analysis method. It was chosen for its flexibility and uniqueness in that it can be used in all types of written text no matter the source of the data meaning it can be used to analyse text data from any kind of interviews, books as well as observations. A brief explanation was given in terms of the sample that was chosen and the procedures that it followed.

To gain insight into the subject, the researcher conducted interviews with 13 government officials and 2 officials from a state-owned company. The researcher also used various sites for documents review and the following are among those sites: OECD, research gates, science direct and sage pub journals. The interviews took months with its huddles but the researcher managed to gain an understanding of what governance of digital innovation looks like in the public sector in South Africa. The ethics considerations were explained and full details were given on how the study followed certain procedures to acquire permission from the respondents as well as the university's ethics committee. The researcher further explained the challenges that she experienced during the research especially at the time that she was supposed to conduct interviews. It was difficult to get gatekeeping letters and the ethics committee approval without those letters. The lockdown made things even worse because although there was some minimal access to government departments, the respondents were reluctant to meet for interviews.

Chapter 5: Governance of Digital Innovation in South Africa: Findings and Discussion.

5.1 Introduction

The chapter presents and discusses the findings of the study in the context of the literature reviewed in the preceding chapters. Semi-structured interviews were conducted at various but specific, national government departments and agencies that applied to the study. All the departments are based in Pretoria, which is the capital city of South Africa. The previous chapters gave insight into how different countries govern digital innovation and among them, Singapore, Brazil and African countries including Rwanda and South Africa were explored. Most of these countries seem to have been lagging because of the slower network due to infrastructure and leadership capacities while those with advanced ICT infrastructure and leadership capacity seem to do well. This chapter will present the results collected from data after a discussion with government officials and officials from a state owned company on how governance of digital innovation is understood and accomplished in South Africa's public sector. It will give an understanding of how the government coordinates digital innovation in the public sector and point to the framework used, if there is any.

5.2 Qualitative data presentation and analysis of data collected from semi-structured interviews

Respondents were interviewed mainly because they were relevant to the study. These were from organisations and government departments that form a public sector digital innovation ecosystem. The researcher first identified one organisation fit for the purpose through an intense literature study. She then visited the Centre for Public Service Innovation offices and assessed their relevance and understanding of the subject. The first respondent became the main network for the researcher. The second part of the sample was then applied, which spoke to snowball. The CPSI official referred the researcher to all other organisations that interacted with them regarding the governance of public sector digital innovation. It became apparent that there are various organisations involved but they have their specific roles in the ecosystem. Therefore, the researcher had to contact them and arrange an appointment for an interview. All the interviews followed the snowball sample and through this, the

researcher secured 14 interviews. Some potential respondents were disturbed by the lockdown, even when they showed an interest to take part.

Some interviews were conducted at government offices as the preferred space for the respondents and a few other interviews were conducted online via zoom because of lockdown. Interviews were conducted with highly qualified, experienced or senior officials in the ICT divisions of identified organisations. The interview comprised eight questions that needed intense description to give an understanding. Therefore, the respondents had to have in-depth information, a deep understanding and be involved in the practical space of digital innovation in the public sector environment. The names of officials interviewed were not mentioned. This was to protect the identity of the respondents. The respondents were coded in alphabets such as A, B, C and D.

5.3 Results and discussion

The following is the discussion of the results from the respondent's interviews that were conducted at the government departments and agencies on the governance of digital innovation in the public sector in South Africa. The interviews were to investigate the existence of the digital innovation framework in the public sector in South Africa.

5.3.1 Public sector idea generation and digital innovation enhancement

Governance of public sector digital innovation requires an understanding of the concept and the meaning from government officials. They all demonstrated their understanding as they answered the first general questions that were posed. They demonstrated their understanding by identifying some work that is being done by different national government departments. Nonetheless, the first aspect of the governance framework speaks to the public sector officials and departments being able to generate innovative ideas that work within the department and later share the ideas with other departments. The public sector is expected to come up with innovative ideas and solutions that will improve the public services with limited resources (Khan & Khan, 2019:1). This entails national conferences, workshops and inside workers moonlighting to diffuse the ideas through other department's employees. Government departments and agencies need to learn and share innovative ideas that have been successful in other departments in achieving their goals (Walker *et al.,* 2011:97).

Respondent A said that their organisation is already sharing ideas with the private sector such as IBM. On the date of the interview, the respondent alluded that they had a meeting with IBM (International Business Machines Corporations) in the previous weeks. IBM has started a digital innovation programme in Braamfontein; they are also funding the whole programme. The project is called Tshimologong, which is a collaboration between the City of Johannesburg, University of Witwatersrand and IBM. It is a digital innovation ecosystem that aims to propel entrepreneurship and grow the skills pipeline for the digital economy. This is to comply with the equity equivalent investment programme. Respondent B agreed that ideas are filtered by CPSI but does not say much on how that filtering happens. The respondent does not have enough information on that. Respondent C referred to 2016 public service regulations which state that:

> If an employee makes a suggestion, improvement or innovation of exceptional value to the department or the public service as a whole or has exceptional ability, a special qualification or has rendered meritorious service, other than the service recognised in terms of the department's performance incentives scheme, to the department or the public service as a whole-
>
> a) The state shall have the right of use of any such suggestion, improvement or innovation
> b) The executive authority may only provide for in a directive issued by the minister, reward the employee through
>   I. A non-monetary reward
>   II. A non-pensionable cash rewards not exceeding 20 percent of the employee's pensionable annual salary
>   III. Such a non-monetary reward and a cash reward.

Respondent C added that:

> *but this is not happening in my experience with government departments. I have never seen or heard anyone declaring their rewards. Most officials are selling their ideas to SITA to make money. That does not benefit the departments*

because ideas are taken out of the departments. Then, SITA sells the developed ideas as programs back to the government.

This means the government does not follow its regulations to encourage innovations in the workplace. Innovation culture requires that employees should be rewarded for their innovations so that they are motivated but the South African government seems to be downplaying the employees' innovations as important. Respondent D explained that it is too early to determine if the current frameworks address employee incentives, sharing and diffusion of ideas and measures to review the performance of digital innovation in the public sector. Still, respondent D emphasised that

this is mainly because South Africa is still at a strategy stage; nothing much has been done to assess all these factors. It's still early as there are discussions on how to go about digital innovation.

Respondent E answered vividly with a:

No, because government departments operate within strict rules. The environment is not as free as you can think. How does one become creative if we are not allowed to risk? I mean no risk, no innovation.

Respondent F reported that:

government departments and agencies never share ideas. We never even sit together anywhere to discuss anything or ideas. There is no interaction of any sort.

Respondent G made it clear that:

there is no framework that specifies all these things but we do have forums made of the public and private sectors. But, the Department of Science and Innovation and different provinces have their sessions and SALGA organises a few meetings in the municipal space. CPSI has a yearly training and awards conference where different departments and the public come together and share ideas. Innovation hub has regular meetings but they are informal. There are also what we call innovation union events or summits that are attended by public managers. Most of these events have the

orientation of innovation but are not called innovation conferences to share ideas. For instance, we have operation Phakisa, which happens in the Department of Health and Department of Education".

Respondent K acknowledged that:

there is no space for sharing ideas in government; the environment is not enabling. There is not enough support for incubators, no framework that support sharing of ideas and there is no financial support either.

The respondent K suggested that there should innovation hubs in every government department to support innovations but instead, there are red tapes everywhere blocking innovations and sharing of ideas even within the government.

Khan (2019:3) suggests that learning and sharing knowledge allow employees to clarify the path from the generation of ideas to its implementation, which may lead to highly innovative solutions. Therefore, the public sector employees should be given a platform or environment where they can interact and share ideas.

On a different note, respondent G defined Gov-tech as a very useful platform where government departments and agencies share ideas:

We get to learn about what others are doing and that can improve those municipalities that are lagging.

Gov-tech is an annual conference organised by SITA; its main focus is public sector ICT service delivery. This is where government and private sectors meet and engage in ways to collaborate and identify new ideas to mainstream ICT solutions while ICT leaders share ideas, experiences, solutions and also showcase the power of technology to improve service delivery. At the heart of GovTech lies the acceleration of public service delivery solutions and the promotion of government modernisation. Respondent I believes that governments should share ideas with the private sector to improve digital innovations in the public sector:

Yes, we have an interest in idea sharing because the government cannot do everything by themselves. They need us and every other organisation that can make an input. CSIR has a cluster that works directly with research

and development but not that only, there is a part that develops pieces of machinery for private sectors, which is enabled by digital. That includes robotics, the internet of things, airplanes and that means, CSIR has the knowledge that can assist government to improve services. We know that CSIR has previously helped the government in their health department. This includes a system to use for their database where the public can consult in any hospital without using a file but just digitally stored information. We normally meet with other digital industries to share ideas and make contributions where possible.

Respondent J agreed that government parastatals need to adapt to problem solving, generating an idea and creating solutions for local to international impact:

For instance, our organisation's mandate is to solve problems, provide solutions and ideas, support the government and make money and it's easy because the organisation is neutral.

Respondent L alluded to Batho Pele encouraging that public sector employees should share ideas. As a result, there are frequent meetings at the CPSI conference to share ideas with organisations such as SITA, CSIR, Universities, other government departments and private companies. But, the respondent L contradicted respondent G in that:

GovTech conferences do not serve a purpose for sharing ideas but they create a platform for private companies to sell their ideas to the government. And truly, the government, later on, buys those ideas. So, it's like a market for private companies to show the government what they can do to improve their administration.

Respondent M noted that there is TIA that was formed so that people can be innovative and send their ideas forward to it to grow and fund them. The respondent complains that government employees are not locked out but they do not use the platform. Respondent N said employees are encouraged to work collectively and collaboratively by combining their strategies. They also partner with universities and have regular policy dialogue.

Innovation processes require interaction between leaders and employees to increase learning and knowledge sharing opportunities (Khan, 2019:1), which is something that is lacking in South African government departments. The leadership should be able to inspire the employees to generate innovative ideas and empower the knowledge-sharing practices to develop innovative skills in the public sector (Khan, 2019:2).

5.3.2 Workforce rewards and empowerment for digital innovation enhancement in the public sector

The public sector digital innovation framework necessitates work environments where employees are given rewards to motivate the culture of innovation and build the capacity of the organisation's workforce. Grady (1992: 160) also agrees that the managers should create a supportive climate for innovative activity and reward innovative performances. Incentives would most likely increase job security and encourage job promotions, which helps organisations retain skilled employees who appreciate rewarded for their innovative ideas (Koch & Hauknes, 2005:22). But, it was alarming that respondent A commended that:

> *the public sector does not give incentives to its officials even when there is a policy on that.*

The last time the respondent's department rewarded innovation was around 2016/2017.

Respondent B claimed that rewards and empowerment for digital innovation *is not a structured system.* Respondent B seemed not to have much information and could not explain what the structure is or looked like. Answering the follow-up question, respondent B said that:

> *there are systems being introduced to create a conducive environment. For instance, the private sector is being rewarded to support and train more people so that there are more skills around the country but the government is not putting in enough finances to assist in digital innovation developments.*

People need to appreciate that government provides bursaries for employees to study further; this is important for skills development and increasing capacity.

Respondent E mentioned that there are frameworks that the government tried to come up with to encourage creative public sector employees;

> *But, we don't have a reward system to encourage innovation in the public sector. Therefore, there are never ideas brought forward by employees.*

Respondent F "emphasised the word "tried" as a symbol that there is nothing much done in workforce rewards and empowerment. The respondent laughs and says:

> *there was a programme that took place where the public and a few government officials were invited to share ideas on innovation. The programme was called the innovation date hackathon but no government employee was given a reward even though their ideas were taken. The incentives were given to the public only*.

Respondent G is adamant that rewards are given in state owned enterprise such as Eskom and Rand Water. There are not many rewards in government departments. The respondent further pointed to metropolitan municipalities that have informal rewards but no frameworks and the City of Tshwane is one example that provides mayor's awards and supports skills development.

Respondent H said SALGA has its reward system for individuals who produced an innovative idea. The reward is in a form of recognition or is monetary. SALGA also recognises municipalities that did well in innovation.

This is one question that most respondents could not answer. It seemed they were unaware that the technological skills of government employees should be developed to match the needs of the digital age. Although they were unaware that government employees should be rewarded for their innovation, this could be the cause for not having an innovation culture. Officials could also think that their innovation is part of the job contract and nothing to be specially acknowledged. One recent example about the dispute in innovation is the case between Vodacom and Mr Nkosana Makate who invented "please call me" at the time he was working for Vodacom and demanded compensation for innovation in the workplace. Despite the court ruling in his favour that the Vodacom should pay him, at the time of writing, the company had not paid him.

Those who are aware that the public sector does not reward innovation end up selling ideas to SITA. Such employees are fully aware that SITA would then sell the idea back to the government. Respondent I suggested that:

> *South African government should arise to the call and live up to the 4th industrial revolution. Every department should be digital. Give legal support so that things are easy for the inventors and implementers from health systems, water purification, community alert on the road to renewing your disk online and also providing security of digital platforms. All these take legal support, availing funds and collaborating with the private sector, which is already in that space.*

Respondent J does not consider governance relevant in digital innovations but the only time governance is necessary for innovation is when managing the process of innovation. The respondent believes that

> *there is no innovation when there is governance; there shouldn't be any restrictions. Therefore, the government should open up the processes and let people innovate*.

It appears from the interview that the private sector would have to make recommendations to the government in creating a conceptual framework to govern digital innovation in the South African public sector. This confirms an observation by respondent I about the government not being able to do everything by themselves. Public-private sector collaboration is, therefore, very essential for developing solutions. Respondent J agrees that:

> *collaboration is good but it should be facilitated because and it's a process, not an event, which is not natural for most people*.

Just like respondent I about legal enablement for digital innovation, responded J agrees that there should be a willingness to try new things and create policies in line with technological policies. Respondent I suggested that the government should only come as a facilitator and funder of innovation. Respondent J said:

digital innovation would be not possible if there are structures that are designed for accountability and monitoring at all times. The well-designed government structures might hamper innovations; therefore, some level of chaos should be allowed for diffusion of innovative ideas.

Respondent I indicated that the government has the capacity along with established agencies and has enough funding to govern digital innovation:

But, what lacks is a will. They are not showing much urgency to speed up the processes and implement a digital innovation in their departments. There is NACI and NIS, for instance, to help foster innovation in the public sector. However, the government can do more. Why do we still have to visit offices to renew a licence disk while there are other simple ways to do it? Government should do more to improve things; the gig economy should be introduced to save on office space, transport system and improve the skills of young people. Young people would re-invent themselves through this.

The respondents agree that government does not show urgency in digital innovation. They all call for the Department of Science and Innovation to make broadband available and accessible to everyone. Respondent J had this to say:

So far, ICASA created expectations but has not lived up to them. No broadband infrastructure has been rolled out. Ideas should be given incentives; private and public sector partnership is hampered by technical infrastructure. The government should create an environment to stimulate innovation because right now, the culture is not suitable for innovation. The government needs to acknowledge and understand that innovation is needed and given a chance to research because right now, things are blurry.

Respondent K indicated that CPSI has a programme to reward government employees and the public. It has collaborated with the private sector such as MTN to raise funds to afford the price. Employees are rewarded for an idea and the idea is piloted in some government departments and adapted if it has potential. Respondent had this to say:

The environment is not good; this pushes other employees to lose interest in working for the government.

Respondent L said the updated Batho Pele encourages the rewards to innovative employees but recognition is for employees who have long service only. Respondent M regretted that:

the public sector has skills but employees are not empowered to bring solutions; IT graduates are used to support other workers with copies and printing.

Respondent N argued that:

The government pays university fees to encourage employees to further their studies so that they improve knowledge and technological skills. This serves as an employee's reward and recognition that they should work towards an improved government.

According to Fernandez and Moldogaziev (2012:156), “empowered employees improve performance by recovering quickly from errors in service delivery, learning from those recoveries and generating innovative proposals for redesigning processes and products. They continue to say that the link between empowerment and encouragement to innovate is significant in the public sector; the restrictions in the ability to reward might neutralise the effect of empowerment efforts.

5.3.3 Navigating Rules and processes in South Africa to enhance digital innovation in the public sector

There is an increasing awareness of digital innovation in the public sector but there is a lack of a necessary framework for understanding and measuring innovations (Bloch & Bugge, 2013:133). The governance of public sector digital innovation is about the rules and strategies to encourage innovation. Frameworks should guide and assist in terms of funding and aligning the innovations with the current policies and strategies of the country (Bason, 2018:14). Respondent A explained that:

policy frameworks that are in place are mainly national developmental plan 2030 and medium-term strategic framework 2014-2019. MTSF is a five years’

report created to analyse the developments and changes in digital innovation and assess if the plan is still followed.

Respondent B claimed:

Yes, there are policies and frameworks governing digital innovation but some are still in their formation stages and to date, we have cloud-first policy, national identity systems and national e-strategy to mention the few that I can remember.

Respondent C had no idea if the country had a framework yet but knew that the Department of Telecommunication deals with the strategies of public sector digital innovation and the Department of Public Service and Administration deals with the policy for public sector digital innovation and these two departments would be best placed to answer that question.

Respondent D indicated that the current frameworks that guide public sector innovation in the country are the white paper on technology and innovation including the ICT policy framework. The trade and industry department has a policy that speaks to digital innovation as well.

Respondents E and F had a different view of this. Respondent E said:

CPSI was mandated to come up with a framework, otherwise, we depend on the white paper on science and technology, which was amended in 2016. For now, there are no frameworks. Remember the government is still trying to understand digital innovation. There is nothing concrete as we speak, nothing that we can follow to the core.

Respondent F said that:

we are trying to come up with frameworks but as I said it's just ideas. It's easy to sit in the boardrooms and write but the implementation is another thing. If you go to government departments, you will see a television set with Wi-Fi installed for easy communication when there is a meeting and we have to use skype. The boardrooms have been equipped with digital systems but that's all. We still communicate with a paper with other departments and within the

departments and we have no access to digital means when we are out of the office.

Respondent G said it with conviction but with the same logic as respondent E and F that:

The frameworks that are governing digital innovation are scattered around. But, the most popular one is established by the Department of Science and Innovation, which is a white paper on science and technology and innovation. Other government departments and agencies have launched different frameworks related to digital innovation. For instance, CPSI has a framework as the mother body of innovation. The Department of Trade and Industry has a few policies related to procurement that are done via digital platforms. TIA also launched a framework related to human settlement; it was doing so in helping municipalities. Treasury also has a procurement bill that highlights the importance of digital innovation in the tender processes. The government is doing enough in terms of financial support. For instance, many regulations inside TIA and innovation hub were opened up to accommodate the digital innovation environment. There is funding but the funding issue is more complex because the public sector officials are struggling to create suitable processes. There are no dedicated funds for innovation; there are internal operational problems to source time and money.

Respondent H seemed to be discouraged by the way things are right now by lamenting that

there is not a single framework that speaks to all of us. Government departments are working on their own, therefore, we need a framework that will create an integrated ecosystem. The Department of Science and Innovation, Department of Telecommunication, Department of Public Service and Administration and School of Government should be working together to make a unit and create a desirable environment for innovation. No single department will make it alone. We need to create a unit and join the resources needed to achieve innovation transformation. South Africa

has no financial problems. There could be funding from different stakeholders who want to be involved. But, we should first be organised and coordinated in order to request funding. Because funders are interested in sponsoring innovation programmes, but they won't participate if we are in the state we are in now. Standard Bank and other international sponsors are always approaching us to make funds available for innovation. But, we don't have a well-coordinated team because we don't have one framework. We don't even know how the funds will be handled, by which department and how. That's the problem.

Respondents argue that instead, each department has started working on its own without other departments being part of the whole ecosystem. The strategy and data classification frameworks that are in place only speak to security or access to data and nothing more. This data refers to any form of data; it can be consumers, firms, open or classification data. Respondents also agreed that more has to be done. Their common hope is that the 4IR commission they all hear about will bring a change and create a favourable ecosystem. However, the respondents indicated that they are not involved in the processes of the 4IR commission meaning, their inputs about the best way to guide innovation in the public sector may not be heard. Nevertheless, the respondents were hopeful that the 2018 4IR strategy under the administration of President Cyril Ramaphosa would guide the much-needed changes.

Respondent I explained that:

digital innovation is new to everyone, so, we all have to learn. Government should change processes, make them easy to understand and use, then, make legal requirements that are not complicated.

The same respondent further noted that mainstream policies and technological policies are not keeping up with each other. She suggests that they need to catch up. There should be willingness to try new things and create ecosystem for innovation. The government seems to consider the public and political opinions more and that delays policies.

The remarks seemed to be common that there is no framework for the governance of innovation. While there is an increasing awareness of digital innovation in the public sector, there is also a lack of a necessary framework for understanding and measuring innovations (Bloch & Bugge, 2013:133). A framework will help create an ecosystem and give clear guidance on the roles of different stakeholders, the allocation of budgets as per the countries' objectives and how to create the innovation culture but South Africa is still using the old white paper on technology and innovation. Also, there has not been any other frameworks that can help coordinate different government departments. The lack of a digital innovation framework affects how government officials interact and developments of digital innovations are coordinated, which frustrate them. Hence, the country must have a central digital innovation framework as outlined by OECD. Most OECD countries have a national digital strategy with the objectives of developing telecommunications infrastructure, strengthening digital government, increasing digital security, promoting ICT skills, advancing e-inclusion and increasing the use of digital technologies in general (OECD, 2019:14). South Africa will have to establish a national strategy if the country wants to have an outlined plan with clear objectives and goals towards a digital economy.

5.3.4 Reviewing organisational structures and design in South Africa's digital innovation

Overall structures, institutional and political contextual conditions at the top and day to day operation of an organisation are important for innovation (Bason, 2018:28). The public sector officials of South Africa seem to understand the broader meaning of innovation and how it contributes to effective service delivery. Respondent A made a case that the Department of Science and Innovation collaborates with various agencies to facilitate innovation. The white paper of 1996 and the recent one of 2019 are the core frameworks used to guide and propel innovation in the public sector. Respondents accept SITA as the main developer and supplier of most digital innovations. SITA provides all government departments with digital innovations, from everyday administration in government departments to home affairs, licence department, SAPS and many other government departments and agencies. They point to a government programme run by Gijima technologies, which created a mobile

application to teach coding in the townships. These community-based programmes are vital to government efforts to implement digital innovation.

Respondent A emphasised that TIA is a key agent in funding new ideas while NACI advises the minister about innovation policies. The respondent argued that government should be open to accommodating start-ups at the lower level not only accommodating the ones who are already able to come forward and present their abilities:

> *Innovation and R&D surveys are done frequently by HSRC and Stats SA. They report on the impact and effectiveness of digital innovations launched and on how much should the government improve. We use a network or collaborations because we cannot come up with everything ourselves. The Department of Public Service and Administration is the one that's more responsible but we also collaborate with the Department of Communications, Microsoft, Gijima technology, Non-governmental organisations such as Black IT forum, and ICT SSME chamber.*

There have been complaints about the lack of a primary framework for digital innovation. Respondents also indicated that there are efforts for collaboration by various organisations in digital innovation. Respondent D alluded to an inter-ministerial platform by all spheres of government and key agencies whose purpose is to avoid duplication of resources and ideas unnecessarily. The respondent lamented that there is a lot of duplication in government spheres and departments at the moment, something that is not beneficial for innovation. Respondent E mentioned that:

> *the government does collaborate, not always but if there is a need for a different skill than what the department has. In most cases, we don't have time to negotiate the terms of collaboration, so, we end up doing things on our own.*

Respondent F alluded that:

> *We have collaborated with HSRC in a few projects though. Other than that, it's just transactional relationships with other agencies like SITA and the private sector like Gijima technologies. The two provide IT services to our*

department, so, you can't call that a collaboration. It's a business relationship.

The aforementioned respondents raise a debate about what collaboration constitutes and do not want to conflate business relationships with a mutually beneficial joint effort in digital innovation. Respondent G spoke about regional forums such as open innovation networks established by the Department of Science and innovation. This is where multiple sectors meet mainly focusing on water and food. *Therefore, where there is innovation, there is collaboration and networks.* Respondent H agrees that:

> *innovation is not something you can do alone. Hence, there is a collaboration between public and private sector institutions.*

While some respondents took SITA as a partner or an organisation one can collaborate with, respondent's E and F disagreed. They see their relationship with SITA as a business one. SITA only comes to their offices to provide service that is being paid for and will not participate in collaborations that will assist the government with digital innovation. Respondent I said that the government has shown some failures:

> *It is important for the government to include the private sector to close the gap on digital innovation and run systems.*

Respondent 1 emphasised the realisation of innovation being impossible when working alone:

> *The private sector can come in as facilitators, funders and for legal purposes. But, they cannot win if they want to do things by themselves*.

In this regard, one can see the potential for the public-private partnership approach in developing digital innovation.

Respondent J observed that:

> *innovation is found in a chaotic system. The more chaos you find, the more innovative people become. We don't need organisational structures; this will*

hamper innovations. The more organisational structures, the less innovation because of accountability. There will be more huddles to overcome before one is allowed to innovate. There will be a reluctance to try new things without testing them first because of government structures in place. There will be doubts.

There are similarities of opinion between respondent J and I in that:

there is a need for more freedom to get together and collaborate. But again, collaboration is not a natural process or an event; it needs to be facilitated until it gives results.

Results need commitment to implementation. Respondent K said:

government has employees that are good at writing but the implementation fails. There are no well-designed structures and suitable infrastructure for digital innovation.

In the same line, respondent L said that:

there is no budget specifically for digital innovation in government, no enablers such as trained human resources, no required technology.

From these views, it seems respondents believe that digital innovation is not prioritised. Other respondents have conceded that digital innovation is still in its initial stage. They point to the government's use of technology and digitalising in public services.

Respondent L noted that there is a considerable collaboration between CSIR, CPSI and the City of Johannesburg to foster innovations:

so there are existing structures but not yet formalised.

Respondent N reports that government's collaboration with organisations such as Tshimologong to improve skill and broadband across Gauteng. Some government departments have digitalised functions where human resources accept leave from submissions online. Universities, IBM, Gijima oracle, Accentia and Delloite are some of the organisations that are formally incorporated into the Gauteng digital innovation

structures to innovate and diffuse innovative ideas into the government and administration.

Bommert (2010:16) suggests that the government should follow collaborative innovation, which is like a networked government. Collaborative innovation emphasises that there should be coordination across government organisations and multiple parties or actors purposed to deal with digital innovations in the public sector because that would mean multiple alternatives or innovative solutions to suggest and consider. Torfing (2016:2) agrees that new idea will emerge when there are collaborations between government and private stakeholders who possess necessary resources, ideas, skills and motivation to meet the unfulfilled demands.

5.4 Towards a framework for improving the governance of digital innovation in South Africa

The study aimed to formulate a conceptual framework for the governance of digital innovation in South Africa's public sector. The researcher asked the respondents to give recommendations and contributions to the digital innovation governance framework. Respondent C recommended proper alignment and information sharing where;

> *government ministers could assist by having a defined role of various officials and departments. There will be less confusion and duplication of roles than there is now. Now there is confusion in who does what, when and how.*

Respondents E and F also agree about the necessity of frameworks that emphasise capacity building of employees in digital innovation. They are unhappy with the lack of coordination, working in silos. They call for the government to pilot projects in digital innovation as a way of skills development and streamlining policies. Respondent B and C had this to say respectively concerning increased budget:

> *fund research and make sure that the results are implemented, the government should also provide training in digital transformation Our young people must be*

sent to go learn more about what other countries are doing and bring back the knowledge.

Respondents are clear that South Africa should fix its policies especially on who is responsible for what in public sector digital innovation. There is a lot of confusion. Rwanda and Kenya are doing better than South Africa in most indexes. They spoke about the good efforts and outcomes that Rwanda has achieved through collaboration with the World Bank. Respondent G called for consideration to the unique environment in South Africa's digital innovation considering that different countries have different layers. The respondents argued that the South African policy environment needs more consultations while ICT needs decisions to be made faster. This way, respondent G calls for action or implementation of policies. Respondent G also called for the rapid decentralisation of broadband roll-out for South Africa to be more competitive in digital innovation.

Respondent H suggested that South African needs a clear innovation agenda coordinated in such a manner that it develops skills and supports local municipalities. The respondent complained that only metros are doing well in digital innovation;

Johannesburg is launching a framework on a SMART city as we speak and the City of Tshwane, the City of eThekwini and the City of Cape T own are doing well but other local municipalities are lagging. We hope that the 4IR commission will create a flow of governance because as we speak, we are not sure who is doing what and where; every department is doing its own thing.

The above recommendations, which will contribute to the formulation of a digital innovation governance framework, highlight mainly that South Africa has no basic framework that guides public sector innovation across all spheres of government. Therefore, there is a need to formulate a central digital innovation framework that should clearly define the roles of different stakeholders. Most of the respondents were concerned about the confusion of roles in government regarding digital innovation in the public sector. They hoped the framework would assist coordinate a digital innovation agenda. They claim that there is no single department that handles digital innovation. But, almost every government department is contributing to the agenda and ends up duplicating the same projects with none of them being a success or being

done excellently. The respondents suggested that the government should find it within their means to create one central department to focus on digital innovation and roll-out programmes, projects, strategies and policies. Furthermore, the framework should help finance research and development, provide training and skills development. They called for international exchange programmes for young people who are interested in science and public servants keep being agents of digital innovation. Government should also retain the skills within the public sector and not lose them to the private sector. This will be a challenge noting that government is unwilling to offer competitive remuneration.

The respondents argued that having a single department or at least a single guiding framework for innovation would do away with the working in silos approach and reliance on research consultants. The challenges that respondents point out about decentralised governance of digital innovation and lack of digital innovation coordination are like those identified in the proposed National Policy Development Framework 2020. Just as the National Policy Development Framework seeks to regulate the policy management process, the National Digital Innovation Framework would regulate the management of digital innovation in the public sector. Respondent G noted that such a national framework would change the policy formation process as it delays innovations in a fast policy environment. Respondent K recommended that the funding mechanism should be improved and the role of CPSI be strengthened at cabinet level, CPSI needs to be recognised as an independent organisation.

Respondent M recommended that the government should work hard and implement the digital innovation framework:

> *They* [government] *should benchmark and decide where to stop replication as it wastes money. Why doesn't the country have the ministry of ICT instead of wanting to force it under a certain ministry?*

5.4.1 Conceptual framework for the governance of digital innovation in the public sector in South Africa.

The South African framework for public sector innovation is guided by CPSI. CPSI has a mandate as an agency to develop and innovate responsive models to improve service delivery (NACI, 2017:60).

Through intense literature study on different countries in Africa and international ones as well as interviews results from various respondents, the following model was developed to give guidance. Three areas would have to be explored to be able to achieve a favourable ecosystem for the governance of digital innovation in the public sector.

1. **Organisational structures and processes** develop a framework, build integrated system (networks and collaborations) and the central point for coordination
2. **Infrastructures-** ICT infrastructure and broadband accessibility
3. **Workforce empowerment -** technological skills development, skills retainment and attraction, organisational culture and sharing of ideas

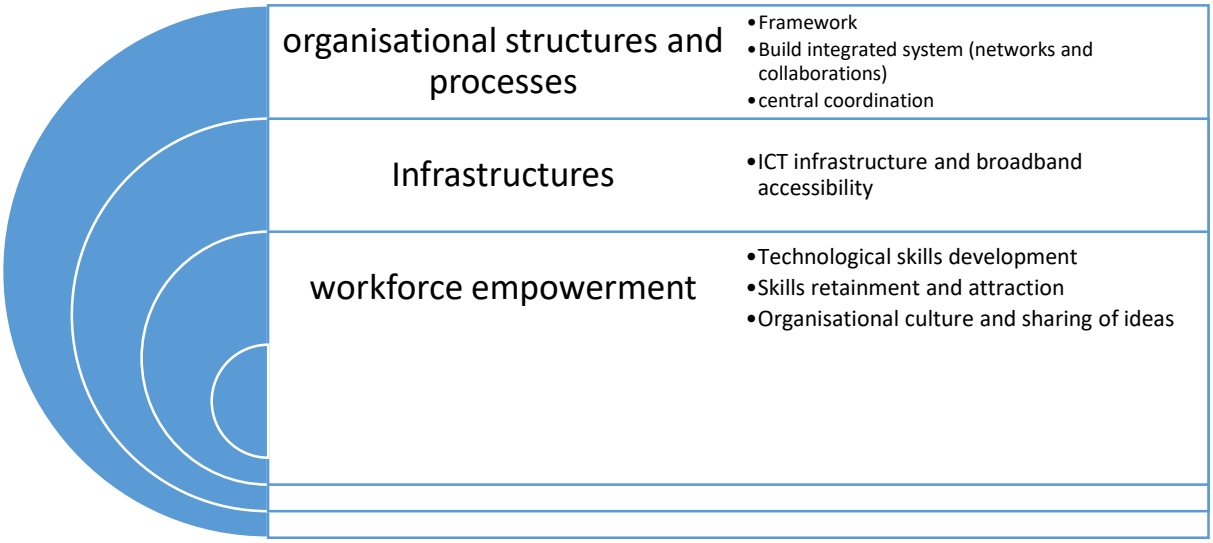


Figure 3: Conceptual framework for digital innovation in South African public sector

5.4.1.1 Organisational structures and processes

The public sector innovation is mostly hampered by strict regulations that are influenced by bureaucratic processes of governments that do not encourage a suitable environment for innovation. For example, the legal or constitutional constraints may reduce the access to funding or elected officials having fear of uncertainty associated with innovation or entrepreneurship may slow the process of innovation (UNECE, 2017:6). This necessitates governments to formulate new frameworks that favour innovation especially digital innovation that is necessary for this digital age but they should be ignorant of the risks posed by artificial intelligence (AI). In some instances,

artificial intelligence may display uncertainties such as taking over the decision making, which makes these AI systems ethically questionable; the government must be able to manage new forms of innovations and its risks (Taeihagh, 2021:2).

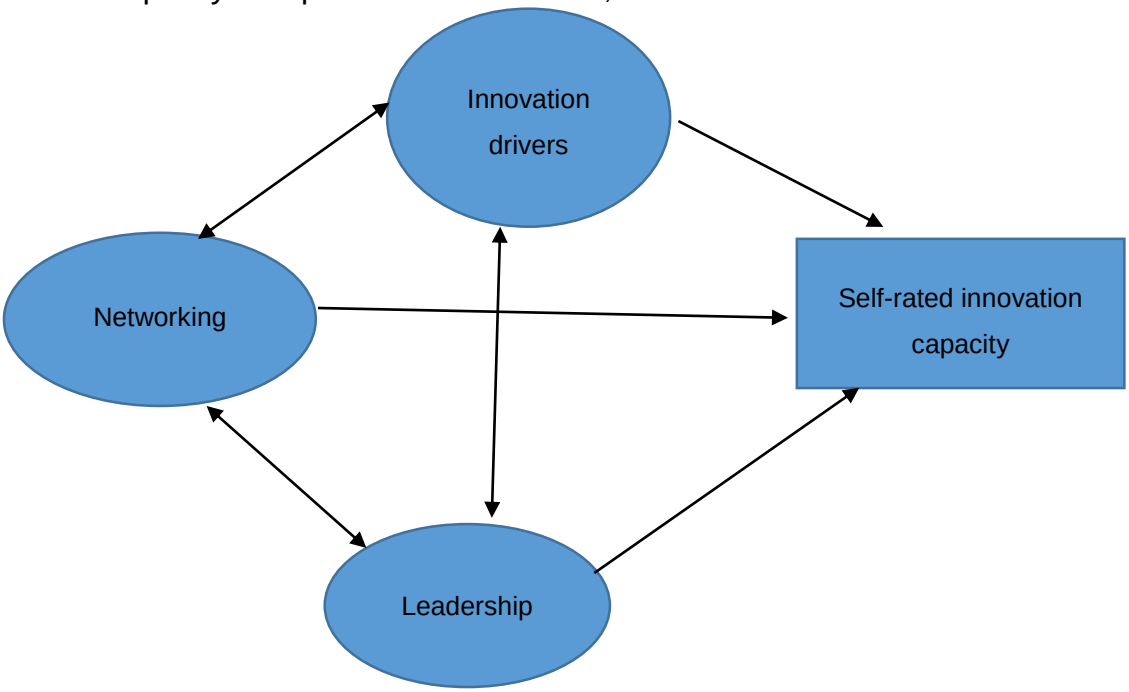
The national perspective on digital innovation provides a comprehensive view of the understanding nature of innovation, meaning innovation will not be promoted if it is not supported by those with central powers and authorities (Manzini, 2012:5). Political leadership is key in this instance because it formulates regulations and frameworks that govern almost everything in the country. They can also influence decision making in policy making processes. Leadership is, therefore, an important part of initiatives related to public sector digital innovation. Policy making processes create a culture of government organisations. They inspire a sense of mission and purpose, stimulate new ways of thinking and also promote creativity when solving problems, which lead to followers being innovative (Villaluz, *et al.,* 2018:140).

Innovation in the public sector is driven to improve service delivery, therefore, the formulation of the frameworks should be guided by political leadership that is willing to embrace the digital use mainly to improve public service (Lee, *et al.,* 2012:149). A framework that is informed by the current knowledge on digital innovations and the needs of people will result in a formation of an ecosystem that is well-coordinated and considerate of the most affected people in the rural areas (Mashinini, 2008:136). The government will solve problems faster if they consider forming collaborations and networks. The benefits include less money will be spent directly by the government; there will be more resources mobilised from the private sector and there will be a general improvement on service delivery (Lee, *et al.,* 2012:150). The network should be a combination of different experts from different institutions such as universities, the private sector and other different government departments and agencies as well as interested public inventors.

However, innovation depends on the stakeholder's willingness to freely generate and share ideas and collectively realising in a form of value to the product, hence, collaborative achievement and not individual responsibility (Dovey, 2009:312). It is now clear that the innovation capacity of any other organisation is dependent upon its environment, internal structures and processes. Political and administrative context, legal culture, state and governance traditions as well as resource arrangements can

hinder or influence innovation in the public sector. This proves that leadership preferably transformational leadership style is key to innovation as it supports innovation and creativity. Networks will require coordination and in that case, leadership is also important.

Figure 4: Conceptual model linking innovation drivers, networking leadership and innovation capacity: Adopted from Lewis *et al.,* 2017:293.



5.4.1.2 ICT Infrastructure

Internet and broadband are necessary if the government wants to provide efficient and effective public service. Services can be provided online and citizens would not have to travel long distances to access services. Furthermore, rural citizens will be able to participate in decision making processes when the government makes new policies but lack of a sufficient technological infrastructure hampers communications and interactions between government and its people (Ntetha & Mostert, 2011:133).

The government of Argentina highlights connectivity in the country's Digital Agenda 2030 as one of the major factors that enable digital innovation as identified by the OECD framework for digital government. The country launched a national connectivity and telecommunication plan to increase broadband internet access in the rural areas.

This is because installation of the required resources will guarantee the expansion of and quality service and digital inclusion will develop digital skills, which will increase employment opportunities (OECD, 2019:54).

The Mexican government has also recognised the importance of ICT infrastructure as an enabler of rural economic development and also help the government of Mexico to provide various services such as e-health and e-education to its citizens. This led to the country drafting a National Digital Agenda 2013 (Fanfalon, 2015:4).

South Africa faces the challenge of not having a sufficient network infrastructure. People in rural areas still struggle with the network, which could eliminate the difference between the urban and rural public sector service provision (Mashinini, 2008:130). The broadband prices have also made accessibility very rare because not everyone can afford the high prices. Even the regulation of broadband prices is necessary to ensure competitiveness, delivery as well as equality and inclusion (Gillwald & Stock, 2008:2). Some townships and towns have WI-FI points, which were set in a few government facilities such as libraries and schools but it is not every township and town that has free WI-FI. Those with free WI-FI do not always give access to everyone automatically as they need a passcode to have access. This makes it difficult for everyone to participate in the economy. Young people need internet access to apply for universities and employment opportunities and new licenses and all this need access to fast and affordable internet. There is a need for government intervention in installing the necessary infrastructure but they will only be able to do this if they collaborate with the private sector.

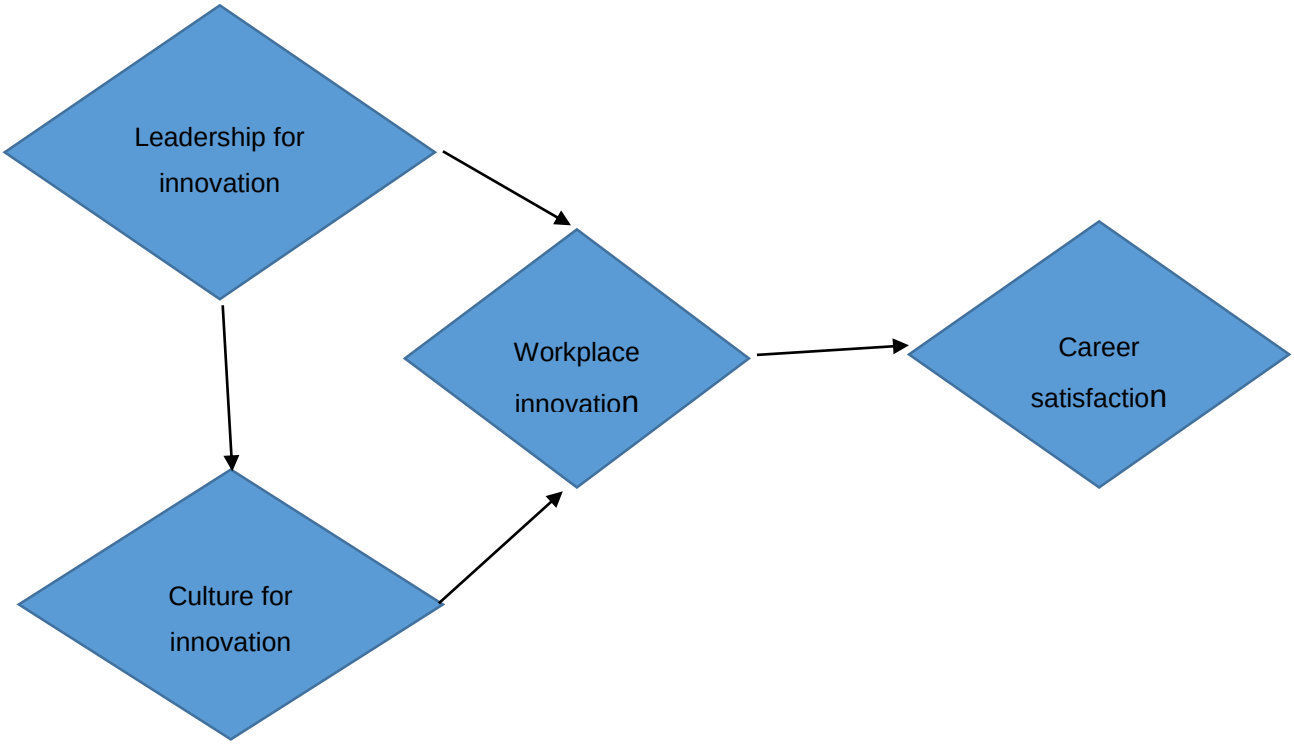
5.4.1.3 Workforce empowerment

Every organisation needs a sufficient workforce that necessitates workforce planning, which is done for the future demand in the workplace. The government should also be able to have human resource strategies that will speak to the goal and objectives of the government in the future (George, 2019:10). Digital skills are important and would need to be recruited if they are unavailable and those in the organisation should be trained to fit the current and future needs of the organisation and build innovation teams. The government of Australia developed a digital transformation strategy 2018-2025, with the primary objective of providing a government services that are simplified,

flexible, responsive and efficient. The third key point of the strategy seeks to create a government that is fit for the digital age and its focus is mainly on building digital skills development among the public service workforces. More programmes are developed for government employees to enhance digital skills and digital service training, mentorship programmes and meet up events (Gekara *et al.,* 2020:8).

In the South African public sector, there is a culture of buying innovations from the private sector instead of training and recruiting new skills. This norm can only be destroyed by applying HR practices that encourage the employees through the reward system and employee recognition (Panigrahy & Pradhan, 2016:6). Organisational culture is key to innovations in the workplace, therefore, the management should be well equipped and trained in driving innovation culture and building a suitable workplace climate in the organisations. Transformational leadership seems to be the relevant leadership style known to enhance creativity and foster innovation (Khalili, 2016:2287). The culture of innovation should be made a normal way of doing things. Employees should be given autonomy to innovate without fear of failure or risk to lose positions and money. They should be trained to be competitive through an easy communication platform that the management can use. This will make an employee feel important and want to own the space of innovation, consequently, increasing the chances of innovation (Uslu, 2015:1464). Leadership and innovation culture are considered the bases for innovation in the workplace. The role of leadership is a critical predictor when considering the degree that the subordinates would be creative. Therefore, is important to have a leadership that will inspire subordinates to recognise and perform organisational goals and objectives and further foster an innovation culture, which will result in career satisfaction as employees are recognised and rewarded for their ideas (Wipulanusat, *et al.,* 2018:896).

Figure 5: Conceptual model for pathway on the workplace: Adopted from Wipulanusat, *et al.,* 2018 :893.



5.5 Government's challenges to forming well-structured governance of public sector digital innovation

Digital innovation has become a buzzword in recent years; the public sector scholars have explored it and found it relevant in the public sector as well (Sorensen & Torfing, 2012:1). Since the transformation from the old public sector reform, the public sector has been moving from the traditional way of doing things or providing services to a new reformed way of delivering services to the people (Brown & Keast, 2014:108). At the centre of its well lies the citizen who is involved in the governance of public resources and freely participating in the decision making as well as policy making and digital innovation in the public sector provides such platform for the public to participate and the government to account to the public (OECD, 2016:11).

Digital innovation has ample benefits; it will enhance the organisational practices and its procedures and processes before the problem occurs. It will focus on continuous improvement of the organisation and be creative in providing services. For instance, it will provide openness and transparency and make it possible for the government

information to be freely accessed on their websites. Citizens will experience a speedy service provision; they can pay their water and electric bills without visiting the government offices but its success depends mainly on the governance. This necessitates that the frameworks should be in place; there should be adequate skilled workforce and infrastructure that is viable and well aligned organisational structures and processes (Martins & Ledimo, 2015:576). The fore-mentioned factors have proven to be a challenge for most governments. The interviews reflected on a few challenges faced by the South African public sector in order to realise a well-defined success in the governance of digital innovation in the public sector and they are presented next.

5.5.1 Workforce and talent capacity

Cinar, *et al.,* (2019:271) identified systematic barriers in the public sector innovations and they mentioned a few that are related to the workforce: (a) the public sector does not seem to recruit enough talent, retain or expand on what they already have and, (b) most technically skilled employees are moving to the private sector due to the work environment and improved income. To curb this, the governments would have to hire additional skills and capabilities from outside because they normally do not have skills readily available. Otherwise, employees would not be able to perform additional work. Governments need a long-term plan and budgets to increase their hiring and spending capacity. According to Borins (2001:311), the public sector is less fertile than the private sector for innovative employees because there are incentives for their innovations. Innovations in the public sector are shared between the government and the innovator, which discourages most individuals to pursue a career in government. These scenarios are not different to the South African innovation ecosystem for not many employees are technically skilled and more skilled employees are moving to outside countries or private companies. Therefore, the government would have to increase their budget to create a lucrative environment for technologically skilled individuals.

5.5.2 Maintaining culture in government

The internal bureaucratic culture of government has to change and internal processes have to be restructured to fit the ever-changing needs of the society. Culture refers to the way things are done around government offices (Bason, 2018:6). Government is slow to change and private sector engineers should not join the government and

expect to make a sweeping change. One respondent revealed that officials show interest in innovation in the public sector but the government is not investing enough in digital innovations. Moreover, there are no rewards even if an official would bring up innovative ideas except for recognition, hence, fewer innovations, which reflect on government as not having the culture of innovation, because some employees would like to partake in innovation but the culture of innovation is not encrypted in government processes; employees should stick to what they are employed to do amazingly.

Mergel (2017:20) notes that central teams as well as urgency teams gain experience by working in a start-up cultural environment. Feshenden and Thompson (2012:984) reckon that the government should learn from the private sector if they want to transform the way their services are designed and provide services, to a point where there are models that allow end-users to manage how they want to transact. Citizens should be able to interact with the government without visiting their offices but from the comfort of their homes, using an application that is accessible to all citizens. For example, Gauteng has NATIS, which is an online booking system to book for your license renewal; they can make sure that one is able to load the required documents and take fingerprints without visiting the traffic department. But, currently, the system does not allow one to do all that from home. You still have to visit the department and stand in the queue the whole day just to renew something you already have. It should be called queue management just to make sure that the stations are able to manage the demand as you cannot go to the department without a booking. Private stores and markets now allow a client to shop online; clients can choose what they and the quantity and they can pay online and the item is delivered to their homes, be it medication, clothes or car parts to mention a few.

5.5.3 Lack of Digital teams in government

Digital innovations are transforming different industries including the public sector, yet digital innovation teams remain indefinable. However, it is important to understand the teams that work within an organisation that have adopted digital transformation to position themselves for success in this age of technology evolution (Hadjielias, *et al.,* 2020:373). Digital teams operate within an established organisation and they are involved in interactions and processes that will create new or improved products,

services and organisational processes (Hadjielias, *et al.,* 2020:373). The digital service teams are sometimes working in a vacuum and are scrutinised by the whole organisation (Mergel, 2017:20). This is a point that is reiterated by Hadjielias *et al.*, (2020:373) that there is a need to assemble the digital team because no one knows exactly how they function, how they interact and the tasks they perform while generating technological innovations for their organisations.

Digital teams are at the heart of the innovation process in an organisation and the team is made of experts and motivated individuals who normally deal with complex issues and work under uncertainty. So, they depend on sharing ideas and knowledge to accomplish innovative solutions for their organisation, hence, digital team members require digital skills, capabilities and mechanisms that will allow them to function within complex environments and also to address rapid changes in digital technologies (Hadjielias, *et al.,* 2020:375). Towards the end of new public management, digital government design elements were organisationally disaggregated and the IT responsibilities were given to a decentralised unit that led to most of the IT functions being outsourced and incentives and rewards given to contractors (Mergel, 2019:2). A few respondents articulated this as the way things are done even in South Africa. Most technically inclined employees are not allowed to explore what they are good at; they end up being administrators in the departments rather than IT experts. Instead, the government outsources from the private sector.

Today most governments do not have enough pool of IT talent to deal with their daily technological demand or innovation. This is because most digital government initiatives depend on the priorities of the seating government administration at that time; they decide what they will focus on as government and recruiting IT talent might not be the focus at the time (Mergel, 2019:2). In the South African scenario, there is a chief information officer in every government department. This was provided by the Public Service Corporate Governance of the ICT policy framework of 2012 after the commission reviewed the state of ICT governance in the country. They are supposed to liaise with each other but the respondents proved otherwise. They do not form digital teams in their departments; they are like the representatives of innovation stakeholders that do not have regular meetings. So far, this office does not seem to have much impact in terms of public sector innovation and its governance.

5.5.4 Lack of funding for digital innovations

One respondent alluded that the national government does not have a budget for organisations that they started such as CPSI but they gave them a mandate to innovate, pilot and distribute working ideas to different departments if possible. Yet, these organisations depend on donors and not mainly on government funding. The Department of Public Service and Administration launched CPSI as its agency and body to focus on public sector innovations but there is a lack of funds to influence the innovations, diffusion and adaptation to different departments.

5.5.5 Confusion in whether innovation should be bought or built by the government

The IT infrastructure is built outside the government because the government does not have software engineers. If the government wants to innovate, then, they should not limit their IT capacity and not treat digital like a computer problem (Mergel, 2017:22). Digital teams should be allowed to bring new organisational and structural approaches into government to foster the development of an innovation culture, consequently, impacting how the public sector interact with the private sector (Mergel, 2018:737) because there is no evidence that government has little capacity for innovation. However, IT support is offered mainly by the private sector even when some government employees have the capacity and qualifications to bring solutions (Lewis, *et al.,* 2018:289). The respondents claimed that the government would rather buy the services; hence, it is rare to hear about big innovative solutions developed by government departments or agencies. This seems to deter most IT graduates from joining the public sector because all they do is some administration work, which in some cases, includes printing and copying.

One respondent said that the government was supposed to encourage collaboration between its agencies such as SITA and CSIR to encourage innovation. But, these entities have become almost private because they sell their services to the government instead of collaborating with other government department employees to encourage digital innovation. The truth is that there are employees who are technically inclined and have an interest in innovation but there is no platform for their interest in the public sector.

5.5.6 Structural constraints

Understandably, the public sector is faced with a bigger challenge than the private sector when it comes to innovations mainly because the public sector has a more regulated environment than the private sector (Mergel, 2018:728). Government institutions also lack a dedicated space for innovations, innovation culture and most governments do not have a chief innovator or a concrete innovation structure that can assist in fostering innovation (Mergel, 2018:739). One respondent supported this statement and said that is the reason the government needs to accept that they would rather have the private sector generate digital innovation solutions. He also reiterated that the government cannot be a competitor with the private sector in the economy.

The public sector has more structural constraints as compared to the private sector; officials report to the political heads who have a political mandate (Cinar, *et al.,* 2019:273). This might create a delay in the internal processes of any government. Some delays might be caused by fear of failing the public as a political party as they should account on how they used the finances (Potts & Kastelle, 2014:124). The structural constraints are obvious in the South African context as all officials interviewed seem not to understand who should be responsible for what; there are no roles distributions for digital innovation yet. All respondents alluded to the confusion of roles and project mandates. Roles and responsibilities are not yet described and this costs the state a lot of money because in some cases, projects are duplicated and funds are misused. Government officials that were interviewed made it clear that it is unclear to anyone now; the country is still at an infancy stage and they are still learning.

5.5.7 Lack of a central framework

The government has an important role to play in an innovation ecosystem. It can play a role of a regulator by creating regulatory bodies across its spheres and introducing frameworks for safety in the network space (Windrum & Koch, 2008:7). South Africa only launched a commission called 4IR commission in 2018. This was initiated by the President's office to formulate a governance framework for public sector digital innovation that will be central to the transformation of the public sector (Sutherland, 2019:234). Until now, there has been no framework that stipulated a clear mandate to every government department and outlined roles and responsibilities as well as the

funding procedures and internal processes. All the respondents desired a central framework that will help coordinate all the government departments, spheres and agencies.

5.6 Summary

The chapter provided the findings of the study in detail and per the literature review and the interview results. The researcher's general reflections on the interview are that the government understands what public sector digital innovation is. Thirteen out of fifteen officials used the same response and their responses link to the fact that the government has established agencies that speak to innovation in the public sector, agencies such as CPSI, TIA, CSIR, NACI and innovations hubs. Only one respondent thought government does not understand the public sector digital innovation

All the respondents acknowledged that there is no framework specifically to the governance of digital innovation in the public sector. Three of the respondents mentioned that South Africa uses the white paper on science and technology 2016 on science and technology as well as NDP 2030 formulated in 2012 for guidelines. While others did not know what the country was using and referred the researcher to the Department of Communications. However, all respondents encouraged that digital innovation should be coordinated through one central framework because at the moment, there is confusion regarding responsibilities. Two respondents explained that the reason for this might be that digital innovation has been a thing for the private sector and is still new for the public sector. One responded indicated that it is too early to determine the framework and anything that should fit into it. The other one said digital innovation is still at an infancy stage, so, nothing is structured as yet.

The common themes were that there is no coordination and that the required skills are unavailable in the public sector but believed this could easily be solved through a national framework outlining role players and responsibilities. Four respondents said that there is a confusion of roles and every department wants to contribute without consulting anyone and this causes duplication and chaos. One respondent claimed that the chaos is caused by the government department that wants to lay their hands-on digital innovation funds without producing results. There are funds available due to pressure caused by global trends. One respondent mentioned that *the confusion is*

created by frequent replacements of minister, every time there is a new minister, there are new rules, new vision, new target and new mandates.

One respondent explained that the government should fund more research entities so that the decisions are made faster because there will be a pool of information to easily make the decisions. The respondents from the private sector had a different solution. One respondent suggested that the government should leave the space of digital innovation to the private sector and only acts as the facilitator who funds and determines the legal processes. Another respondent reported that chaos is good and can bear good results for innovation flourishes where there are no designed organisational structures; people should be allowed to freely innovate. This is a point that one government official also made that the public sector is unwilling to take the risk and allow everyone to innovate. The respondent explained that government should not expect innovation in a well-coordinated and governed environment.

Four respondents added that human resource capacity is also key to the success of innovation diffusion in the public sector. They believed that government should emphasise HR developments and training as well as recruitment and retaining of necessary ICT skills. It did not seem like the government has any space for employee rewards when they performed well or participated in any innovation projects. This might be one of the reasons most government employees are not interested in bringing forth ideas or even remaining longer with the government. Instead, the retainment of skills has to look at how to keep necessary skills longer in government and employee rewards can motivate longer stay in any organisation.

All respondents mentioned that they have hope that things will change and work out very well as the president has launched the 4IR commission. At the time of the interview, the respondents said they had no idea who participated in that team and they did not know any of the participants solely because the participants were not from their departments or agencies. The main factors seem to be the coordination of public sector digital innovation through a governance framework. The framework should emphasise formulating policies that will be compatible with digital age, building employees' capacity, creating an innovation ecosystem that include an innovation culture of generating and diffusing ideas, an environment with fewer legal requirements and more ICT accessibility to everyone.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The chapter is concluding what the study was about; it determines the extent to which the objectives of the study have been accomplished. The chapter will also make references to the hypothesis made in the study, to establish the analysis of the hypothesis. The chapter will also pose recommendations to the South African public sector or government.

In chapter One, the researcher showed interest in research about the governance of digital innovation in the public sector in South Africa.

In chapter Two, the researcher focused on five objectives of the study which are, the theoretical exposition of governance of digital innovation in the public sector and the international experiences when it comes to governance of digital innovation in the public sector. The researcher gave a theoretical understanding of the public sector, governance, network governance and expanded knowledge on innovation as well as digital innovation. The chapter further dwelt on how different international countries as well as African countries are governing the public sector digital innovation, emphasising the use of the framework recommended by OECD and answering the objectives of the study.

In chapter three paid focused on the last four objectives of the study. The objectives were aimed at assessing the governance of digital innovation in South Africa. The governance framework is looked into to determine how the South African government governs its digital innovation. The country's policies, frameworks and structures and assessed against the four determinants of international standards for the public sector digital innovations.

Chapter four outlines the research design used to collect data. Qualitative research methods were used in this study. Semi-structured interviews were the prime tool used to collect data from different government officials and private sector officials. The

chapter looked at the ethics considerations in the study as well as the challenges experienced by the researcher throughout the study.

Chapter five is about how the researcher collected data by interacting with different respondents. The chapter covers the responses from different government departments' officials, agencies and the private sector officials.

Chapter six gives more attention to the findings of the study; it corroborates whether the findings match the objectives of the study. The chapter gives effect to the findings and makes recommendations on how to improve the governance of digital innovation in the public sector, particularly in South Africa.

6.2. Empirical summary

The study followed a qualitative method. The researcher conducted interviews with 15 respondents and most of them were based in Pretoria. Most of these interviews were conducted at the respondent's preferred space while other interviews were conducted online via zoom or Microsoft teams due to lockdown that was implemented by the government in 2020. The purpose of the interviews was to investigate if there is a digital innovation framework in place in the public sector in South Africa. The study findings are outlined below in line with the study objectives.

6.2.1 Generating and sharing ideas

The diffusion of digital innovation depends on the environment in which it occurs and this environment is shaped by regulatory and legal frameworks associated with trade, competition, privacy and intellectual property rights (OECD, 2016:11). CPSI was launched to prompt public sector employees and the public to innovate. The organisation rewards those that are doing well during the competition and some of these ideas are adopted in different government departments like SAPS. Intellectual property rights play a vital role in protecting local inventions. Delays and uncertainties in the reform of South Africa's intellectual property rights regime are a concern. Furthermore, there is uncertainty concerning the future of power purchase agreements, copyright amendments bill and ICT regulatory framework, which may deter the investment in innovation (The World Bank, 2012: 47). Different officials that

were interviewed made it clear that there are no platforms for public officials to sit and share innovative ideas that will help transform the public sector into digital government.

GovTech conference that is usually organised by SITA is the only platform that allows all public and private sector officials to gather in one place and share ideas, besides that, government officials do not usually collaborate or share ideas. However, one respondent disputed that GovTech conference helps in any way when it comes to sharing ideas. She said that a conference is like a marketplace where different private companies are given a platform to present their innovative ideas to government departments so that they can buy if they see them fit for their development or advancement but it is not a place where officials share ideas and create an opportunity for future collaborations.

CPSI offers another platform to the public and public sector officials to bring forth their ideas and compete for their ideas to be recognised and rewarded. There are few private companies such as MTN that sponsor such competition. This encourages the public sector employees to participate and be recognised. Other than this, the national government does not necessarily have an open platform for a different government department to meet and share tried and tested ideas or even new ideas. Every department seems to be working on its own. One respondent complained about the employee's ideas not being rewarded. He said that there is a policy on employee reward but the government does not reward its employees for their ideas. This discourages them and sometimes, they sell their ideas to the highest bidder. If there is a conference where digital innovation in the public sector is discussed, it will be treated as an item in a long list of other items not as a focused area of discussion. This seems to create problems for other officials because they do not understand the importance of digital innovation in improving service delivery or inter-governmental relations.

6.2.2 Empowering the workforce/Capacity and skills

The government seldom rewards innovative employees. There is normally a lack of incentives to encourage new thinking among employees (Casebourne, 2014:6). But, that is not the only element to look at when one needs to motivate innovations in the public sector for the culture of an organisation is also important. Public sector servants'

function within a constraints bureaucratic environment that might resist change and innovations (Casebourne, 2014:12) and this might demotivate them and become less innovative and less productive and, in the future, they might leave the public sector. The public sector officials lag necessary skills that match the digital age. The government does not seem to give required training or empowerment to the existing workforce. They do not recruit necessary skills and cannot even retain the required skills. Most government employees that have skills and ideas are deterred by salary and work conditions; they leave the public sector and go work for the private sector or leave the country.

Most officials interviewed suggested that there should be a method that the government can use to recruit new skills and retain them by motivating the existing ones because there is a need for technological skills in the public sector. Skills development is a major issue in the government departments. Some officials are said to have been employed to assist with further development in bringing an important change maybe in technological advancements or initiatives only to be doing administrative work like copies, printing and filing. Two respondents indicated that there is this issue in their departments. The digital innovation framework will help realign the roles, the limitation or barriers for every department and the finances needed to explore the different areas which still need attention. At the moment, there is less focus on workforce empowerment and skills building, which is necessary for digital government.

Another respondent had a different view when she commended that there are many university graduates who join the government and other government agencies with the hope that they will be placed in strategic teams only to find that they will be kept in the back seat doing some administrative work. This means the government can recruit qualified and motivated IT graduates but they do not have a plan on how and where to use them. They end up being administrators who get bored and frustrated and also underpaid because of their job descriptions. She suggested that the government should have a central ministry for ICT or digital innovation, then, all digital innovations programmes and plans will be under one central umbrella. This will limit confusion and maladministration of funds. The skills in the country do not match the skills needed for the 21st century. The country lacks high-end technical skills such as data science and

high-end coding and vocational training is not doing enough to produce artisans for level skills (OECD, 2014:29). Few universities are changing their curricula to include new digital skills to address this.

The skills problem might not be fully addressed as many people are leaving the country to search for opportunities elsewhere (Department of Telecommunication and Postal Services and ITU, 2018). There are records of graduates migrating to OECD countries in recent years. According to OECD 2012 cited by the World Bank (2012: 11), about 19 000 people migrated to USA, UK and Australia in 2015. These are people who are skilled in business, information technology and health care. South Africa is not different. According to the Department of Communication, the main challenge to the implementation of the Information Society Development Plan in South Africa is because of ICT skills shortage, which is aggravated by skilled ICT personnel and professionals leaving to work in developed countries or from public to the private sector (Naidoo, 2012: 65). This was also evident in the report made by NACI (2006:82). The National System of Innovation has its weaknesses as well. The lack of trained specialists to create new products and the lack of young researchers in the public sector is a problem because the South African government spends low on education and training. A digitally competent workforce, with basic digital skills and advanced specialists, is necessary to strengthen the foundation of digital transformation for they will extend the application of the digital tools to different sectors, be it health, agriculture, education and transportation (Bashir & Miyamoto, 2020:7). Therefore, South Africa needs to work on their digital skills development to match the demand that is currently available.

6.2.3 Navigating Regulations and Policies

Digital platforms and activities are increasing at a fast pace and are important because they are used for various reasons, some for sharing information and some for interaction with clients but the governance around them is not well developed. There is a need for an integrated framework of digital innovations at the national and international levels. This framework should entail policies, principles and regulations and developing it will require international and as well as a wide range of stakeholders to interact (Fay, 2019:27).

South Africa is not immune to this call. They also need to formulate a governance framework for digital innovation in the public sector. It is plain from the interviews that the country does not have a central framework for digital innovation in the public sector. The officials mentioned that the newly formed 4IR commission is expected to bring forth a governance framework that will help coordinate digital innovation. Other than that, the government works with this subject as they go. They create policies that will assist them as they go. This means every department has a booklet or policy that speaks to ICT but is not aligned with any other national policy or framework. This creates confusion for national government officials because they also seem not to know where their roles or powers end. Things are a blur and now well coordinated. The government understands that ICT is one other component of the 4th industrial revolution that cannot be ignored. Broadband will enable the access of ICT services more so when it is affordable.

The Department of Telecommunications and Postal Services developed the national integrated ICT policy white paper in 2016, mainly to address service access for all, digital innovation, ICT infrastructure and fair competition (NACI, 2017:58). Even after all these efforts, there is still a lack of a well-developed framework in South Africa. It was evident at the beginning of this study in 2018 that the government has not adopted a framework that will drive the implementation. The country requires an integrated policy framework, which will emphasise different government departments collaboration. This will result in policy certainty and cohesiveness among government departments and spheres to foster digital evolution. Research conducted by the World Economic Forum to assess the readiness of South Africa indicated that the country is a follower. The assessment was made based on four maturity levels: global leaders, legacy champions, followers and high champions. Global leaders have a strong manufacturing base and are ready for the future. Legacy champions have a strong manufacturing base but reflect risk in the future. Followers have a limited manufacturing base and are underprepared for 4IR, therefore, are at risk for the future. High champions have limited manufacturing but are ready for the future (NACI, 2017:59).

The public sector has developed various frameworks for innovation, for instance, OECD's 2015 framework. The framework focuses on four pillars and are the officials

involved, the information utilised, rules and regulations that govern them and their interactions (NACI, 2017:60). South African government seems to be in the early stages of the digital age. There are a few developments made towards digital innovation in the public sector but no central framework has been established yet. The government departments are still dependent on the 2016 White paper on science technology and innovation. It is a common belief among most government officials that there should be a central digital innovation framework that will give guidelines on the responsibilities of each department and the systems of coordination because there is still confusion among the government departments.

It is only recently that the President of the country, Mr. Ramaphosa, launched a 4IR commission in 2018 and this was concurrent with this study. The commission was formed by 12 main committee members who will be joined by other officials from different government departments and agencies that included the Department of Science and Technology, which is now called the Department of Science and Innovation and HSRC. The commission had some responsibilities to carry out, among others, the commission had to develop a digital innovation framework that will be central to all other government policies. This was to influence the economic development and the adaptive process to technological applications in all facets of the human development in the country in some way so that all other policies may align themselves with the requirements of the framework.

All respondents had a problem with the coordination of digital innovation roles and structures, which can only be answered by a central framework. This proves that this study was necessary as there is arguably not a single framework that explains the roles of different officials from different departments, which leads to the misappropriation of funds as there is a duplication of resources and initiatives in most departments as one respondent mentioned.

6.2.4 Reviewing Organisation's design

The government exists for public purposes and any action by the government gives it legitimacy for decisions taken. Innovation helps the government to rediscover and reconnect to the public purpose. Innovation in the public sector helps the officials to explore new and better ways to provide and improve services. Most important

innovations are those that contribute to the capacity of government, to adapt to the changing environment and changing demands of citizens. This opens up the opportunity for cooperation across government departments and beyond, for instance, working with the private sectors, civil society, communities and individuals (Bourgon, 2014:3). Most government agencies are in Pretoria where most national departments are and this does not assist those in remote areas. The likes of TIA, CSIR and CPSI are government agencies established to foster innovations especially in the public sector and the public is expected to participate in their programmes but there is a problem of accessibility and knowledge about these agencies to the public.

The country seems to be doing well in terms of supporting the digital innovation initiatives, for instance, there is TIA, which is entrusted with funding and piloting of the innovations from the public, private organisations and public sector employees. There is also CSIR, which is always working with the government to develop new technological ideas to improve service delivery in the public sector. Even when the government made efforts in establishing these agencies, they do not always work collaborate in their missions or plans. Each organisation seems to be working on its own. They never sit to share innovative ideas and form collaborations unless if it is for the business, for instance, SITA would only visit government departments to offer their IT services and not work on a collaboration with other agencies. One respondent mentioned that this might be because so much funds have been made available in the digital innovation sector to match global trends. Now, the government is fighting with each other. The government made efforts in the previous years to extend ICT infrastructure to the rural areas but most of those were no longer in place. For instance, the post offices were empowered with ICT telecentres to assist those in the rural areas but most post offices no longer offer those services to the communities. This was also to build technology skills in the communities.

Innovations are stimulated by partnerships or networks that go beyond conventional, organisational structures. Partnerships can be with private sectors, citizens or within government departments. This partnership can lead to the formation of innovative institutions, entities and governance approaches. For instance, Denmark has a MindLab, which is a ministerial entity but it works with service users, public sector organisations and private companies to design an innovative solution for public

service. Arrangements such as this can help in drawing/grouping competencies and risks (OECD, 2017: 20).

The country needs to clarify institutional arrangements and eradicate the tensions found across the different sectors. The structural conflict exists between government and competitive players in the market because the state has two roles of a competitor and a policy maker. Therefore, there should be better role distinctions and clear strategies and approaches to avoid irregular policy outcomes. Public consultations are also important as well as the autonomy of the state to act on their own and be captured by a few individuals. Accountability will be exercised through parliament oversight and justice administrative processes to ensure transparency (NDP, 2018:175).

The Department of Communication was given the mandate to establish a 4IR framework together with other appointed committee members but most officials that were interviewed from different departments had no idea who was in the committee and how they were selected because they expected to be part of such formation as they also worked closely with the subject. This demonstrated some flows in the structural processes in government departments. They do not seem to work interdependently or in collaboration, exactly what most officials referred to during the interviews that they work on their own. There is no relationship between government departments, which demoralises the officials in most times because some lack information while others lack skills. Some have skills but lack financial support. Finances are there in most cases but there is no direction to where and how to do things. 4IR framework is seen as a hope that they waited for and they hope it will give a directive as to how and who.

South Africa has organisations that are well established. The problem might only be in their designs for they are not designed to work collaborate in their existence, which causes conflicts. Every organisation does what they intend to do without consulting with other departments. Therefore, there is a duplication of projects or initiatives and resources. There is not an open discussion or understanding of the responsibilities of organisations. CPSI was established by the Department of Public Service and Administration to coordinate officials and the public to develop and pilot ideas but it seems the government does not give them finances to execute its mandate, which

means, they depend on the department and sponsors. It then defeats the purpose of the organisation if it is well-funded but is expected to fulfill its mandate fully.

6.3 Recommendations

6.3.1 Leadership and political will

Digital innovations have a great potential to transform societies and economic systems but some risks should be governed while democratic values and human rights are considered. The government plays a vital role in the development and diffusion of digital innovations (Bounfour, 2016:20; Kuziemski 7 Misuraca, 2020:30). The government is the regulator or the facilitator; they should develop a framework that will guide the private and the public on the ethical use of AI and the use of digital innovations should then influence the policy designs and the administration processes thereof (Clarke, 2019:403). The government should be the main actor in the governance of digital innovations. For instance, they must stimulate the developments and regulate the use of digital innovation; there should be clear and more disciplined ways to access valuable citizens' data (Kuziemski & Misuraca, 2020:30). However, governance of digital innovation should be innovation-friendly and not hamper innovations, which implies providing security for buyers' information and trust in new products and their use (Scheltema, 2014:5).

Future innovation policies should be more influenced by the demand for innovation, which has spiralled from the demand for improved public services and social needs of the future (Edler, 2006:24). Political, professional and community/business leaders have a key role in encouraging and cultivating public service (Hambleton & Howard, 2013; 56). Civic leadership can easily create platforms for people to come together, especially those who might not normally meet to have an innovative dialogue. More research suggests that the public service innovations are created in more informal and personal interactions. This could be when leaders step out of their authority spaces and meet up with the community to engage about their realities and perspectives (Hambleton & Howard, 2013; 56). When different perspectives are brought together, this will enable questioning and uncomfortable debates, values and priorities collide but this will promote a culture of listening and it could lead to innovations (Hambleton & Howard, 2013; 56).

6.3.2 Human resource skills and organisational cultures

Innovations require organisational culture and climate that is suitable for innovations. This creates a challenge for the human resource manager to align the organisational strategies with the empowerment of human resource that would foster organisational development and improve organisational culture (Wipulanusat, *et al.,* 2018:893). Human resource plays is an essential part of every organisation to reach its goal, therefore, a strategic HRM will assist the organisation in retaining, recruiting, selecting and training the required skills and talent and also reward employees according to their performances, which will motivate employees to innovate (Papa, *et al.,* 2020:592). A digital innovation framework should be in place, including policies and regulations that will guide the HRM processes that include retaining, recruiting, empowering and rewarding employees (Papa, *et al.,* 2020:592).

The HRM strategies should be aligned with the digital innovation framework so that the main objectives and goals of the organisation can be achieved (Panigrahy &Pradhan, 2015:12). Innovation culture does not form part of the job descriptions in the government department. Employees are only employed to carry out the task at hand. One respondent said some of them resorted to selling their ideas to the private sector and the same private sector sells the same idea to government because there is no recognition and reward for their innovations. One respondent suggested that there should be training for knowledge empowerment because most government employees were employed before the digital era, therefore, they struggle with technology. The government should be willing to invest in human resources and research aimed at digital innovation projects/gains.

6.3.3 Coordination between all government spheres, departments, the private sector and the public

Different parties should be involved to achieve a well-balanced digital innovation ecosystem. The connection between innovation policy goals and socio-economic needs should be established to set the innovation policy objectives (Bekkers, *et al.,* 2011:4). A policy agenda should be shared across government departments and other stakeholders to understand the possibilities of satisfying the social needs through digital innovations (Bekkers, *et al.,* 2011:4). Digital innovation strategy should

encompass all the facts including the conflicts that might rise between innovation and sectoral objectives. This necessitates inter-ministerial coordination; the process should be set from the main stakeholder of the national government department but the coordination should be streamed to other levels of government and private sectors (Elder, 2006:25). For instance, in South Africa, the Department of Communication and Digital Technologies and the Department of Science and Innovation can work together to formulate a digital innovation strategy that will suit the needs and demands of the public and the future social demands aligned with the government's main objectives or policy agenda.

To avoid conflict and promote understanding of a national strategy, all sectors should be included in the formation of the nation's digital innovation strategy or framework. The Department of Public Service and Administration should reinvent its processes and policies to match the requirements of the information society, which means, they must re-think the existing processes and policies. The government must ensure that its department managers and heads of departments understand their mandate regarding transformation into digital innovation.

6.3.4 Methods to assess the progress and performance of e-governance to ensure sustainability

There should be regular reviews of the performance of short projects and their requirements to evaluate the impact of any digital innovations and the effect of the decisions on the public service. The public sector, unlike the private sector, does not seem to have a measuring tool. They mainly depend on self-reports such as interview and surveys but there is now the OECD Oslo manual developed by NESTI and it is a recent document that serves as a universal guideline when collecting data on innovation. This manual relies on the National Statistics Office and collects extensive data, comparing the public and private sector and also compares the service provision between the private and public sector.

It is also important to conduct a survey testing and assessing the public; this will influence the public policy-making processes (Kuziemski & Misuraca, 2020:11). Not a single respondent had an idea on how the South African government measures digital innovations' impact or progress. This is one element that needs attention so that the

government can assess its progress and failures. It can be done through surveys and the national statistics office can assist in this regard.

6.3.5 collaborations and innovation networks

Collaboration allows people to share information and tools; it empowers individuals to work without limits by engaging in the processes of collaborations (Marabito, 2014:113). The implementation of government digital strategies necessitates the collaboration of different government spheres and departments as well as agencies, the private sector and the whole society. Such collaborations can assist in improving service deliveries and relieving the government of the burden (Mikhaylov, *et al*., 2018:3). Collaborations will assist with building a bridge between different parties. They will enforce joint objectives between the government and the private sector, consequently building an aligned goal. They will be a contribution made by the private sector and universities during their communication with the government (Mikhaylov, *et al.,* 2018:3).

Collaboration allows a diversity of actors across different hierarchies and organisations and this will provide different expertise and the whole digital innovation will make sense to every stakeholder. As a result, they will be willing to participate because they understand what the system requires (Bommert, 2010:22) There is a sense of understanding that these networks and partnerships between government and private sector and other affected actors will accommodate the development and implementation of new ideas in a way that will revive public policies and services (Sorensen & Torfing, 2012:1).

In South Africa, there seems to be collaborations between government and the private sector but it is usual. The trend is that the private sector provides services to the government and there are a few instances when the private sector funds government innovations. In one interview, the respondent made a commend that she wished things were as on paper because on paper, they should be having more collaborations and conferences but the private sector and the government are pulling in different directions. The government is a consumer and not a partner. Universities and other science bodies are bringing solutions and innovations but again, in most instances, the government becomes a funder of those projects.

6.3.6 Telecommunication infrastructure

This era is very important as society is transformed and there is rapid adoption of digital technologies, thanks to the availability of data throughout the world and the advancement in computing in dealing with the emergency of COVID-19. The public showed more trust in government to play a vital role in making sure that the policies are relevant to the current digital technologies and the AI ecosystem has become the main policy issue as real-time accessibility to information and services became more important and the relationship between the government institutions and the public strengthened (Kuziemski & Misuraca, 2020:11).

A study was conducted on the adoption and diffusion of the use of e-government services in Romania and the findings were that majority young people who were aware of e-government services and those who were equipped to use technology were likely to use these services. Therefore, citizens need to be informed about the digital services that the government offers so that they use them and participate where required (Colesca & Dobrica, 2008:213). The main stakeholder for digital government is the citizen, government administration and private sector; the aim is to simplify administrative processes, cut costs and improve public services efficiency (Andersen, *et al.,* 2011:239). The government website and communications should be made in the languages that people understand to curb the illiteracy gap; some people could use technology if they understood the language used. They should also use technology that citizens are familiar with such as a mobile cell phone to provide services and influence the transformation. For instance, the public should receive messages on their cell phones about their updated bills and also be encouraged to pay their bills via mobile transfers.

6.4 Recommendations for further research

The study was initiated in 2018 and this is the year when President Ramaphosa of South Africa introduced the 4IR commission, which was mandated to launch the digital governance framework. The commission started working on a new framework in 2019. The framework was completed just before the final stages of this study. Therefore, this study should continue to establish if the current framework assisted in any way concerning the identified challenges that the study identified, coordination, skill

resources and financial support to mention a few that were key in this study. Interviews should be conducted with the Department of Communication and Digital Technologies as well and the Department of Science and Innovations. These two departments changed their names during the study. They were changed to usher and accommodate the new era of digital innovation in the public sector. It is essential for the researcher to understand why the names were changed and how the process of 4IR policy framework unfolded and if there were major changes that it introduced in different government departments. The researcher should show interest in visible changes that are there about structural designs that speak to co-ordinational measures improved. Also, the thrust is to find out if there are any efforts on collaborations and sharing ideas among government employees. The last attempt is to check on how the framework speaks to the improvement of the current ICT infrastructure and access to the ICT infrastructure by the general public.

The research was conducted during lockdown, which had its challenges. For instance, not all relevant officials were available due to the lockdown regulations. Further research should be extensive and extended to more officials in the relevant national departments and government agencies as well as the private sector especially those that are working closely with the government. It will give a broad understanding of the subject and give light on where to focus more. The research focused on the national departments, hence, processes to give permission to conduct research were lengthy, which denied the researcher the opportunity to have a large pool of respondents. The researcher recommends he research that is comprehensive and that considers all the other stakeholders.

6.5. Concluding remarks

The chapter gave an understanding of where South Africa is in terms of digital innovation framework. It has concluded that the country still has to develop a framework that will help create a conducive environment for the innovation ecosystem. Furthermore, the researcher provided recommendations for the South African government to create a well-articulated digital innovation framework. It became clear that the governance of digital innovation in the public sector in South Africa is still at an infancy stage; not much has been done.

The following are the illustration of what is currently happening at the national level. The country has different national government departments working towards a digital government but it seems difficult because they do not have a central governance framework yet. Several government structures are established by the national government to foster innovations across different departments but there is a lack of coordination, which causes even more confusion for government officials because the roles of different stakeholders are not outlined anywhere to make interaction, sharing and diffusion of ideas easy or build a well-informed ecosystem. Lastly, there are regulations and processes that speak to employee rewards but none of them is utilised.

The research was conducted at the time when the country was actively formulating the digital strategy. Then, the researcher, made recommendations for further study to assess the 4IR policy framework against OECD recommendations and what other countries already have and to see if it makes any impact across government organisations and public service improvements. The current 4IR policy framework is supposed to bring light to how processes will unfold and how the innovation ecosystem will be built going forward.

7.1 Reference list

Abrahams, L. & Burke, M. 2020. Innovation in monitoring and evaluation for e-development and transformational government. https://ieeexplore.ieee.org/abstract/document/6524702 Date of access: 28 Aug. 2020.

Agere, S. 2000. Promoting good governance: principles, practices and perspectives. Commonwealth secretariat. London. https://books.thecommonwealth.org/promoting-good-governance-paperback Date of access: 12 Jul. 2020.

Ajagbe, M.A. Sholanke, A.B., Isiavwe, D.I. & Oke, A.O. 2015. Qualitative inquiry for social sciences. http://eprints.covenantuniversity.edu.ng/5293/#.YLUIIPkzbIU Date of access: 31 May. 2021.

Akhtah, I. 2016. Research design. https://papers.ssrn.com/sol3/papers.cfm?Abstract_id=2862445 Date of access: 31 May. 2021.

Alberti, A. & Bertucci, G. 2007. Innovation in governance and public administration: Key issues & perspectives (Department of economic and social affairs Innovation in governance in the Middle East, North Africa and Western Belkans New York. UN pg 3-12) https://www.researchgate.net/publication/317507525_Pathology_Bureaucracy_Reality_of_the_Indonesian_Bureaucracy_and_Prevention Date of access: 01 Jul. 2020.

Albino, V., Berardi, U. & Dangelico, R. M. 2015. Smart cities: Definitions, Dimensions, Performance and Initiatives. https://www.researchgate.net/publication/311947485_Smart_Cities_Definitions_Dimensions_Performance_and_Initiatives Date of access: 21 Jul. 2020.

Ali, F. 2013. The South African telecommunications environment: A brief assessment for regulatory change https://www.researchictafrica.net/publications/Evidence_for_ICT_Policy_Action/

Policy_Paper_7__Understanding_what_is_happening_in_ICT_in_South_Africa.pdf Date of access: 13 Jul. 2020.

Ammusan, L. & Oyekunle, O.A. 2017. Conceptualizing innovation management development through Organisational learning in the public service: any lesson for developing states. https://www.businessperspectives.org/pdfproxy.php?item_ id:7663 Date of access: 26 May. 2020.

Amy, I. & Rahayu, Y.S. 2018. Collaborative innovation in digital ecosystem. https://pdfs.semanticscholar.org/23a7/974f2f645c50eefec337771d47b86ea9b141.pdf Date of access: 19 Jul. 2020.

Andrade, A.D. 2009. Interpretive research aiming at the theory building: adopting and adapting the case study design. The qualitative report, 1(14)42-60. https://www.researchgate.net/publication/264555272_Interpretive_Research_Aiming_at_Theory_Building_Adopting_and_Adapting_the_Case_Study_Design Date of access: 10 Sep. 2021.

Andersen, K. N, Medaglia, R., Vatrapu, R., Hendriksen, H. Z. & Gauld, R. 2011. The forgotten promise of e-government maturity: Assessing responsiveness in the digital public sector. https://www.sciencedirect.com/science/article/pii/S0740624X11000542?casa_token=eJJA3jYKsCEAAAAA:2F7ON5EiBROudvDLtY7ZF5WlaY1Qyf2ZsCbVRjn9auQ6o9Gj2fvg-WOYTh7iy34anL8aFZwCLw Date of access: 31 May. 2021.

Anggadwita, G. & Dhewanto, W. 2013. Service innovation in the public sector: A case study on PT. Kereta Api Indonesia. https://www.researchgate.net/publication/256077622_Service_Innovation_in_Public_Sector_A_Case_Study_on_PT_Kereta_Api_Indonesia Date of access: 15 Jul. 2020.

Anon, 2016. Science, technology and innovation: recent policy development in South Africa http://www.oecd.org/science/inno/2112129.pdf Date of access: 04 Jun. 2018.

Anttiroiko, A., Bailey, S. J. & Valkama, P. 2011. Innovations in public governance. Ebook. Ios press. Netherlands. https://www.iospress.nl/book/innovations-in-public-governance/ Date of access: 26 May. 2020.

Annual report 2014/2015. CPSI. 2015. Unlocking innovation. http://www.cpsi.co.za/wp- content/ uploads/2016/05/AnnualReport2015.pdf Date of access: 15 May. 2020.

ASSAF, 2013. Review of the state of science, technology and innovation system in South Africa https://www.assa.org.za/files/reports/8%20November%20NSI%20State%20of% Date access: 16 Apr. 2018.

Australian Government. 2007. Tackling wicked problems: A public perspective. https://www.apsc.gov.au/tackling-wicked-problems-public-policy-perspective Date of access: 07 May. 2020.

Avgerou, C., Smith, M.L. & Van Der Besselaar, P. 2008. Social dimensions of information and communication technology policy. e-book. Springer. Pretoria. https://link.springer.com/book/10.1007%2F978-0-387-84822-8 Date of access: 13 July.2021

Barendse, A. 2003. Innovative regulatory and policy initiatives at increasing ICT connectivity in South Africa. https://www.researchgate.net/publication/311621772_Telecommunications_in_South_Africa_Governance_of_who_is_actually_regulating Date of access: 28 Jun. 2020.

Bashir, S. & Miyamoto, K. 2020. Digital skills framework and programs. https://openknowledge.worldbank.org/handle/10986/35080 Date of access: 05 Nov 2021.

Bason, C. 2018. Leading public sector innovation: co-creating for a better society. 2nd edition. https://policy.bristoluniversitypress.co.uk/leading-public-sector-innovation-1 Date of access: 07 Jul. 2020.

Basu, S. 2004. E-government and developing countries: an overview. https://www.researchgate.net/publication/228939077_E-government_and_developing_countries_An_overview Date of access: 10 Jul. 2020.

Bekkers, V., Edelenbos, J. & Steijn, B. 2011. Innovation in the public sector: Linking capacity and leadership. EBook https://www.palgrave.com/gp/book/9780230284524 Date of access: 07 May. 2020.

Bengtsson, M. 2015. How to pan and perform a qualitative study using content analysis. https://core.ac.uk/download/pdf/81181707.pdf Date of access: 25 Jul. 2020.

Bertot, J.C., Estevez, E.& Janowski, T. 2016. Digital public service innovation: Framework proposal https://www.researchgate.net/publication/299388163/download Date of access: 15 Sep. 2019.

Bessant, J., Alexander, A., Tsekouras, G., Rush, H & Lamming, R. 2012. Developing innovation capability through learning networks. https://academic.oup.com/joeg/article-abstract/12/5/1087/973923 Date of access: 01 Aug. 2020.

Bevir, M. 2009. Key concepts in governance. London: Sage. https://www.worldcat.org/title/key-concepts-in-governance/oclc/744290196 Date of access: 13 Jul. 2020.

Bingham, L.B., Nabatchi, T. & O'Leary, R. 2005. The new governance: Practices and processes for stakeholder & citizen participation in the work of government. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1540-6210.2005.00482.x Date of access: 03 Aug. 2020.

Bisong, B.D. & Oguwmike, J.C. 2020. Electronic governance and fraud detection I internally generated revenuein cross river state, Nigeria. https://v2.itweb.co.za/event/itweb/governance-risk-and-compliance-2020/ Date of access: 24 Jun. 2020.

Blanche, M.T., Durrheim, K. & Painter, D. (2nd ed). 2006. Research in practice. 2nd ed. Cape Town: UCT Press.

Bland, T., Bruk, B., Kim, D. & Lee, K.T. 2010. Enhancing public sector innovation: Examining the network innovation relationship. https://journals.sagepub.com/doi/10.1177/0095399711418768 Date of access: 18 Jul. 2020.

Blind, K., Pertersen, S.S. & Riillo, C.A.F. 2017. The impact of standards and regulation on innovation ib uncertain markets. https://core.ac.uk/download/pdf/82677505.pdf Date of access: 14 Jul. 2020.

Bloch, C. & Bugge, M.M. 2013. Public sector innovation-from theory to measurement https://www.researchgate.net/publication/259137359_Public_sector_innovation-From_theory_to_measurement Date of access: 15 Sep. 2018

Bodin, O. 2017. Collaborative environmental governance: Achieving collective action in social-ecological systems. https://www.researchgate.net/publication/319171247_Collaborative_environmental_governance_Achieving_collective_action_in_social-ecological_systems Date of access: 07 Aug. 2020.

Bommert, B. 2010. Collaborative innovation in the public sector http://observgo.uquebec.ca/observgo/fichiers/57785_GDO1.pdf Date of access: 15 Sep. 2018

Bond, P. 1998. Basic infrastructure for South Africa's economic development, environmental protection and geographical desegregation: South Africa'sunmetchallenges. https://journals.sagepub.com/doi/10.1080/00420980120084813 Date of access: 22 Jun. 2020.

Borins, S. 2001. Encouraging innovation in the public sector. https://www.emerald.com/insight/content/doi/10.1108/14691930110400128/full/html?queryID=41%2F5412397 Date of access: 19 May. 2021.

Bormmer, 2010. Collaboration innovation in the public sector: Electronic journal at https://www.innovation.cc/volumes-issues/intro_eva_sorensen_torfing _17v1i1.pdf Date of access: 14 Jun. 2020.

Bornman, E. 2016. Information society and digital divide in South Africa: results of longitudinal survey. https://www.researchgate.net/publication/282235624_Information_society_and _digital_divide_in_South_Africa_results_of_longitudinal_surveys Date of access: 07 Nov. 2019.

Bounabat, B. 2017. From e-government to digital government: Stakes and evolution models. http://www.webmail.revue-eti.net/index.php/eti/article/view/117 Date of access: 02 Aug. 2020.

Bounfour, A. 2016. Digital futures digital transformation: From lean Production to Acceluction. E-book. Springer. France. https://link.springer.com/book/10.1007%2F978-3-319-23279-9 Date of access: 17 July. 2021.

Bourgon, J. 2014. Innovation in the public sector or public innovation? https://www.pgionline.com/wp-content/uploads/2015/08/Innovation-in-the-Public-Sector-or-Public-Innovation.pdf Date of access: 22 May. 2019.

Brousseeau, E., Marzouki, M. & Meadel, C., 2012. Governance, Regulations and Powers on the internet. UK. Cambridge. https://www.amazon.com/Governance-Regulation-Powers-Internet-Brousseau/dp/1107013429 Date of access: 28 May. 2019

Brookes, R. 2007. A study of UK policy regarding public access to ICT (In Griffin, D, *et al*., ed. Development in e-government. Netherland. IOS Press. P182-195). http://ebooks.iospress.nl/volume/developments-in-e-government Date of access: 18 June. 2019.

Brown, K. & Keast, R. 2005. Citizen-government engagement: community connection through networked arrangements. https://www.researchgate.net/publication/27466333_Citizen-

Government_Engagement_Community_Connection_Through_Networked_Arrangements Date of access: 06 Jul. 2020.

Brynard, P.A. & Hanekom, S.X. 2006. Introduction to research in management-related fields. 2nd ed. Pretoria: Van Schaik.

Buckley, D.A.H., Charles, P.A., Nordsieck, K.H. & Donoghue, D.O. 2015. The southern African large telescope project. https://www.researchgate.net/publication/241245138_The_Southern_African_Large_Telescope_project Date of access: 22 Aug. 2020.

Bughin, J., Chui, M. & Manyika, J. 2010. Cloud, big data and smart assets: ten tech enabled business trends to watch. https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/clouds-big-data-and-smart-assets-ten-tech-enabled-business-trends-to-watch Date of access: 03 Jul. 2020.

Butina, M. 2015. A narrative approach to qualitative inquiry. http://clsjournal.ascls.org/content/ascls/28/3/190.full.pdf Date of access: 31 May. 2021.

Calder, K.E. 2016. Singapore Smart City Smart State. Library Congress catalogue. Washington. https://books.google.co.za/books?hl=en&lr=&id=0tuACwAAQBAJ&oi=fnd&pg=PT7&dq=Calder,+K.E.+2016.+Singapore+Smart+City+Smart+State.+Library+Congress+catalogue.+Washington.+&ots=-OAwDVsaav&sig=zCM_ns4ZgCPvQfmtyrXNYxntTZI&redir_esc=y#v=onepage&q&f=false Date of access: 23. Jul. 2020.

Carrington, W., DeBuse, J. & Lee, H. 2008. Theory of governance and accountability http://cprid.com/pdf/Course%20Material_political%20science/4-Governance_&_Accountability-Theory.pdf Date of access: 02 July. 2018

Cassiolato, J.E & Vitorino, V. 2011. Brics and development alternatives: Innovation systems & politics. https://books.google.co.za/books?hl=en&lr=&id=BIMKz-lLh94C&oi=fnd&pg=PR3&dq=Cassiolato,+J.E+%26+Vitorino,+V.+2011.+Bric

ks+and+development+alternatives:+Innovation+systems+%26+politics.+&ots=eB_nuQ674L&sig=dsvKT2yXhDZfYqIDnugmf6RT8DM&redir_esc=y#v=onepage&q&f=false Date of access: 03 Aug. 2020.

Chamber, V., Wild, L. & Foresti, M. 2013. Innovations in service delivery: International experience in low density countries https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9442.pdf Date of access: 23 May. 2018

Cheah, S., Ho, Y.P. & Lim, P. 2016. Role of public science in fostering the innovation and start up ecosystem in Singapore. https://www.researchgate.net/publication/310483292_Role_of_Public_Science_in_Fostering_the_Innovation_and_Startup_Ecosystem_in_Singapore Date of access: 13 Jul. 2020.

Chetty, M., Sundaresan, S., Muckadend, S., Feamster, N. & Celandro, E. 2013. Measuring broadband performance in South Africa. https://www.researchictafrica.net/docs/RIA_policy_paper_measuring_broadband_performance_South_Africa.pdf Date of access: 13 Jul. 2020.

Chigona, W., Beukes, D., Volley, J. & Tanner, M. 2019. Can mobile internet help alleviate social exclusions in developing countries? https://onlinelibrary.wiley.com/doi/abs/10.1002/j.1681-4835.2009.tb00254.x Date of access: 11 Jun. 2020.

Chigona, W. & Licker, P. 2008. Using diffusion of innovations framework to explain communal computing facilities adoption among the urban poor. https://www.semanticscholar.org/paper/Using-diffusion-of-innovations-framework-to-explain-Chigona-Licker/7ba801971415aaadf1ee661c8fff6b636b7048a1 Date of access: 20 Aug. 2020.

Christensen, T., Laegreid, P., Roness, P.G. & Rovik, K.A. 2007. Organisation theory and the public sector. https://www.amazon.com/Organization-Theory-Public-Sector-Instrument/dp/0415433819 Date of access: 18 June. 2019.

Chowdhury, S. Akesson, & M. 2011. A proposed conceptual framework for identifying the logic of digital services https://www.diva-portal.org/smash/get/diva2:437044/FULLTEXT01.pdf Date of access: 15 Sep. 2018.

Chu, S.A. & Luna-Reyes, L.F. 2012. Social media in government. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.348.3144&rep=rep1&type=pdf Date of access: 31 Jul. 2020.

Cinar, E., Trott, P. & Simms, C. 2019. A systematic review of barriers to public sector innovation process. https://www.tandfonline.com/doi/full/10.1080/14719037.2018.1473477?casa_token=W2YM4uwqFqsAAAAA%3AYo2BL0Bls6eIgczhPPwpFHHVFxuv2HEf4OAW3tkWL2IDiyBikM8qTx-OuXF2fJZ6LdKGLJ77mEwj Date of access: 14 July. 2021.

CIPFA. & IFAC. 2013. Good governance in the public sector. https://www.ifac.org/system /files/publications/files/Good-Governance-in-the-Public-Sector.pdf Date of access: 15 Jul. 2019.

Clarke, R. 2019. Regulatory alternative for Artificial intelligence. https://www.sciencedirect.com/science/article/pii/S0267364919301281?casa_token=d2IJNk0zdmwAAAAA:mdJz-W-SzVAEVpGZlhWurggVxNRKK-MajvfJMji44e__fpLEfdVomljZ9hxun_Vu-7-ueS67ew Date of access: 16 July. 2021.

Colesca, S.E. & Dobrica, L. 2008. Adoption and use of e-government services: The case of Romania. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1665-64232008000300006 Date of access: 22 May. 2021

Cordella, A. & Paletti, A. 2018. 2018. ICT and value creation in public sector. https://www.researchgate.net/publication/325304512_ICTs_and_value_creation_in_public_sector_Manufacturing_logic_vs_service_logic Date of access: 04 Aug. 2019.

Corydon, R., Gavesan, V. & Lundqvist, M. 2016. Digital by default: A guide to transforming government. https://www.mckinsey.com/~/media/mckinsey/industries/public%20sector/our%20insights/transforming%20government%20through%20digitization/digital-by-default-a-guide-to-transforming-government.ashx Date of access: 23 May. 2020

Contini, F. & Lanzara, G.F. 2009. ICT and innovation in the public sector. https://www.palgrave.com/gp/book/9780230224896 Date of access: 03 Nov. 2019.

Cristofoli, D., Markovic, J. & Meneguzzo, M. 2012. Governance, management and performance in public networks: How to be successful in shared governance networks. https://www.researchgate.net/publication/257619031_Governance_Management_and_Performance_in_Public_Networks_How_to_Be_Successful_in_Shared-Governance_Networks Date of access: 08 Aug. 2020.

Crous, M. 2002. Service delivery in South African public service: Implementation of Batho pele principles by statistics South Africa. Pretoria: UP (Thesis-Master). https://repository.up.ac.za/handle/2263/3916 Date of access: 06 April. 2020.

CPSI, 2012. 10 years of unearthing innovation. https://www.cpsi.co.za/wp-content/uploads/2015/04/CPSI_10_Year_Review.pdf Date of access: 03 Jun. 2019.

CPSI, 2007. Innovation framework for the public sector of South Africa. http://unpan1.un.org/intradoc/groups/public/documents/cpsi/unpan028343.pdf Date of access: 11 Apr. 2018.

CPSI. 2018. Innovation Trailblazers: celebrating public service developers: Ideas that works. The South African public sector innovation journal. Volume 8. Issue 2. http://www.cpsi.co.za/wp-content/uploads/2018/04/Ideas-that-Work-Vol-8-Issue-2-1.pdf Date of access: 09 Oct. 2019.

CSIR. 2013. Science infrastructure for world-class research development and innovation. Vol 6: NO 4.

https://www.csir.co.za/sites/default/files/Documents/SCIENCESCOPE_VOL6_NO_4%20NOV_2013_low_res.pdf Date of access: 21 Aug. 2020.

Currie, G. & Spyridonidis, D. 2019. Sharing leadership for diffusion of innovation in professionalized settings. https://journals.sagepub.com/doi/abs/10.1177/0018726718796175 Date of access: 31 Jul. 2020.

Daglio, M., Gerson, D. & Kitchen, H. 2014. Building organisational capacity for public sector innovation. https://www.oecd.org/innovating-the-public-sector/Background- report.pdf Date of access: 05 Jul. 2019.

Danhardt, J.V. & Danhardt, R.B. 2007. The new public service: serving not steering. https://www.researchgate.net/publication/227630021_The_New_Public_Service_Serving_Rather_Than_Steering Date of access; 15 Mar. 2020.

Denzin, N.K. & Lincoln, Y.S. 2008. Strategies of qualitative inquiry. https://books.google.co.za/books?hl=en&lr=&id=hD7W095U66cC&oi=fnd&pg=PR7&dq=Denzin,+N.K.+%26+Lincoln,+Y.S.+2008.+Strategies+of+qualitative+inquiry.&ots=7Y2jk8xkT5&sig=HTYrmyBWdfWfyyTuZVTfD049NYQ#v=onepage&q=Denzin%2C%20N.K.%20%26%20Lincoln%2C%20Y.S.%202008.%20Strategies%20of%20qualitative%20inquiry.&f=false Date of access: 31 May. 2021.

Department of science and technology. 2006. 10 Years innovation plan http://www.sagreenfund.org.za/wordpress/wp-content/uploads/2015/04/10-Year-Innovation-Plan.pdf Date of access: 17 Jul. 2018.

Department of science and technology. 2016/2017. Annual report. https://nationalgovernment.co.za/department_annual/199/2017-department:-science-and-technology-(dst)-annual-report.pdf Date of access: 04 Jul. 2020.

Deschamps, J.P. 2013. What is innovation governance: Definition and scope? http://www.innovationmanagement.se/2013/05/03/what-is-innovation-governance-definition-and-scope/ Date of access: 15 Sep. 2018.

Dodgson, M., Gann, D.M. & Phillip, N. 2014. Innovation management. Oxford university press. UK. https://global.oup.com/academic/product/the-oxford-handbook-of-innovation-management-9780198746492?cc=za&lang=en& Date of access: 14 Jul. 2020.

Dovey, K. 2009. The role of trust in innovation. https://www.emerald.com/insight/content/doi/10.1108/09696470910960400/full/html?casa_token=5vTtvwxhYLkAAAAA:uQ6q1y4nfFigQ9GH8Nq5skVnbpnqwotqqqMZnzbEHDbUSU6W86fgk53Ue6VJ2CF-s_No8oZsyVZMOHqMOf6-juzCiGVJj02-y8uPzDj5xdrTJFQNYrk Date of access: 20 July. 2021.

Du. P., Yu. S. & Yang. D. 2019. The development of e-governance in China: Improving cybersecurity and promoting informatization as a means for modernization state government. https://www.springer.com/gp/book/9789811310133 Date of access: 07 Jul. 2019.

Dube, S. 2011. Supplemental guidance: Public sector definition. https://global.theiia.org/standardsguidance/Public%20Documents/Public%20Sector%20Definition.pdf Date of access: 08. Aug 2019.

Dunleavy, P., Magretts, H., Bastows, S. & Tinkler, J. 2005. New public management is dead- Long live digital era governance. https://www.researchgate.net/publication/228301216_New_Public_Management_Is_Dead_-_Long_Live_Digital-Era_Governance Date of access: 09 Oct.2019.

Edamadaka, P. & Seike, I, 2019. Digitalization in Indonesia. https://www.baycurrent.co.jp/en/our-insights/pdf/Digitalization%20in%20Indonesia.pdf Date of access: 18 Jan. 2020.

Eggers, B. & Singh, S.K. 2009. Innovation state: The public innovators handbook. https://www2.deloitte.com/content/dam/insights/us/articles/innovation-state-adapted-from-the-public-innovators-playbook/USdeloittereview_Innovation_State_Jan09.pdf Date of access: 02 Jul. 2018.

Elder, J. 2006. Demand orientated innovation policy. https://www.tab-beim-bundestag.de/en/pdf/publications/summarys/TAB-Arbeitsbericht-ab099_Z.pdf Date of access: 14 Nov. 2021.

Elo, S.& Kyngas. H. 2007. The qualitative content analysis process. https://www.academia.edu/4898103/The_qualitative_content_analysis_process Date of access: 26 Jul. 2020.

Ernst and Young. 2017. Public sector innovation from ideas to actions. https://www.ey.com/en_za/government-public-sector Date of access: 07 Aug. 2019.

Evans, O. 2019. Digital government: ICT and public sector management. https://www.researchgate.net/publication/330345855_Digital_government_ICT_and_public_sector_management_in_Africa Date of access: 04 Sep. 2020.

EY, 2017. Public sector innovation: from ideas to actions. http://www.ey.com/Publication/vwLUAssets/EY-innovation-public-secto Date of access: 24 Apr. 2018.

Fanfalone, A.G. 2015. Post 2015 development agenda: Mexico perspectives. https://www.copenhagenconsensus.com/sites/default/files/mexico_ict_resouces.pdf Date of access: 29 Oct. 2021.

Farelo, c. & Morris, C. 2016. The status of e-government in South Africa. http://researchspace.csir.co.za/dspace/bitstream/handle/10204/966/Farelo_2006_D.pdf;jsessionid Date of access: 25 Apr. 2018.

Fasenfest, D. 2011. Government, governing and governance. Critical_sociology 36(6)771-774. https://journals.sagepub.com/doi/pdf/10.1177/0896920510378192?casa_token=ojdLFHfEJ3IAAAAA:EaMbX0VXNOkbw2yfHOqyiLhzOnW-JXA1XC3TIvQnTLmpkyJdIlqtqZDMTx4lT-OlHgcEm9O2zCA Date of access: 08 Jun. 2018.

Fay, R. 2019. Digital platforms require a global governance framework. https://www.cigionline.org/static/documents/documents/Platform-gov-WEB_VERSION.pdf#page=29 Date of access: 05 Nov. 2021.

Fernandez, S. & Moldogaziev. 2012. Using employee empowerment to encourage innovative behaviour in the public sector https://academic.oup.com/jpart/article/23/1/155/974260?login=true Date of access: 05 Nov. 2021.

Fichman,R.G., Dos Santos, B.C. & Zheng.Z. 2017. Digital Innovation as a fundamental and powerful concept in the information system curriculum https://doc.uments.com/download/d-digital-innovation-as-a-fundamental-and-powerful-concept-in-the.pdf Date of access: 11 Jul. 2018.

Fishended, J. & Thompson M. 2021. Digital government open architecture, and innovation: Why public sector IT will never be the same again. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1065.973&rep=rep1&type=pdf Date of access: 10 Sep. 2021.

Flick, U. 2013. Qualitative data analysis: Mapping the field. https://in.sagepub.com/sites/default/files/upm-binaries/58869_Flick__The_SAGE_HB_of_ Date of access: 4 May. 2018.

Fourie, J. 2008. A note on infrastructure quality in South Africa. https://www.researchgate.net/publication/24134174_A_Note_on_Infrastructure_Quality_in_South_Africa Date of access: 08 Jun. 2020.

Gastrow, M. 2018. Policy options framework for the fourth industrial revolution in South Africa. http://www.hsrc.ac.za/uploads/pageContent/10155/4IR%20Framework%20Report_Final_lowres.pdf Date of access: 05 Sep. 2020.

Gedara, V., Snell, D., Molla, A. & Karanasios, S. 2020. A scan of approaches taken by Australia to build skills of the existing workforce in response to digital transformation of industry. https://digitalskillsformation.org.au/wp-

content/uploads/2020/09/FINAL-Australian-Scan-Report_Approved.pdf Date of access: 29 Oct. 2021.

George, V. 2019. The role of HRP in the human resource network. https://www.coursehero.com/file/75048816/HR-planningdocx/ Date of access: 20 July. 2021.

Gillwald, A. & Esselaar, S. 2004. South Africa 2004 ICT sector performance review. https://www.wits.ac.za/media/migration/files/cs-38933-fix/migrated-pdf/pdfs-5/tspr2004.pdf Date of access: 05 May. 2020.

Gillwald, A. & Stork, C. 2008. Towards evidence based ICT policy and regulation. https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/39064/128372.pdf. Date of access: 15 July.2021.

Gillwald, A., Odufuwa, F., Rademan, B. & Esselaar, S. 2016. An evaluation on open data access. Broadband network in Africa: A case of Nigeria and South Africa. https://researchictafrica.net/2017/05/22/an-evaluation-of-open-access-broadband-networks-in-africa-the-cases-of-nigeria-and-south-africa/ Date of access: 06 Nov. 2019.

Gillwald, A., Moyo, M. & Stork, C. 2012. What is happening in ICT in South Africa: A supply and demand side analysis of the ICT sector? https://www.researchictafrica.net/publications/Evidence_for_ICT_Policy_Action/Policy_Paper_7_-_Understanding_what_is_happening_in_ICT_in_South_Africa.pdf Date of access: 14 Sep. 2018.

Goldsmith, S., Georges, G., Burke, G. & Bloomberg, M.R. 2010. Social innovation: How civic entrepreneurs ignite community networks for good. Jossey-Baa A Wiley imprint. San Francisco. https://www.goodreads.com/book/show/7269598-the-power-of-social-innovation Date of access: 23 Jul. 2020.

Govender, N. 2019. Effectiveness of governance towards digitalisation at e-eThekwini metropolitan municipality in KwaZulu-Natal province, South Africa.

https://apsdpr.org/index.php/apsdpr/article/view/336/504 Date of access: 01 Sep. 2020.

Government Gazette, 18425, 14 November. http://www.wipo.int/edocs/lexdocs/laws/en/za/za080en.pdf Date of access: 24 Apr. 2018.

Government serving citizens. https://publicadministration.un.org/publications/content/PDFs/E-Library%20Archives/2007%20Public%20Administration%20and%20Democratic%20Governance_Governments%20Serving%20Citizens.pdf Date of access: 09 Sep. 2019.

Govmez-Alvarez, D., Rajack, R., Lopez-Morero, E. & Lanfranchi, G. 2017. Steering the metropolis: Metropolitan governance for sustainable urban development. https://publications.iadb.org/en/steering-metropolis-metropolitan-governance-sustainable-urban-development Date of access: 14 Nov. 2021.

GovTech Singapore. 2016. Fact sheet: Government technology agency (Govtech). https://www.tech.gov.sg/files/media/media-releases/2016/10/1%20GovTech%20Factsheet.pdf Date of access: 08 Jul. 2019.

Grady, D.O. 1992. Promoting Innovation in the public sector https://www.jstor.org/stable/3380989?casa_token=lIyorqPEyJ8AAAAA%3AUlaYgAT2p4YVrNKRvD2kmVleai80Di3dCvwOoCuS5Kv167Wd98Lg0fJdiM--Hpu2-SkaPWDvT_WwsuGAv5TNub752Ku7iBdZ-x9vXJEz04QALR_J#metadata_info_tab_contents Date of access.: 05 Nov. 2021.

Gray, B. & Purdy, J. 2018. Collaborating for our future: Multi-stakeholder partnership for solving complex problems. https://www.researchgate.net/publication/326893444_Collaborating_for_our_future_Multistakeholder_partnerships_for_solving_complex_problems Date of access: 08 Aug. 2020.

Grimmelikhuijsen, S.G. 2010. Policy and internet: Transparency of public decision making towards trust in local government. (vol. 2: ISS.1. article 2 . https://onlinelibrary.wiley.com/doi/abs/10.2202/1944-2866.1024 Date of access: 25 Jun. 2020.

Grin, H. 2013. Journal of multidisciplinary research. Vol 5.no 1. https://www.academia.edu/31208480/Journal_of_Multidisciplinary_Research-_Volume_5_Number_2 Date of access: 04 Jul. 2020.

Groenewald, J. & Durham, B. 2004. Ensuring the sustainability of GM technologies in Africa-using a system approach based on South African experiences. https://www.researchgate.net/publication/281450194_Ensuring_the_sustainability_of_GM_technologies_in_Africa_-using_a_systems_approach_based_on_South_African_experiences Date of access: 15 Jul. 2020.

Gunase, K.V. & Harmatzis, F.C. 2007. Emerging wireless technologies for developing countries. https://www.sciencedirect.com/science/article/pii/S0160791X06000443?casa_token=x1szHemF-WwAAAAA:KjhHH1HOr8K5nGJJ6dWYnRo_nKDg_6QKjyExNzMvm17muNM5kTI-4hajG53g9gU0mSaQ8BVjLQ Date of access: 20 July. 2021.

Hadjielias, E., Dada, O., Crus, A.D., Zekas, S., Christos, M. & Sakka, G. 2020. How do digital innovation teams function? Understanding the team's cognition process nexus within the context of digital transformation. journal of business research, (122)373-386. https://ideas.repec.org/a/eee/jbrese/v122y2021icp373-386.html Date of access: 10 Sep. 2021.

Haines, J. K. 2014. Iterating an innovation model: Challenges and opportunities in adapting accelerator practices in evolving ecosystem. https://anthrosource.onlinelibrary.wiley.com/doi/full/10.1111/1559-8918.01033 Date of access: 19 Jul. 2020.

Hamdani, J. & Wirawan, C. 2012. Open innovation implementation to sustain Indonesia SME's.

https://repository.maranatha.edu/11854/1/International%20Conference%20on%20Small%20and%20Medium%20Enterprises%20Dev.pdf Date of access: 19 Jun. 2020.

Hamelink, C.J. 2000. The ethics of cyberspace. London. Sace publications Ltd. https://sk.sagepub.com/books/the-ethics-of-cyberspace Date of access: 17 Aug. 2019.

Hana, U. 2013. Competitive advantage achievement through innovation and knowledge. https://www.researchgate.net/publication/289822592_Competitive_Advantage_Achievement_through_Innovation_and_Knowledge Date of access: 12 Jul. 2020.

Harrsion, B. 2005. Information and communication technology policy in Rwanda. https://ocw.mit.edu/courses/global-studies-and-languages/21g-034-media-education-and-the-marketplace-fall-2005/projects/MIT21G_034F05_ictrwanda.pdf Date of access: 08 Feb. 2020.

Hauknes, J. & Koch, P. 2005. Public report no D20: On innovation in the public sector: retrieved from https://www.oecd.org/innovating-the-public-sector/Background-report.pdf Date of access: 10 Apr. 2018.

Heeks, R. 2001. Understanding e-government for development. https://www.researchgate.net/publication/334637903_Understanding_e-Governance_for_Development Date of access: 17 Jul. 2020.

Herselman, M.E. 2003. ICT in the rural areas in South Africa: various case studies. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Herselman%2C+M.E.+2003.+ICT+in+the+rural+areas+in+South+Africa%3A+various+case+studies&btnG= Date of access: 04 Aug. 2021.

Hlungwani,C.C. 2015. Partnering for service delivery: Paper presented at the annual conference of govtech hosted by SITA. Durban. 25-29 October 2015. http://www.nda.agric.za/doaDev/sideMenu/links/docs/NATCCIM/GovTech%20Conference%202015_Durban.PDF Date of access: 05 Feb. 2020.

Ho, E. 2016. Smart subject for Smart Nation? Governing smart mentalities in Singapore. https://journals.sagepub.com/doi/abs/10.1177/0042098016664305 Date of access: 21 Jul. 2020.

Hodge, J. 2010. Liberalising communication services in South Africa. https://www.tandfonline.com/doi/abs/10.1080/713661415 Date of access: 14 Jun. 2020.

Hoogeveen, I.G & Ozler, B. 2005. Not separate, not equal: Poverty and inequality in post-apartheid South Africa. https://deepblue.lib.umich.edu/handle/2027.42/40125 Date of access: 03 Jun. 2020.

Hsieh, H. & Shannon, S.E. 2005. Three approaches to qualitative content analysis. https://www.researchgate.net/publication/7561647_Three_Approaches_to_Qualitative_Content_Analysis Date of access: 26 Jul. 2020.

Hudson, H.A. 2006. Universal access to the new information infrastructure (In Lee, A.L and livingstov, L.S. ed. Social shaping and social consequences of ICT's. London. Sage. P307-318). https://journals.sagepub.com/doi/abs/10.1177/0021886305284291 Date of access: 23 Jun. 2020.

Infodev. 2008. Enhancing the livelihoods of the rural poor through ICT: A knowledge ma. http://documents.worldbank.org/curated/en/994361468159335243/Enhancing-the-livelihoods-of-the-rural-poor-through-ICT-a-knowledge-map Date of access: 18 May. 2020.

Institute on governance-leading expertise. 2017. The path to digital governance: An agenda for public service innovation and excellence https://iog.ca/docs/The-Path-to-Digital-Governance.pdf Date of access: 11 Sep. 2018.

ITU. 2017. Bridging the digital innovation divide: A toolkit for strengthening ICT centric ecosystem https://www.itu.int/en/ITU-

D/Innovation/Documents/Publications/Policy_Toolkit-Innovation_D012A0000D13301PDFE.pdf Date of access: 18 Jul. 2018.

Jackson, R.L., Drummond, D.K. & Camara, S. 2007. What is qualitative research? https://www.tandfonline.com/doi/pdf/10.1080/17459430701617879?needAccess=true Date of access: 03 May. 2018.

Janssen, M. & Van der Voort, H. 2016. Adaptive governance: Towards a stable, accountable and responsive government. https://www.sciencedirect.com/science/article/abs/pii/S0740624X16300156 Date of access: 07 Aug. 2020.

Jenkins, T. & Barrenechea, M.J. 2014. E-government or out of Government. Ebook.

OTC Canada. https://www.opentext.com/file_source/OpenText/en_US/PDF/e-Gov%20Book.pdf Date of access: 21 Sep. 2019.

Jensen, M. 2003. ICT in Africa. https://pdfs.semanticscholar.org/74cc/b3936ea01d5887ea712b38e011bccf1babd3.pdf Date of access: 19 Apr. 2018.

Juiz, C., Guerrero, C. & Lera, I. 2014. Implementing good governance principles for the public sector; IT governance framework. https://www.researchgate.net/publication/273742558_Implementing_Good_Governance_Principles_for_the_Public_Sector_in_Information_Technology_Governance_Frameworks Date of access: 03 May. 2019.

Kadar, M., Moise, I.A. & Colomba, C. 2014. Innovation management in the globalized digital society. Procedia- Social and Behavioral Sciences. (143) 1083-1089. https://cyberleninka.org/article/n/1278839 Date of access: 14 Jun 2020.

Kakia, A. 2013. Research philosophy, methodology, quantitative and qualitative methods. The Cyprus Journal of Sciences. (11):33-43. https://www.ac.ac.cy/images/media/assetfile/JOURNAL%20MAIN%20DOCUMENT%202013%20HTML%20final.pdf Date of access: 10 Sep. 2021.

Kaisara, G. & Pather, S. 2011. The government evaluation challenge: A South African Batho pele aligned service quality approach. https://www.sciencedirect.com/science/article/abs/pii/S0740624X10001401 Date of access: 02 Feb. 2020.

Kattel, R. & Mazzucato, M. 2018. Mission oriented innovation policy and dynamic capabilities in the public sector. Industrial and Cooperate change: 27(5):787-801. https://www.ucl.ac.uk/bartlett/public-purpose/sites/public-purpose/files/iipp-wp-2018-05.pdf Date of access: 11 Jun. 2019.

Katsamunska. P., 2016. The concept of governance and public governance theories. https://www.unwe.bg/uploads/Alternatives/Polya_1_br2_2016_en.pdf Date of access: 20 Jul. 2018.

Kenya. Ministry of Public Service, Youth and Gender Affairs. 2017. Public service delivery: innovation strategy. http://www.psyg.go.ke/images/downloads/PUBLIC%20SERVICE%20DELIVERY%20INNOVATION%20STRATEGY.pdf Date of access 19 Apr. 2018.

Kenya. Republic of Kenya. 2019. Digital economy blueprint. https://www.ict.go.ke/wp-content/uploads/2019/05/Kenya-Digital-Economy-2019.pdf Date of access: 21 May 2018.

Khalili, A. 2016. Linking transformational leadership, creativity, innovation and innovation supportive climate. https://www.emerald.com/insight/content/doi/10.1108/MD-03-2016-0196/full/html Date of access: 20 July.2021.

Khan, N.A. & Khan, A.N. 2019. What followers are saying about transformational leaders fostering employee innovation via organisational learning, knowledge sharing and social media use in the public organisations https://www.sciencedirect.com/science/article/pii/S0740624X18305392?casa_token=_RLmimqK8QUAAAAA:Jvy0pi4PDybNdLviJnD84U9xBKGiL2Fp8Gb8GScUGc1Y5PgVNmXWWKXQX5tP3ni3oeduVX8 Date of access: 05 Nov 2021.

Kim, J. 2014. Network, network governance and networked network http://unpan1.un.org/intradoc/groups/public/documents/UN/UNPAN019252.pdf Date of access: 13 Sep. 2018.

Kivijarvi, H. & Dahlberg, T. 2006. An integrated framework for IT governance and the development and validation of assessment instrument. https://ieeexplore.ieee.org/document/1579685 Date of access: 15 May. 2020.

Klijn, E.H. & Koppernjan, J. 2016. Governance networks in the public sector. Routledge. New York. https://onlinelibrary.wiley.com/doi/abs/10.1111/gove.12307 Date of access: 12 Jul. 2020.

Kooiman, J. 1993. Modern governance: New Government-Society interactions. London: Sage.

Kroukamp, H. 2004. E-government in South Africa: Are we coping. http://journals.ufs.ac.za/index.php/aa/article/view/885 Date of access: 08 Mar. 2020.

Kuye, J.O. & Naidoo, G. 2018. Electronic technology and service delivery in South African public service. (Conference organized by international institute for administration sciences. Yaounde. Cameroon) https://repository.up.ac.za/handle/2263/5480 Date of access: 15 Mar. 2020.

Kuziemski, M. & Misuraca, G. 2020. AI governance in the public sector: Three tales from the frontiers of automated decision-making in democratic settings. https://www.sciencedirect.com/science/article/pii/S0308596120300689?casa_token=uefgtOyi1nYAAAAA:6qUh-r9ogC04bfNV8yVRuOtYv1ybSmNWBmm43FqfCDcdHtOQil3vRvqEWBSXZM_weH_J1ADXLA Date of access: 22 May. 2021.

Kyobe, M. 2011. Investigating the key factors influencing ICT adoption in South Africa. https://www.emerald.com/insight/content/doi/10.1108/13287261111164844/full/html?casa_token=5B5NJdAi-

F4AAAAA:VI_IiXwUIt1ljJSg78jPFLG9ryEOEk48x2sloSlX2PZ-hoLxkiqM8puPyn6gEdPo9iHcZ07I6VUhOTkmmLZM3vx2YThchWyWHdZs7QOf9fsnhy21HHPN Date of access: 04 Aug. 2021.

Labaree, R.V., 2013. Organising your social sciences research paper. http://www.oise.utoronto.ca/ctlsa/UserFiles/File/Guide_to_Proposal_Writing.pdf Date of access: 04 Jun. 2018.

Larson, O. 2015. The governmentality of meta-governance: Identifying theoretical and empirical challenges of network governance in the political field of security and beyond. http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1373750&dswid=1294 Date of access: 19 Jul. 2018.

Larsson. 2019. The governmentality of the Meta governance. https://onlinelibrary.wiley.com/doi/full/10.1111/1467-8675.12447 Date of access: 07 Apr. 2019.

Lee, C., Chang, K. & Berry. F. 2011. Testing the development and diffusion of e-government and e-democracy: A global perspective. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1540-6210.2011.02228.x Date of access: 01 Aug. 2020.

Lee, S.M. Hwang, T. & Choi, D. 2012. Open innovation in the public sector of leading countries. https://www.emerald.com/insight/content/doi/10.1108/00251741211194921/full/html?casa_token=JvgnjkK2QWQAAAAA:vGP5Gkh3c95x-7I43J-DGW-ULheWtHmnsOmml2R_HuppTU1-PW4SXvF2bLZqZP86XdQO_Urt7shWashn6dpDtc4wPwoQ_POJDsfYQhXLLoNP9Ct-rFU Date of access: 20 Jul. 2021.

Lekhanya, L.M. 2019. Public outlook on creative methodologies for the 4th revolution in South Africa. International Journal of Entrepreneurship. 23 (3): 1-13. https://www.researchgate.net/publication/324238228_The_Digitalisation_of_Rural_Entrepreneurship Date of access: 15 Jul. 2019.

Leon, L.R., Simmonds, P. & Romans, L. 2012. Trends and challenges in the public sector innovation in Europe http://www.technopolis-group.com/wp-content/uploads/2014/06/1447_INNOERATREND-2011-12.pdf Date of access: 04 Jul. 2018.

Levi-Faur, D. 2012. Oxford Handbook of Governance. Oxford University Press. New York. https://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199560530.001.0001/oxfordhb-9780199560530 Date of access: 19 Jul. 2020.

Lewis, J.M., Ricard, L.M. & Klijn, E.H. 2018. How innovations drivers, networking and leadership shape public sector innovation capacity. https://journals.Sagepub.com/doi/full/10.1177/0020852317694085 Date of access: 20 July. 2021.

Lovan, W. P., Murray, M.O. & Shafter, R. 2017. Participatory governance. https://www.taylorfrancis.com/books/9781315247335 Date of access: 03 Aug. 2020.

Lovelock. P. 2018. Framing policies for the digital economy: Towards policy frameworks in asia-pacific. https://sea-vet.net/39-e-library/565-framing-policies-for-the-digital-economy-towards-policy-frameworks-in-the-asia-pacific Date of access: 15 Aug. 2019.

Lune, H. & Berg, L. 2016. Qualitative research methods for the social sciences, e-book. 9th edition

Macagnano, E.V. 2002. Peri-urban areas of South African cities: Innovative technologies for sustainability. https://www.witpress.com/elibrary/wit-transactions-on-ecology-and-the-environment/54/659 Date of access: 29 Aug. 2020.

MacCallum, D., Moulaert, F., Nillier, J & Haddock, V. 2016. Social innovation and territorial development. https://www.researchgate.net/publication/44960912_Social_Innovation_and_Territorial_Developmen Date of access: 08 Aug. 2020.

Mahmood, M. 2019. Does digital transformation of government lead to enhanced citizens trust and confidence in government. UK. Springer. https://www.springer.com/gp/book/9783030017583 Date of access: 28 Oct. 2019.

Mahrer, H & Krimmer, R. 2005. Towards the enhancement of e-democracy: identifying the notion of the middleman paradox. https://www.researchgate.net/publication/220356731_Towards_the_Enhancement_of_e-Democracy_Identifying_the_Notion_of_the_'Middleman_Paradox Date of access: 05 May. 2020.

Makhanya, G. & Roberts, S. 2003. Telecommunications in developing countries: Reflections from South African experience. https://ideas.repec.org/a/eee/telpol/v27yi1-2p41-59.html Date of access: 03 Mar. 2020.

Malcalm, E. 2020. Flattening the world: The prospects for fiber optic technology in Africa. https://scholar.google.com/citations?user=DA2jtasAAAAJ&hl=en Date of access: 12 Jul. 2020.

Manda, M.I. & Backhouse, J. 2017. Digital transformation for inclusive growth in South Africa: Challenges and opportunities in the 4th industrial revolution. https://www.researchgate.net/publication/318395119_Digital_transformation_for_inclusive_growth_in_South_Africa_challenges_and_opportunities_in_the_4_th_industrial_revolution Date of access: 03 Sep. 2020.

Manda, M.I. & Dhaou, S.B. 2019. Responding to the challenge and opportunities in the 4th industrial revolution in developing countries. https://collections.unu.edu/eserv/UNU:7324/p244-Ickson-Manda.pdf Date of access: 11 Mar. 2020.

Manoharan, A. & Holzer, M. 2012. Active citizen participation in e-government: A global perspective. https://www.researchgate.net/publication/281687018_Active_Citizen_Participation_in_E-Government_A_Global_Perspective Date of access: 13 May. 2020.

Manzini, S.T. 2012. The national system of innovation concept: An ontological review and critique. https://journals.co.za/doi/abs/10.10520/EJC125500 Date of access. 20 Jul. 2021.

Mason, J. 2002. Qualitative researching. 2nd edition. Sage. London web book. https://uk.sagepub.com/en-gb/eur/qualitative-researching/book244365 Date of access: 17 Apr. 2020.

Marabito, V. 2014. Trends and Challenges in digital business innovations. Springer. New York. https://link.springer.com/content/pdf/10.1007/978-3-319-04307-4.pdf Date of access: 22 May. 2021.

Maramura, T.C. & Thakhathi, D.R. 2016. Challenges of ICT and electronic governance for service delivery in the public service. https://catalog.ihsn.org/index.php/citations/85615 Date of access: 29 Aug. 2020.

Martin, N. & Gregor, S. 2008. ICT governance journal of e-government 2.3, 19-49, DOI. https://www.tandfonline.com/doi/abs/10.1080/13600860410001674779 Date of access: 23 Nov. 2019.

Martins, N. & Ledimo, O. 2015. The perceptions and nature of service delivery innovations among government employees: an explanatory study. https://web.archive.org/web/20200709092923id_/https://virtusinterpress.org/IMG/pdf/10-22495_jgr_v4_i4_c5_p1.pdf Date of access: 14 Jul. 2021.

Maumbe, B. & Okello, J.J. 2013. Technology, sustainability and rural development in Africa. https://books.google.co.za/books?hl=en&lr=&id=0LgjonGtmFgC&oi=fnd&pg=PR1&dq=Maumbe,+B.+%26+Okello,+J.J.+2013.+Technology,+sustainability+and+rural+development+in+Africa.&ots=lvg1Snd20x&sig=rG2taRpbS5KXrvRYE3L6-43Kkt4#v=onepage&q=Maumbe%2C%20B.%20%26%20Okello%2C%20J.J.%202013.%20Technology%2C%20sustainability%20and%20rural%20development%20in%20Africa.&f=false Date of access: 13 Jul. 2020.

Maumbe, B.M., Owei, V. & Alexander, H. 2008. Questioning the pace and pathway of e-government development in Africa: A case study of South Africa's Cape gateway project. http://digitalknowledge.cput.ac.za/handle/11189/3233 Date of access: 11 Jun. 2020.

May, J. 1998. Poverty and inequality in South Africa. https://scholar.google.co.za/citations?user=aS-ifvEAAAAJ&hl=en Date of access: 23 Jun. 2020.

Marshall, C. & Rossman, G.B. 1989. Designing qualitative research. USA: Sage.

Martins, N. & Ledimo, O. 2015. The perception and nature of service delivery innovation among government employees: An exploratory study. Journal of government and regulation. Volume 4, issue4, 2015. http://uir.unisa.ac.za/bitstream/handle/10500/21656/perceptions%20and%20nature%20of%20service%20delivery%20innovation%20among%20government%20employees%20ledimo%20j%20gov%20regulat.pdf?sequence=1&isAllowed=y Date of access: 20 Apr. 2018.

Mashinini, M.J. 2008. Challenges of ICT policy for rural communities: A case study from South Africa. (Avgerou, C., Smith, M.L. & Van Der Bessellar, P. social dimensions of information and communication technology policy. Pg 125-137*)* https://link.springer.com/chapter/10.1007/978-0-387-84822-8_9 Date of access: 20 Jul. 2021.

Mawela, T., Twinomurinz, H. & Ochara, N.M. 2017. Exploring public sector planning for transformational government. https://www.oecd.org/gov/digital-government-review-of-norway-9789264279742-en.htm Date of access: 17 Jul. 2020.

Mchunu, N. & Theron, F. 2014. Revitalizing the good in good local governance: calling for active participatory citizenship. Volume 7 issue 2. https://repository.up.ac.za/bitstream/handle/2263/58119/Mchunu_Revitalising_2014.pdf?sequence=1&isAllowed=y Date of access: 15 May. 2020.

McNabb, D.E. 2007. Knowledge management in the public sector. A blueprint for innovation in government. EBook. M.E. Shape Inc. press. London.

https://www.amazon.com/Knowledge-Management-Public-Sector-Innovation/dp/0765617285 Date of access: 09 Feb. 2019.

Meerman, S. 2010. CPSI 4th public sector innovation conference: The state of e-governance in South Africa. https://www.cpsi.co.za/wp-content/uploads/2015/04/CPSI_10_Year_Review.pdf Date of access: 28 Jan. 2020.

Meljer, A.J. 2007. Holding e-government to account: Renovating old forms of public accountability and creating new ones. (In Griffin. D. et al., ed Development in e-government. Netherland, IOS press. Pg 101-111). https://journals.sagepub.com/doi/abs/10.1177/0095399715598341 Date of access: 03 Aug. 2019.

Mergel, I. 2017. Digital service teams: Challenge and recommendations for government. http://www.businessofgovernment.org/report/digital-service-teams-challenges-and-recommendations-government Date of access: 07 Sep. 2019.

Mergel, I. 2018. Open innovation in the public sector: drivers and barriers for the adoption of challenge. Gov. https://www.tandfonline.com/doi/full/10.1080/14719037.2017.1320044?casa_token=YmwN-h2NueEAAAAA%3AdYfqlLk9dcN6OOESxj8JNKwH4O6FJJz4GKe4SJQg2pHRNhQ6holigsW1XalX8SG5dCyJmAu0hVQR Date of access: 15 Jul. 2021.

Mikhaylov, S.J., Esteve, M. & Campion, A. 2018. Artificial intelligence for the public sector: Opportunities and challenges of cross-sector collaborations. https://royalsocietypublishing.org/doi/full/10.1098/rsta.2017.0357 Date of access: 22 May. 2021.

Mofolo, M., Mkuyana, L. & Skade, T. 2014. Actions and behaviors essential for monitoring and evaluation to succeed in South African public service. https://apsdpr.org/index.php/apsdpr/article/view/58 Date of access: 03 Jun. 2020.

Mohalajeng, L. & Kroon, J. 2016. Innovation through accelerators: A case for open innovation. https://www.researchgate.net/publication/311635916_Innovation_through_accelerators_A_case_for_open_innovation Date of access: 08 Sep. 2020.

Molla, A. & Licker, P.S. 2005. E-commerce adoption in developing countries: A model and instrument. https://www.researchgate.net/publication/223787294_Licker_PS_eCommerce_adoption_in_developing_countries_a_model_and_instrument_Information_and_Management_42_877-899 Date of access: 21 Jun. 2020.

Montenegro, L. & Balgacov, S. 2014. Reflection on actor-network theory, governance network and strategic outcomes. http://www.scielo.br /pdf/bar/v11n1/v11n1a07.pdf Date of access: 04 Jul. 2018.

Montenegro, L.M. & Bulgracov, S. 2014. Reflection of actor network theory, Governance network and strategic outcomes. https://www.scielo.br/pdf/bar/v11n1/v11n1a07.pdf Date of access: 18 Jun. 2019.

Mouleman, L. 2008. Public management and meta-governance of hierarchies, Networks and markets. https://core.ac.uk/download/pdf/18511356.pdf Date of access: 14 Apr. 2019.

Mulgan, G. 2014. Innovation in the public sector: How can public organisations better create, improve and adapt? https://media.nesta.org.uk/documents/innovation_in_the_public_sector-_how_can_public_organisations_better_create_improve_and_adapt.pdf Date of access: 19 Dec. 2019.

Mulgan, G. 2014. Innovation in the public sector. http://www.pgionline.com/wp-content/uploads/2015/08/Innovation-in-the-Public-Sector-or-Public-Innovation.pdf Date of access 25 Apr. 2018.

Murphy, J.T. & Carmody, P. 2015. Africa's information reveolution-Technical regimes and production networks in S.A. and Tanzania. England: Wiley Blackwell.

https://www.wiley.com/en-us/Africa%27s+Information+Revolution%3A+Technical+Regimes+and+Production+Networks+in+South+Africa+and+Tanzania-p-9781118751329 Date of access: 14 Apr. 2020.

Mutula, S.M. & Mostert, J. 2005. Challenges and opportunities of e-government in South Africa. https://www.emerald.com/insight/content/doi/10.1108/02640471011023360/full/html Date of access: 08 May. 2019.

Mutula, S.M. & Mostert, J. 2010. Challenges and opportunities of e-government in South Africa. https://www.emerald.com/insight/content/doi/10.1108/02640471011023360/full/html Date of access: 23 Nov. 2018.

NACI (National Advisory Council on Innovation). 2006. The South African National system of innovation: Structures, policies and performance. http://www.naci.org.za/wp-content/uploads/2017/09/South-African-Science-Technology-and-Innovation-Indicators-2016-web.pdf Date of access: 2 May. 2018.

NACI (National Advisory Council on Innovation). 2016. Review of the White paper on science and technology http://www.naci.org.za/STIForesight2018/indexphp/relevant-documents/policies-strategies-roadmaps-plans-sa/the-south-african-nsi/575-walwyn-2016-white-paper-review/file Date of access: 18 Sep. 2018.

NACI (National Advisory Council on Innovation). 2017. South African Science, Technology and innovation indicators. https://pmg.org.za/committee-meeting/25522/ Date of access: 12 Feb. 2020.

Naidoo, G. 2012. Implementation of e-government in South Africa-successes and challenges: the way forward. International journal of advances in computing and management, 1(1): 62-66. http://uir.unisa.ac.za/bitstream/handle/10500/21060/Implementation%20of%20E Date of access: 11 Apr. 2018.

Naidoo, R., Kaplan, D. & Fransman, M. 2019. The South African Telecoms innovation system and the diffusion of broadband. http://radian.co.za/docs/BROADBAND_paper_final.doc.pdf Date of access: 16 March. 2020.

Nambisan, S., Lyytinen, K., Majchrzak, A. & Song, M. 2017. Digital management: Reinventing innovation management research in a digital world. https://www.researchgate.net/publication/306254446_Digital_Innovation_Management_Reinventing_Innovation_Management_Research_in_a_Digital_World Date of access: 27 Oct. 2019.

Nassaji, H. 2015. Qualitative and descriptive research: Date type versus data analysis. https://journals.sagepub.com/doi/full/10.1177/1362168815572747?casa_token=R61pj0q9PLYAAAAA:1tO2FBqcm7JkPeiVlHETsOOr7Ef6wNZJdTXq0aEcjxPLD6zLUbKpWkTtLx5SckDTFNS6gTyroQ Date of access: 05 Nov. 2021.

Ndou, V. 2004. E-government for developing countries: opportunities and challenges. https://onlinelibrary.wiley.com/doi/abs/10.1002/j.16814835.2004.tb00117.x Date of access: 15 Mar. 2020.

NDP. 2018, Economic infrastructure (NDP. South Africa). https://www.nationalplanningcommission.org.za/assets/Documents/NDP_Chapters/devplan_ch3_0.pdf Date of access: 22 Mar. 2020.

Ndukwe, E.C.A. 2020. Connecting Africa by increasing access to telecommunication on the continent. http://www.connectingafrica.com/author.asp?section_id=728&doc_id=759120 Date of access: 02 May. 2020.

Nederland, J., Bekkers, V. & Voorberg, W. 2014. Self-organisation and the role of government: How and why does self-organisation evolves in the shadow of hierarchy? https://pdfs.semanticscholar.org/3105/1f09bfe340175ecd2dc2ae28f096485f642e.pdf Date of access: 12 Apr. 2020.

Negovhela, N.R. 2012. The performance of government information technology officer in e-government policy implementation. Johannesburg: Wits. (Thesis-Masters). http://wiredspace.wits.ac.za/handle/10539/12447 Date of access: 04 Feb. 2020.

Nel, D & Masilela, L. 2020. Open government for improved service delivery innovation in South Africa. https://dergipark.org.tr/en/pub/ijebeg/issue/51621/669856 Date of access: 15 Feb. 2020.

Nkomo, N. 2020. Implications of e-government on information delivery service. http://www.lis.uzulu.ac.za/research/2012/Ntando%20Nkomo%20SCECSAL%202012%20May%202.pdf Date of access: 19 Nov. 2019.

Nowack, C. & Monk, A. 2018. Ambidexterity in government: The influence of different types of legitimacy on innovation. https://www.sciencedirect.com/science/article/pii/S004873331930160X Date of access: 04 Aug. 2020.

Ntetha, M.A. &Mostert, B.J. 2011. Availability and utilization of information and communication technologies for service delivery: A South African case study. https://journals.co.za/doi/abs/10.10520/EJC61365 Date of access: 16 July. 2021.

Nugrodo, Y., Reiter, H., Pawennei, I.A. & Amalia, M. 2013. Indonesia Innovation profile. http://cipg.or.id/wp-content/uploads/2015/06/MEDIA-3-Media-Vulnerable-2012.pdf Date of access: 12 Apr. 2019.

Nylen, D. & Holmstrom, J. 2015. Digital innovation strategy: A framework for diagnosing and improving digital product and service innovation. https:// www.sciencedirect.com/science/article/pii/S0007681314001256 Date of access: 24 Apr. 2019.

OECD. 2014. A skills beyond school review in South Africa. https://www.oecd-ilibrary.org/docserver/9789264223776-

en.pdf?expires=1636127734&id=id&accname=guest&checksum=F2E30704B568FF6992A16BE3EEF79799 Date of access: 05 Nov. 2021.

OECD. 2016. Digital government strategies for transforming public services in the welfare areas. http://www.oecd.org/gov/digital-government/Digital-Government-Strategies-Welfare-Service.pdf Date of access: 17 Dec. 2019.

OECD. 2016. Stimulating digital innovation for growth and inclusiveness. The role of policies for the successful diffusion of ICT. http://www.oecd.org/*officialdocuments*/publicdisplaydocumentpdf/?cote=DSTI/ICCP(2015)18/FINAL&docLanguage=En Date of access: 16 Sep. 2019.

OECD. 2017. Fostering innovation in the public sector. https://oecd-opsi.org/wp-content/uploads/2018/07/Fostering-Innovation-in-the-Public-Sector-254-pages.pdf Date of access: 17 Sep. 2019.

OECD. 2017. Embracing innovation in government. https://www.oecd.org/gov/innovative-government/embracing-innovation-in-government.pdf Date of access: 03 Sep. 2019.

OECD, 2017. Embracing Innovation in Government: Global trends. https://www.oecd.org/innovation/innovative-government/embracing-innovation-in-government-global-trends.htm Date of access: 21 May. 2019.

OECD, 2016. Digital government as an enabler for open government in Indonesia. https://www.oecd.org/gov/open-government-in-indonesia-9789264265905-en.htm Date of access: 22 Mar. 2019

OECD, 2019. Going digital: Shaping policies and improving lives. http://www.oecd.org/going-digital/going-digital-synthesis-summary.pdf Date of access: 29 May. 2020.

OECD. 2007. Innovation growth: Rationale for an innovation strategy https://www.oecd.org/sti/inno/39374789.pdf Date of access: 05 Jul. 2018.

OECD. 2007. National Innovation System https://www.oecd.org/science/inno/2101733.pdf. Date of access: 10 Sep. 2018.

OECD. 2016. Stimulating digital innovation for growth and inclusiveness https://www.oecd.org/sti/inno/Innovation-Inclusive-Growth-Brochure.pdf Date of access: 10 Sep. 2018.

OECD. 2019. Digital government review of Argentina: Accelerating the digitalisation of the public sector. https://www.oecd.org/gov/digital-government-review-of-argentina-354732cc-en.htm Date of access: 29 Oct. 2021.

OECD. 2019. The digital innovation policy landscape in 2019. https://www.oecd-ilibrary.org/science-and-technology/the-digital-innovation-policy-landscape-in-2019_6171f649-en Date of access: 05 Nov. 2021.

Oksanen, J. 2005. Information society governance and its links to innovation policy in Finland (Governance of innovation system: Case studies in cross-sectional policy. France. P 35-56) https://www.researchgate.net/publication/299821188_Innovation_and_the_Information_Society Date of access: 04 Aug. 2021.

Osborne, S.P. 2010. The new public governance service: emerging perspective on the theory and practice of public governance. https://edisciplinas.usp.br/pluginfile.php/3343001/mod_resource/content/0/Anexo%20sem%20t%C3%ADtulo%2000582.pdf Date of access: 29 Jun. 2019.

Ouden, T.D. 2015. A contribution to the understanding and strengthening of network governance. https://edepot.wur.nl/347962. Date of access: 09 Sep. 2019.

Oyekemi, T. 2015. Participation, citizenship and internet use among South African youth. https://www.journals.ac.za/index.php/sajhe/article/view/3382 Date of access: 02 Jun. 2020.

Paletti, A. 2018. ICT and value creation in public sector: Manufacturing logic vs service logic.

https://pdfs.semanticscholar.org/eac5/72fbf7db8428500c4be4473fd3215e1a592c.pdf Date of access: 09 Sep. 2019.

Panigrahy, N.P. & Pradhan, R.K. 2015. Creativity and innovation: exploring the role of human resource practices at workplace. https://scholar.google.com/citations?view_op=view_citation&hl=en&user=eWEPvOUAAAAJ&citation_for_view=eWEPvOUAAAAJ:2osOgNQ5qMEC Date of access: 20 Jul. 2021.

Papa, A., Dezi, L., Gregori, G.L., Muller, J. & Miglietta, N. 2018. Improving innovation performance through knowledge acquisition: The moderating role of employee retention and human resource practices. https://www.semanticscholar.org/paper/Improving-innovation-performance-through-knowledge-Papa-Dezi/2b3707bbad973d13d6debcccc6bb958b6f1ae71d Date of access: 22 May. 2021.

Pater, D. 2005. Major telecoms cable project in Sub-Saharan Africa. https://www.ee.co.za/wp-content/uploads/legacy/Major%20telecoms%20cable%20projects.pdf Date of access: 09 Jun. 2020.

Patton, M.Q. & Cochran, M. 2002. A guide to using qualitative research methodology https://evaluation.msf.org/sites/evaluation/files/a_guide_to_using_qualitative_research_methodology.pdf Date of access: 2 May. 2018.

Pedersen. T.E. 2005. Information society policy co-ordination: A mould for innovation policy development in Norway (Governance of innovation system: Case studies in cross-sectional policy. France. P 65-92) https://www.researchgate.net/publication/299821188_Innovation_and_the_Information_Society Date of access: 04 Aug. 2021.

Pol, E. & Villiers, S. 2009. Social innovation: Buzz word or enduring term? https://www.sciencedirect.com/science/article/abs/pii/S1053535709000249 Date of access: 24 Jul. 2020.

Polikanov, D. & Abramova, I. 2011. Africa and ICT: A chance for breakthrough. https://www.tandfonline.com/doi/abs/10.1080/1369118032000068778 Date of access: 17 Jun. 2020.

Polt, W. & Schinder, J. 2005. Governance of Austria information society policy: Progress without strategy. (OECD, Governance of innovation system: Case studies in cross sectoral policy, France. P13-33) https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Polt%2C+W.+%26+Schinder%2C+J.+2005.+Governance+of+Austria+information+society+policy%3A+Progress+without+strategy.+&btnG= Date of access: 04 Aug. 2021.

Ponelis, S.R. & Holmner, M.A. 2015. ICT African building a better life for all. https://www.tandfonline.com/doi/full/10.1080/02681102.2015.1010307 Date of access: 23 Aug. 2020.

Potts, J & Kastelle, T. 2014. Public sector innovation research: What's next?. https://www.tandfonline.com/doi/pdf/10.5172/impp.12.2.122?needAccess=true Date of access: 19 May. 2021.

Pratama, B. 2018. Indonesia legal framework to support innovation sustainability. https://iopscience.iop.org/article/10.1088/1755-1315/126/1/012072/meta Date of access: 19 Jul. 2020.

Promberger, K. & Rauskala, M.I. 2003. New public management-An introduction from UK perspective. http://www.verwaltungsmanagement.at/687/uploads/10657009510.pdf Date of access: 16 Jul. 2018.

Provan, K.G. & Kenis, P. 2008. Modes of network governance: Structure, management and effectiveness. https://pure.uvt.nl/ws/portalfiles/portal/964494/modes.pdf Date of access: 07 Sep. 2019.

Pruzan, P. 2016. Research Methodology: The aims, practices and ethics of science. Switzerland: Springer. https://www.springer.com/gp/book/9783319271668. Date of access: 05 Jun. 2018.

Puttick, R., Baeck, P. & Colligan, P. 2014. The team and funds making innovation happen in governments around the world. https://media.nesta.org.uk/documents/i-teams_june_2014.pdf Date of access: 12 Jul. 2020.

Putra, H.S. 2017. Different perspective on public service innovation in Indonesia. https://www.slideshare.net/HeruSyahPutra/different-perspective-on-public-service-innovation-in-indonesia Date of access: 19 Jul. 2020.

Rabee, M.R. 2006. Developing a successful e-government. https://faculty.kfupm.edu.sa/ARCH/Rabee/publications_files/03Reffat_eGov.pdf Date of access: 01 Aug. 2020.

Ramakrishnan. 2013. Delivery of public service; The way forward. https://www.researchgate.net/publication/256055827Delivery_of_Public_Services_-_The_Way_Forward Date of access: 22 May. 2020.

Randal, L., Berlina, A., Tera, J. & Rinne, T. 2018. Digitalisation as a tool forsustainable Nordic regional development http://www.nordregio.org/wp-content/uploads/2018/03/Digitalisation_Discussion-Paper_Jan-31.pdf Date of ace: 10 Sep. 2018.

Ratcliff, D. 2016. 15 methods of data analysis in qualitative research. https://www.psychsoma.co.za/files/15methods.pdf Date of access: 12 Mar. 2018.

Reid, J. 2018. Singapore’s impressive digital success story. https://www.imd.org/news/updates/Uncovering-the-secrets-to-Singapores-digital-success/ Date of access 13 Sep. 2019.

Reynolds, E.B., Scheneider, R. & Zylberberg, E. 2019. Innovation in Brazil: Advancing development in the 21st century. https://www.routledge.com/Innovation-in-Brazil-Advancing-Development-in-the-21st-Century/Reynolds-Schneider-Zylberberg/p/book/9780367671501 Date of access: 03 Aug. 2020.

RIIS, 2016. A perspective on innovation in South Africa. http://www.innovationeasterncape.co.za/wpcontent/uploads/2017/11/perspec Date of access: 2 May. 2018.

Robinson, M. 2015. From old public administration to the new public service: implications for the public sector reform in developing countries. https://www.undp.org/publications/old-public-administration-new-public-service Date of access: 11 Jul. 2018.

Rondinelli, D.A. 2007. Public Administration and democratic governance: http://dag.un.org/handle/11176/89799 Date of access: 25 Oct. 2019.

Runya, X., Qigui, S. & Weis, S. 2015. The third wave of public administration-The new public governance. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.865.6642&rep=rep1&type=pdf Date of access: 31 Jul. 2018.

Rwanda: Ministry of Information Technology and communications. (2017). ICT sector strategic plan: 2018-2024. https://minict.gov.rw/fileadmin/Documents/Mitec2018/Policies___Publication/Strategy/ICT_HUB_STRATEGY_FINAL.pdf Date of access: 22 Jan. 2020.

Rwanda: Ministry of youth and ICT (2006). Smart Rwanda Master Plan: 2015-2020. https://www.theigc.org/wp-content/uploads/2016/11/Session-4.2-SRMP_ Mineacom.pdf Date of access: 22 Jan. 2020

Rwanda: Ministry in charge of ICT in the president office. (2015). National ICT strategy and plan. NICI:2011-2015 https://www.itu.int/en/ITU-D/Cybersecurity/Documents/National_Strategies_Repository/Rwanda%20NCSS%20NICI_III.pdf Date of access: 03 Feb. 2020.

Rwanda: Rwanda Smart (2020) Master plan: 2015. https://nyabihu.gov.rw/fileadmin/user_upload/ICT_SSP__SMART_Rwanda_Master_Plan1.pdf Date of access: 23 Jan. 2020.

SALGA. 2019. In.Know.vation. Sharing municipal knowledge, innovation & excellence. Cape town. https://www.salga.org.za/Documents/Knowledge%20Hub/Publications/inKNOWvation%20Magazine_Low.pdf Date of access: 30 Mar. 2020

Salman, A. 2009, ICT, The new media (internet) and development: Malaysian experiment. Vol 15 (1) 2009. Article 5. https://www.innovation.cc/scholarly-style/2010_15_1_5_salman_internet_malaysian.pdf Date of access: 16 Jul. 2020.

Schwab, K. 2016. The fourth industrial revolution. Crown publishing group. US. https://www.weforum.org/about/the-fourth-industrial-revolution-by-klaus-schwab Date of access: 22 Jun. 2020.

Scheltema, M.W. 2014. Assessing effectiveness of international private regulation in the CSR arena. https://scholarship.richmond.edu/global/vol13/iss2/4/ Date of access: 20 July. 2021.

Scopula, A. & Zanfei, A. 2016. Governance and innovation in public sector: A case of the digital library. WEB (1), 2012. https://daneshyari.com/article/preview/1024250.pdf Date of access: 06 Sep. 2019.

Singh, S. 2010. The South Africa information society, 1994-2008: Problems with policy, legislation, rhetoric and implementation. https://www.tandfonline.com/doi/abs/10.1080/03057071003607444 Date of access: 13 Jun. 2020.

Sirianni, C. 2012. The network of self-governance. https://democracyjournal.org/magazine/24/the-networks-of-self-governance/ Date of access: 16 Jul. 2018.

Sithole, n. 2009. Ideas that work: the public-sector innovation journal. Volume 1, issue1, 2009. http://www.cpsi.co.za/wp-content/uploads/2015/04/issue1_no1_2009.pdf Date of access: 30 Apr. 2018.

Shashnov, S. & kotsemir, M. 2018. Research landscape of the BRICKS countries: Current trends in research output, thematic structures of publications and relative influence of partners. https://ideas.repec.org/a/spr/scient/v117y2018i2d10.1007_s11192-018-2883-7.html Date of access: 23 Jun. 2020.

Shenglin, B., Simonelli, F., Ruidong, Z., Bosc, R. & Wenwei. L. 2017. Digital infrastructure: Overcoming the digital divide in emerging economies. https://www.g20-insights.org/wp-content/uploads/2017/05/Digital_Overcoming-Digital-Divide-II.pdf Date of access: 03 Aug. 2020.

Smart Nation and digital government office. 2018. Digital government blueprint: A Singapore government that is digital to the core and serves with heart. https://www.tech.gov.sg/files/digital-transformation/dgb_summary_june2018.pdf Date of access: 06 Sep. 2019.

Smith, P.A. 2012. Municipal guide to successful ICT governance. https://www.salga.org.za/Documents/Municipalities/Municipla%20Focus/Municipal%20ICT/SALGA_ICT-Governance-Guidelines_revised_June2012_v1_2.pdf Date of access: 25 Mar. 2020.

Sorensen, E. & Torfing, J 2012. Collaboration innovation in the public sector. Journal, vol 17 (1), 2012, article 1. https://www.innovation.cc/volumesissues/intro_eva_sorensen_torfing_17v1i1.pdf Date of access: 05 Sep. 2019.

Sorensen, E. & Torfing, J. 2016. Theories of democratic network government. Palgrave McMillian. New York. https://www.palgrave.com/gp/book/9781403995285 Date of access: 08 Aug. 2020.

South Africa. Department of telecommunication and postal services. 2016. National integrated ICT policy white paper. 2016. Pretoria. https://www.dtps.gov.za/images/phocagallery/Popular_Topic_Pictures/National_Integrated_ICT_Policy_White.pdf Date of access: 28 May. 2018.

South Africa. Department of telecommunications and postal services. 2018. Invitation to nominate candidates for the presidential commission on 4IR. https://www.dtps.gov.za/images/phocagallery/Popular_Topic_Pictures/Minister-nomination-form.pdf Date of access: 12 May. 2020.

South Africa. 2016. National integrated ICT policy white paper (notice 1212) government gazette, 40325, 03 October. https://www.greengazette.co.za/notices/electronic-communications-act-36-2005-national-integrated-ict-policy-white-paper_20161003-GGN-40325-01212 Date of access: 14 Dec. 2019.

South Africa. Department of Presidency. 2018. National planning commission. 2018. Pretoria. https://www.gov.za/issues/national-development-plan-2030 Date of access: 22 May. 2020.

South Africa. Department of public service and administration. 2012. PSCGICTPF. http://www.dpsa.gov.za/dpsa2g/documents/psictm/2013/CGICT%20Policy%20Framework.pdf Date of access: 14 Sep. 2019.

South African. 2017. National e-government strategy and road map: Digitizing Government services. 2017 (notice 40772) 538. 7 April. https://www.ellipsis.co.za/wp-content/uploads/2017/04/National-e-government-strategy-and-roadmap-Digitizing-government-services.pdf Date of access: 17 Nov. 2019.

South Africa. 2015. Department of Public Service and Administration. Annual report 2014/2015. 2015. https://www.gov.za/documents/department-public-service-and-administration-annual-report-20142015-13-oct-2015-0000 Date of access: 19 May. 2020.

South Africa. 1997. National Advisory Council on Innovation (Act no. 55 of 1997). http://www.saflii.org/za/legis/num_act/nacoia1997424 Date of access: 17 Dec. 2019.

Sutherland, E. 2019. The fourth industrial revolution: The case of South Africa. https://www.tandfonline.com/doi/abs/10.1080/02589346.2019.1696003 Date of access: 14 Jun. 2020.

Szabo, Z.K., Neag, R. & Szabo, M. 2019. The challenges of transition from e-government to digital government. https://old.upm.ro/fa cultati_departamente/ea/RePEc/curentul_juridic/rcj19/recjurid194_7F.pdf Date of access: 17 Aug. 2020.

Taiehagh, A. 2021. Governance of artificial intelligence. https://www.Tandfonline.com/doi/full/10.1080/14494035.2021.1928377 Date of access: 20 Jul. 2021.

Tamayao, M.J. 2017. What is governance? https://www.researchgate.net/publiccation/37376941_The_concept_of_commu nity_governance_a_preliminary_review Date of access: 04 Sep. 2019.

Telkom business. 2015. Broadband in South Africa. https://media.telkom.co.za/today/media/downloads/BroadbandWP_2014_PRIN T.pdf Date of access: 29 Jan. 2018.

Thornhill, C. & Van Dijk, G. 2010. Public Administration theory: Justification for conceptualization. https://repository.up.ac.za/bitstream/handle/2263/14976/Thornhill_Public%2 82010%29.pdf?sequence=1&isAllowed=y Date of access: 12 Jul. 2018

Toikka, A. 2011. Governance theory as a framework for empirical research. Finland University of Helsinki (thesis) https://pdfs.semanticscholar.org/58a 4/6f8226414102e1d2397ebbd6e578cb2b5631.pdf Date of access 05 Sep. 2019.

Tuli, F. 2010. The basis of distinction between qualitative and quantitative research in social sciences: reflection on ontological, epistemological and methodological

perspectives. https://www.ajol.info/index.php/ejesc/article/view/65384 Date of access: 10. Sep 2021.

Turner, A. 2018. Digital innovation: Australia's 315 b opportunity. https://www.csiro.au/en/News/News-releases/2018/Australias-315bn-opportunity Date of access: 04 Sep. 2019.

UNECE, 2017. Innovation in the public sector: Country experiences and policy recommendations. https://unece.org/fileadm in/DAM/ceci/publications /Innovationin_the_Public_Sector/Public_Sector_Innovation_for_web.pdf Date of access: 20 Jul. 2021.

USAASA. 2016. Universal access and services to ICT for all. USAASA strategic plan (2016-2020). http://www.usaasa.org.za/export/sites/usaasa/resource-centre/download-centre/downloads/USAASA-2016-2020-Strategic-Plan.pdf Date of access: 30. Nov. 2019.

Usengumukiza, F. 2009. Overview of Rwanda's ICT context. https://www.infodev.org/infodev-files/resource/InfodevDocuments_423.pdf Date of access: 20 Jan. 2020.

Uslu, T. 2015. Innovation culture and strategic human resource management in public and private sector within the framework of employee ownership. https://www.sciencedirect.com/science/article/pii/S1877042815039245 Date of access: 20. Jul. 2021.

USP. 2011. Status of ICT development: country report: Brazil. https://cordis.europa.eu/docs/projects/cnect/0/231730/080/deliverables/001-D52StatusofICTpolicydevelopmentCountryreportBrazil.pdf Date of access: 17 Dec. 2019.

Vander Waldt, G. 2002. E-governance: Where do we stand and what are the challenges? https://www.academia.edu/6863714/E-Governance_Where_do_we_stand_and_what_are_the_challenges Date of access: 09 Jun. 2020.

Veit, D. & Huntgeburth, J. 2014. Foundation of digital government: Leading and managing in the digital era. Ebook. Springer. New York. https://ru.b-ok2.org/book/2170632/6007e4 Date of access: 03 Sep. 2019.

Villaluz, V.C. & Hechanova, R.M. 2018. Ownership and leadership in building an innovation culture. https://www.emerald.com/insight/content/doi/10.1108/LODJ-05-2018-0184/full/html?casa_token=pdF0BYT5ISQAAAAA:dt2m6svZlbn2uwYUI67_irl77WoWywZ8_LI1AzksqtzpLKUhygUY06lWgcXjstRGfKh92r1esroqm7hi_wHprwHXvElpHyHYpikwyEYRPvrIH1O9JKA Date of access: 20 Jul. 2021.

Walker, R.M., Avellaneda, C.N. & Berry, I.S. 2011. Explaining the diffusion of innovation among high and low innovative localities. https://www.tandfonline.com/doi/abs/10.1080/14719037.2010.501616 Date of access: 05 Nov. 2021.

Walsham, G. 2006. Doing interpretive research. https://link.springer.com/article/10.1057/palgrave.ejis.3000589 Date of access: 10 Sep. 2021.

Welchmen, L. 2015. The basics of digital governance in managing chaos: Digital government by design. https://www.amazon.com/Managing-Chaos-Digital-Governance-Design/dp/1933820888 Date of access: 02 Sep. 2019.

Welchmen, L. 2017. Digital governance. https://www.geonetric.com/wp-content/uploads/webinar_take-control-with-digital-governance.pdf Date of access: 02 Sep. 2019.

Wessels, B. 2000. Understanding the internet: A socio-cultural perspective. China. Macmillian. https://mragnedda.files.wordpress.com/2013/06/introduction-and-table-of-content.pdf Date of access: 03 Sep. 2019.

West, D.M. 2005. Digital government: Technology and public sector performance: Princeton University Press. UK. https://press.princeton.edu/books/paperback/9780691134079/digital-government Date of access: 17 Jul. 2020.

Windrum, P. & Koch, P. 2008. Innovation in the public sector: entrepreneurship, creativity and management. https://www.researchgate.net/publication/41555262_Innovation_in_Public_Sector_Services_Entrepreneurship_Creativity_and_Management Date of access: 19 May. 2021.

Winston, M.E. & Edelbach, R.D., 2012. Society, ethics and technology. Canada.

Wipulanusat, W., Panuwatwanich, K. & Stewat, R.A. 2018. Pathways to workplace innovation and career satisfaction in the public service. https://www.emerald.com/insight/content/doi/10.1108/IJOA-03-2018-1376/full/html Date of access: 20 Jul. 2021.

Worldbank. 2018. Overcoming poverty and inequality in South Africa: An assessment of drivers, constraints and opportunities. https://www.dpme.gov.za/publications/Reports%20and%20Other%20Information%20Products/World%20Bank%20Report%202018.pdf Date of access: 15 May. 2020.

Yigitcanlar, T. 2020. Bridging the gap between citizens and local authorities via e-government. https://pdfs.semanticscholar.org/3d61/fe8b878de9a 219a6a7 a06222d2b6cb7a37e2.pdf Date of access: 27 May. 2020.

Yin Lin, D. 2016. What makes Singapore's government a digital leader-and how it might do better? https://www.mckinsey.com/~/media/McKinsey/Locations/Asia/Singapore/Our%20insights/Singapore%20govt%20digital%20leader/Singapore%20govt%20digital%20leader.ashx Date of access: 03 Sep. 2019.

Zeitlin, A. & Bower, J. 2018. Harnessing the potential of ICT for education in Rwanda. https://www.theigc.org/wp-content/uploads/2019/01/Zeitlin-Bower-2018-Policy-brief_ICT.pdf Date of access: 21 Jan. 2020.

Addendum

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
VAAL TRIANGLE CAMPUS

PO Box 1174, Vanderbijlpark
South Africa, 1900

Web: http://www.nwu.ac.za

DATE: 04/03/2021

BaSSREC Authorization

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

TITLE OF THE RESEARCH PROJECT: Governance of digital innovation in the public sector in South Africa

REFERENCE NUMBERS:

PRINCIPAL INVESTIGATOR: Oniccah Motloung

ADDRESS: No 06 Corot Court street Vanderbijlpark

CONTACT NUMBER: 073 262 8197

You are being invited to take part in a research project that forms part of my PhD study Please take some time to read the information presented here, which will explain the details of this project. Please ask the researcher any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research is about and how you could be involved. Also, your participation is **entirely voluntary,** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part. Prior to publication of the study's results (or the point that publication is in process), you may also withdraw the data you generate.

This study has been approved by the **Basic Social Sciences Research Ethics Committee (BaSSREC) of the Faculty of Humanities of the North-West University (NWU …)** and will be conducted according to the ethical guidelines and principles of the international Singapore Statement on Research Integrity (2010) and the ethical guidelines of the National Health Research Ethics Council. It might be necessary for the research ethics committee members or relevant authorities to inspect the research records to make sure that we (the researchers) are conducting research in an ethical manner.

What is this research study all about?

- *This study will be conducted in an ethical manner and will involve the use of 12 semi-structured interviews.*
- *The researcher has been trained to use the methods mentioned in the previous sentence.*
- *Approximately twelve participants will be included in this study.*
- *The objectives of this research are to find out if there is an existing governance framework for digital innovation in the public sector in South Africa.*

Why have you been invited to participate?

Inclusion

- *You have been invited to participate because you are a government official relevant to the study.*

You have also complied with the following inclusion criteria in the research project: Only officials employed in government departments concerned with public sector innovation and its governance. This means that the relevant officials in the following national government departments: Science and Technology, Public service and Administration, Communications and Digital technologies and officials in government agencies established for the enhancement of innovation; agencies include, CPSI, CSIR, NACI, TIA, HSRC. Officials that are in the department of Science and technology, CSIR and CPSI will recommend other officials in different government departments relevant to the study to be interviewed. Even when snowball is used as a method to find participants, considerations will still be made to make sure that it's only relevant participants and they are not minors.

Exclusion:

- *The study will not exclude anyone who is a minor, officials not working in the National government department relevant to the study. Any government official who is not in the*

inclusion criteria for instance the department of science and technology or CPSI will not be included in the research as they have no relevance unless recommended by an official working under the above-mentioned departments based on their interactions with regard to digital innovation.

What will your responsibilities be?

- *You will be requested to answer questions in all honesty.*
- *To participate in the semi-structured interview.*
- *To sign the Informed Consent Statement before the commencement of the interview.*

Will you benefit from taking part in this research?

- *The direct benefits for you as a participant will probably be having an electronic thesis that will be the final product of this research.*
- *The indirect benefit will probably be able to use the recommendations made in the thesis in your department.*

Are there risks involved in your taking part in this research and how will these be managed?

- *The risks in this study, and how these will be managed, are summarised in the table below:*

Probable/possible risks/discomforts	***Strategies to minimize risk/discomfort***
No risk is foreseen in this study	*Interviews will be conducted for 40 minutes to limit respondents being tired or losing focus and it will be at the space that is convenient to the respondent like his office.*

- *We do believe that the benefits to you and to science (as noted in the previous section) outweigh the risks we have listed. If you disagree, then please feel free not to participate in this study. We will respect your decision.*
- *Should we learn, in the course of the research, that someone is harming you, or that you are intending to harm someone, then we must tell someone who can help you/warn the person you are intending to harm.*

Who will have access to the data?

- *Anonymity (that is, in no way will your results be linked to your identity) the researcher will use a set of alphabets to identify the respondents and also report the research results, and no alphabet will be linked to any participant in any way for instance; the letter won't be the first letter of the name of the respondent, it will be a random alphabet. This is done to protect the identity of the respondent and also to make sure that the respondent is free and honest in his response to interview questions.*
- *Confidentiality (that is, I/we assure you that we will protect the information we have about you) Reporting of findings will be anonymised by the researcher. The interview*

transcripts will be kept safe in locked cupboard to prevent access to them, and no names will be used in reports and findings in order to protect the participants. The information/documents will be secured with a password until the final results of the research study is determined. The information will only be assessed by the researcher. Data will be stored until the findings have been published in a report. The true identities of the interviewees will only be known to the researcher. The researcher's journal and signed consent forms will be kept for five years in a secured facility at the department of governance in accordance to NWU research policy.

- *Only the researcher and the supervisor will have access to the biographical data of the participants. Data will be kept safe and secure by locking hard copies in locked cupboards in the researcher's office and for electronic data, it will be password protected.*
- *Audio-recorded data: The researcher will not use any audio recorder; this is also to protect the respondent. A transcriber will not be used in this project, the researcher will transcribe the findings by herself. As soon as data has been transcribed it will be deleted from the recorders. The transcripts will be stored on a password-protected computer.*
- *Data will be stored for five years in a university safe.*

What will happen to the data?

The data from this study will be reported in the following ways: thesis. In all of this reporting, you will not be personally identified. This means that the reporting will not include your name or details that will help others to know that you participated (e.g., your address or the name of your school).

This is a once-off study, so the data will not be re-used.

Will you be paid/compensated to take part in this study and are there any costs involved?

No, you will not be paid/compensated to take part in the study, but refreshments will be given. If participating in the research means that you have to travel especially for the purpose of participating, then your travel costs will be paid. There will thus be no costs involved

How will you know about the findings?

- The general findings of the research will be shared with you by email.
- If you would like feedback on your results, please notify the researcher.

Is there anything else that you should know or do?

- You can contact (*researcher)* Oniccah Motloung at 073 262 8197 if you have any further queries or encounter any problems.
- You can contact the chair of the Basic Social Sciences Research Ethics Committee (Dr Jacques Rothmann) at 018 299 1595 or 21081719@nwu.ac.za if you have any concerns or complaints that have not been adequately addressed by the researcher.
- You will receive a copy of this information and consent form for your records.

Declaration by participant

By signing below, I _____ agree to take part in a research study entitled:

I declare that:

- I have read and understood this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions to both the person obtaining consent, as well as the researcher (if this is a different person), and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I understand that what I contribute (what I report/say/write/draw/produce visually) could be reproduced publically and/or quoted, but without reference to my identity.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (*place*) _____ on (*date*) _____ 20 _____

_____ _____

Signature of participant **Signature of witness**

- You may contact me again ☐ **Yes** ☐ **No**
- I would like a summary of the findings of this research ☐ **Yes** ☐ **No**
- I would like feedback on my functioning/wellbeing as reflected in the questionnaires I completed ☐ **Yes** ☐ **No**

The best way to reach me is:

Name & Surname: _____
Postal Address: _____
Email: _____
Phone Number: _____

Cell Phone Number: _____

In case the above details change, please contact the following person who knows me well and who does not live with me and who will help you to contact me:

Name & Surname: _____

Phone/ Cell Phone Number /Email: _____

Declaration by person obtaining consent

I *(name)* _____ declare that:

- I explained the information in this document to _____
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter.

Signed at (*place*) _____ on (*date*) _____20 ____

_____ _____

Signature of person obtaining consent **Signature of witness**

Declaration by researcher

I *(name)* _____ declare that:

- I explained the information in this document to _____
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter.

Signed at (*place*) _____ on (*date*) _____20 _____

_____ _____

Signature of participant **Signature of witness**

_____

Declaration by researcher and participant

Personal face-to-face interviews during Covid-19 restrictions

***Additional declaration by participant in those instances where the participant requests to participate in a personal face-to-face semi-structured interview:**

By signing below, I _____, acknowledge the following information related to the required measures regarding Covid-19:

I declare that:

- It is my choice and preference to participate in a face-to-face semi-structured interview with the researcher.
- This requires that I consent to the following strict measures to safeguard the health and safety of myself and that of the researcher/interviewer/primary investigator:

- I consent to the researcher taking my temperature before the interview using a thermometer. ☐ **Yes** ☐ **No**
- I confirm that my temperature measured at _____ degrees. ☐ **Yes** ☐ **No**
- I consent to use the three-ply mask provided by the researcher. ☐ **Yes** ☐ **No**
- I consent to wear the three-ply mask for the full duration of the interview. ☐ **Yes** ☐ **No**
- I consent to the researcher sanitising the interview context using a sanitiser with an 80% alcohol content before the commencement of the interview. ☐ **Yes** ☐ **No**
- I consent to the researcher using a sanitiser with an 80% alcohol content before and during the interview if required. ☐ **Yes** ☐ **No**

Signed at (*place*) _____ on (*date*) _____ 20 ____

_____ _____

Signature of participant **Signature of researcher**

File number:

Date of interview:

Place of interview:

Name of respondent:

Occupation of respondent:

Year of occupation:

ID/Passport number:

Gender:

Address of respondent:

Email address:

Telephone number (W)_____and (H)_____

Cellular/mobile number:

Date of birth:

Summary of subject discussed:

……

Interview guide

Introduction

Thank you for allowing me to interview you. This interview serves a research purpose for the philosophy doctor degree (PhD) in public management and governance. The North West University's ethics committee endorses this research project.

The interview should take about 40 minutes to complete. You are expected to answer all the questions in one sitting. Should you have questions, please do not hesitate to ask.

List of questions to government departments and agencies

Does the government understand the importance of public sector digital innovation in the 4th industrial revolution? If yes, please explain.

Does the government have the capacity to govern digital innovation in the public sector?

Are there any programmes in place to inspire public sector digital innovation in SA and who participates in these programmes, for instance, government departments, NGO's and private companies?

Is there a policy/framework in SA to govern digital innovation in the public sector?

Does the existing framework encourage employee incentives or rewards and improve employee skills? If yes, please explain.

How does this framework address sharing and diffusion of ideas among employees of the same department, other government departments, the public as well as private sectors?

Is the government doing enough to make sure that the digital innovation diffusion environment is conducive for digital innovation development, in terms of finance and frameworks available?

Are there methods available to review or measure if the digital innovation in the public sector is performing well?

Does governance of digital innovation use network governance, collaboration and partnerships to enhance digital innovation in the public sector?

What more can the government do to improve the governance of digital innovation in S.A in relation to what other countries are doing?

File number:

Date of interview:

Place of interview:

Name of respondent:

Occupation of respondent:

Year of occupation:

ID/Passport number:

Gender:

Address of respondent:

Email address:

Telephone number (W)_____and (H)_____

Cellular/mobile number:

Date of birth:

Summary of subject discussed:

……

Interview guide

Introduction

Thank you for allowing me to interview you. This interview serves a research purpose for the philosophy doctor degree (PhD) in public management and governance. The North West University's ethics committee endorses this research project.

The interview should take about 40 minutes to complete. You are expected to answer all the questions in one sitting. Should you have questions, please do not hesitate to ask.

List of questions to NGO's and private Organisations

Do you have an interest in digital innovation in the public sector?

What role has your organisation played in the governance of digital innovation in SA?

What are your general thoughts regarding digital innovation and its governance in South African's public sector?

Does the government have the capacity to govern digital innovation in the public sector?

How is South Africa performing as compared to other countries?

Would the country be able to close the gap? If yes, please explain.

Would collaboration and partnerships between governments, the general public and the private sector enhance digital innovation in the South African public sector? If yes, please explain.

What would you suggest as the best way to govern digital innovation in the public sector in SA?