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The role of ICT to promote smart governance in local governments

by

MNCEDISI NCAMPHALALA

A dissertation submitted in fulfilment for the Degree of Master’s in Arts in Public Management and Governance at the College of Business and Economics UNIVERSITY OF JOHANNESBURG

Supervisor: Prof S Vyas-Doorgapersad

2019
DECLARATION

I certify that the dissertation submitted by me for the degree Master’s of Arts (Public Management and Governance) at the University of Johannesburg is my independent work and has not been submitted by me for a degree at another university.

________________________________________
(MNCEDISI NCAMPHALALA)
ACKNOWLEDGEMENTS

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I would like to express my sincere gratitude to my study supervisor, Prof Shikha Vyas-Doorgapersad for mentorship and continuous guidance.

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My thanks go to my love Joyce Mahasele, Dr Maxwell Haurovi, and my family for their continuous and undying support.
ABSTRACT

This study aims to provide a conceptual framework to explain the issues, concerns, challenges and solutions on introducing information and communication technology initiatives to create smart governance. The study contextualises the use of ICTs in the City of Ekurhuleni Metropolitan Municipality, thereby aiming to make this key South African metropolitan municipality a ‘smart city’, with smart governance, by offering smart services to community members. The research takes a qualitative research approach, which is exploratory, and a quantitative research approach, which is descriptive, to realise the outcomes of the research questions formulated. This mixed-methods approach was deemed most suitable. The findings explore that while various challenges remain, it is the willingness of leadership and the relative importance that those holding the levers of power in the CoE attach to ICTs that determine how deep and far they will drive the municipality towards this goal. Ultimately, there is a need for modern-day municipalities to adopt 21st-century, compliant, smart solutions that not only improve the effectiveness of public service delivery, but also transform the economic and efficient aspects of the delivery of services to citizens. The study recommends that there is a need to balance policy prescripts and implementation or practice; to prioritise ICT in planning and budgeting; to improve community involvement and engagement; to establish ethical and professional leadership practices; to consider meritorious and competency-based appointments; to intensify investment in ICT infrastructure, and to mould municipal service delivery on smart governance.

Key words: Information and Communication Technology, e-government, smart cities, smart governance, service delivery
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>NPM</td>
<td>New Public Management</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisations for Economic Cooperation and Development</td>
</tr>
<tr>
<td>SALGA</td>
<td>South African Local Government Association</td>
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<tr>
<td>CoE</td>
<td>City of Ekurhuleni</td>
</tr>
<tr>
<td>SDBIP</td>
<td>Service Delivery and Budget Implementation Plan</td>
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<tr>
<td>EPWP</td>
<td>Expanded Public Work Programme</td>
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<tr>
<td>SETAs</td>
<td>Sector Education and Training Authorities</td>
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<tr>
<td>E-Administration</td>
<td>Electronic Administration</td>
</tr>
<tr>
<td>E-citizen</td>
<td>Electronic Citizen</td>
</tr>
<tr>
<td>E-Society</td>
<td>Electronic Society</td>
</tr>
<tr>
<td>DPSA</td>
<td>Department of Public Service and Administration</td>
</tr>
<tr>
<td>ITU</td>
<td>International Telecommunication Union</td>
</tr>
<tr>
<td>GHS</td>
<td>General House Survey</td>
</tr>
<tr>
<td>DTPS</td>
<td>Department of Telecommunications and Postal Services</td>
</tr>
<tr>
<td>G2C</td>
<td>Government to Customers</td>
</tr>
<tr>
<td>G2B</td>
<td>Government to Business</td>
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<tr>
<td>G2E</td>
<td>Government to Entities</td>
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<td>G2G</td>
<td>Government to Government</td>
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<tr>
<td>ECT</td>
<td>Electronic Communication and Transaction</td>
</tr>
<tr>
<td>ECA</td>
<td>Electronic Communication Act</td>
</tr>
<tr>
<td>OGCIO</td>
<td>Office of Government Chief Information Officer</td>
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<tr>
<td>GITOC</td>
<td>Government Information Technology Officer</td>
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<tr>
<td>IT</td>
<td>Information Technology</td>
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<tr>
<td>MISS</td>
<td>Minimum Information Security Standards</td>
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<tr>
<td>MIOS</td>
<td>Minimum Interoperability Standards</td>
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<tr>
<td>NDP</td>
<td>National Development Plan</td>
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<tr>
<td>CIO</td>
<td>Chief Information Officer</td>
</tr>
<tr>
<td>PIAC</td>
<td>Presidential International Advisory Council</td>
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<tr>
<td>ISAD</td>
<td>Information Society and Development</td>
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<tr>
<td>DoC</td>
<td>Department of Communication</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>Human Immune Virus/ Acquired Immune Deficiency Syndrome</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>ESKOM</td>
<td>Electricity Supply Commission</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>GCC</td>
<td>Government Certificate of Competency</td>
</tr>
<tr>
<td>IDZ</td>
<td>Industrial Development Zone</td>
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<tr>
<td>GDS</td>
<td>Growth Development Strategy</td>
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<tr>
<td>EAP</td>
<td>Economically Active Population</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>EMM</td>
<td>Ekurhuleni Metropolitan Municipality</td>
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<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
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<tr>
<td>BTN</td>
<td>Bytes Technology Networks</td>
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<tr>
<td>ICASA</td>
<td>International Collaborative Network for Agricultural Systems Applications</td>
</tr>
<tr>
<td>CATV</td>
<td>Cable Television</td>
</tr>
<tr>
<td>FTTH</td>
<td>Fiber To The Home</td>
</tr>
<tr>
<td>FWA</td>
<td>Fixed Wireless Access</td>
</tr>
<tr>
<td>2G</td>
<td>2\textsuperscript{nd} Generation</td>
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<tr>
<td>QDA</td>
<td>Qualitative Data Analysis</td>
</tr>
<tr>
<td>CDW</td>
<td>Community Development Workers</td>
</tr>
<tr>
<td>PITs</td>
<td>Public Internet Terminals</td>
</tr>
<tr>
<td>IM</td>
<td>Information Management</td>
</tr>
<tr>
<td>IS</td>
<td>Information Systems</td>
</tr>
<tr>
<td>CEOs</td>
<td>Chief Executive Officers</td>
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CHAPTER ONE
GENERAL SCIENTIFIC AND METHODOLOGICAL ORIENTATION TO THE STUDY

1.1 INTRODUCTION

This study focuses on the use of information and communication technologies (ICT) to transform municipalities into smart cities for improved smart governance, with smart delivery of services. This first chapter provides the background and rationale for the study in order to contextualise the research. The problem statement, guiding research question, secondary research questions and study objectives are provided. The methodological approach in terms of the research design, research method, and data-collection methods are also given attention. Concepts that are used frequently in the dissertation are defined. The chapter provides an outline of the study, introduces the research process that will be followed in the subsequent chapters, and concludes with a discussion of ethical considerations.

1.2 BACKGROUND AND RATIONALE

The information published in an article regarding urbanisation by Abbas (2017: 4), highlights that “throughout the world, cities are growing at exponential rates. In 1910, 10% of the world’s population lived in cities. By 2014, 50% of the world’s population lived in cities, and it is projected that by 2050, 75% of the world’s population will live in cities”. This information was supported by in.KNOW.vation (a magazine 2015: 1) emphasising that “as urban municipalities grow, they face the challenge of increased populations, greater service-delivery requirements, and a more demanding, educated consumer. Many rural municipalities, on the other hand, are shrinking, together with their tax bases and access to capable talent” (in.KNOW.vation 2015: 1). This situation is furthermore highlighted by Das and Misra (2017: 1), that in 1950, only “30% of the world’s population was urban”. According to United Nations Report (Das and Misra 2017: 1), it can be argued that 54% of the world’s population was living in urban areas in 2014, which is expected to increase to 66% by 2050. In 2014, the most urbanized regions include Northern America (82% living in urban areas), Latin America and the
Caribbean (80%) and Europe (73%). In contrast, Das and Misra (2017: 1) further stress that Africa and Asia remain mostly rural, with 40% and 48% of their respective populations living in urban areas. Africa and Asia are urbanizing faster than the other regions and are projected to become 56% and 64% urban respectively, by 2050. This situation, according to Das and Misra (2017: 1) demands urban renewal in terms of infrastructure and services; therefore, the establishment of smart cities is considered a requirement for seamless services. Smart cities can bring smart solutions to make infrastructure and services effective and efficient.

Smart governance, on the other hand, as described by Basheka (2012:34) and (Henry (2010:29), is synonymous with such practices as e-governance. E-governance, as cited by Vyas-Doorgapersad (2009: 460), “refers to new processes of coordination made possible or even necessary by the advent of technology-and the spreading of online activities in particular”. Maseko and Vyas-Doorgapersad (2019: 176) further cite Hernon and Cullen (2006) highlighting “that e-government not only seeks to improve services and efficiency, but also contributes to public management modernisation and reform”. In order for the study to locate the e-governance paradigm in an era where technology-driven public service delivery has risen to prominence, it provides a brief synopsis of the paradigmatic development in the discipline of Public Administration. In public administration, scholars to some extent agree on some distinguishable path in the development of this discipline (Basheka 2012:34; Henry 2010:29). The paradigm chronology as recognised by Henry (2010:30) is as follows:

**Paradigm 1: The politics administration dichotomy (1900-1926)**

The major assumption of the Politics Administration Dichotomy paradigm was to separate politics and the administration functions of government as a strategy to promote efficiency and effectiveness. Basheka (2012:41) remarks that “Woodrow Wilson who pioneered this paradigm with his seminal article of 1887 earmarked four requirements of effective public administration, namely, separation of politics and administration, comparative analysis of political and private organizations, improving efficiency with business-like practices and attitudes toward daily operations, and improving the effectiveness of public service through management and training of civil servants, as well as encouraging merit-based assessment”. Henry (1975: 379)
emphasises that “it is appreciated that this paradigm debuted the discipline by providing a solid foundation for the theorisation and pedagogy of public administration”.

- **Paradigm 2: Principles of administration (1927-1937)**

  The era of principles of administration paradigm was an advancement to the management orientation through the elevation of Public Administration and the administration/management to the status of science. The existing belief was in certain scientific principles of administration that could be relied upon to increase the efficiency and effectiveness of government, and that these principles by their scientific characteristics, could work in any administrative setting regardless of sector, culture, function, environment, mission or institutional framework (Dahl 2018:70). According to Basheka (2012: 43), “the identification of seven principles of administration including planning, organising, staffing, directing, coordinating, reporting and budgeting (POSDCORB), was the climax of this stage”.

- **Paradigm 3: Public administration as political science (1950-1970)**

  Paradigm three, which Henry (2010:28) describes as Public Administration as political science (1950-1970), saw a revolt of political scientists to reclaim Public Administration. In the same period, there were increasing claims by management theorists to the discipline. Dhameja (2003:1) describes the period as the era of deflating the dichotomy and puncturing of the principles. Thus, the politics-administration dichotomy was refuted on the grounds of inseparability of administration from politics in the real world of government. Politics, according to Basheka (2012:35), which had initially meant partisan and corrupt politics, expanded in scholarly meaning by the 1930s to include public policy-making. At this point, it became obvious that the dichotomy was practically untenable.

- **Paradigm 4: Public administration as management (1956-1970)**

  Henry (2010:32) notes that the fourth paradigm is the era of Public Administration as management (1956-1970). This virtually coincides with the third, showing that it was
not a win-win victory for political science, as some scholars consolidated the management outlook of public administration. Clearly, in paradigms three and four, the two disciplines contending for the soul of Public Administration almost left no locus and focus for the newly-acclaimed science and field of study canvassed by the pioneer scholars.

- **Paradigm 5: Public administration as public administration (1970-1990)**

  At this stage, according to Peters (2003:9), there was effort to re-establish the discipline as an autonomous field of study. However, the focus, identified to be a hierarchical bureaucracy, was shifted to markets and private sector organisations. In other words, there was a move from the traditional, conventional public administration model to the New Public Management model. Against the various paradigms or stages of public administration development recognised by Henry (1975), this was the clear genuine paradigm shift towards management approach.

- **Paradigm 6: Governance (1990 to date)**

  It is rather ironical to talk about a shift to governance paradigm, when the very objective of government and its public administration is governance. It is a term that is usually used as a synonym to the word ‘government’ or to qualify its activity. The concept is not new but had acquired new meaning and application from the late 1980s and 1990s. It can be defined as the exercise of power or authority by political leaders for the well-being of their country’s citizens or subjects, the complex process whereby some sectors of the society wield power, and enact and promulgate public policies which directly affect human and institutional interactions, and economic and social development (Tamayao 2014:12). The governance paradigm has a similar origin and conceptual connation with the New Public Management (NPM), which it is said to succeed. Both were public administration streams of the neoliberal ideology that most Organisations for Economic Cooperation and Development (OECD) countries embraced in the late 1970s and early 1980s. The two paradigms in some ways do fit together well, both attempting to break down the hierarchical, top-down system of governing inherited from the past (Peters 2003:18). The governance paradigm as the
current paradigm through which Public Administration and service delivery are being studied and done respectively, has become solidly linked to e-governance through to rapid globalisation and 21st century ICT advancement.

Contextually, this situation, as discussed, has created stress in the daily functioning of municipalities, especially in the African continent, that have experienced and still do experience the crisis of political turmoil, intolerance and harsh dictatorship; others have a military regime with highly centralised government processes (Vyas-Doorgapersad 2011: 238). This scenario has impacted negatively on delivery of services to end users who are the consumers of municipal services. Kanyane (Undated:78) highlighted that to the public management school of thought, commonly referred to as New Public Management (NPM), the recipients or beneficiaries of public service delivery are referred to as ‘customers, while in the context of the discipline of Public Administration, they are usually termed the ‘clientele’ or ‘citizenry’. The term ‘new public management’ appeared in the early 1990s and puts very strong emphasis on the idea of providing service to customers. Kanyane (Undated: 78; also refer Maseko 2018: 27) furthermore analysed the Karl Marxian and Max Weberian schools of thought in the context of public service and emphasised that human beings would cease to exist if basic public services such as water and sanitation, were not available to them. This is clearly articulated in Weber’s hierarchy of needs.

African countries are therefore making paradigm shifts in Public Administration and are introducing new NPM-inspired initiatives of public management such as public-private partnerships; the issuing of service contracts, and decentralisation. The rationale is the need to revolutionise the method/s of delivering services to the people. To make this a reality, there has to be a move away from the conventional approaches to public service delivery, where government is the sole provider of such services. Alternative mechanisms must be used instead; these must be cost-effective and efficient and be in accordance with the prescribed legal frameworks in the specific country (in Maseko 2018: 32-33). These alternative mechanisms include ICT that utilises digitalised means to create a “networked society, networked cities and networked governance associated with ICTs”, hence transforming municipalities (Castells 2008 cited in Sadoway and Shekhar 2014: 1), into smart cities creating smart citizens, smart mobility, smart networks, smart grids, smart parking, smart energy,
smart water, and smart transport, to state a few outcomes. The ultimate outcome is creating a municipality that is digitally equipped to offer smart services to consumers.

Like other African countries, municipalities in South Africa also have to find practical answers to common challenges, from providing power, water, homes, roads and transport, to catering for the needs of a varying body of citizens. Big cities are growing bigger. Smaller municipalities struggle both financially and in developing capacity to deal with years of apartheid-neglected infrastructure. The rapidity of change in municipalities can have some devastating effects on planning. Services such as transportation, safety, basic water and electricity have to cater for many more people. It is the municipalities whose solutions are resilient and scalable that have the most opportunities to be Smart Cities (South African Local Government Association (SALGA) 2015:5).

Smart cities are therefore, according to Abbas (2017:10), referred to as “urban areas that use digital technologies in a secure fashion to manage the municipality’s assets, enhance sustainable economic development, reduce costs and resource consumption, and support the well-being of its citizens”. Smart cities, as further emphasised by Meering and Balella (Undated: 1), “have become a global phenomenon, and municipal leaders around the world are interested in the potential opportunities as they prepare their cities for the future”. Smart Cities, according to Das and Misra (2017:1), encompass constituents who collaborate and aim to provide services to people and government (including municipalities) through augmented infrastructure, environment, and economy while ensuring mobility. In the context of smart cities, smart governance is a key issue. It is important for the study to highlight on smart governance as the concept is closely related to smart city concept. Smart governance means “that various stakeholders are engaged in decision-making and public services; it also means that new technologies that is, social media, the internet, open data, citizen sensors, and serious games are used to strengthen the collaboration between citizens and urban governments” (Weiss 2000:799). From this perspective, one important element of governance is collaboration both across departments and with communities and making public service operations and services truly citizen-centric” (cited in Pereira, Cunha, Lampoltshammer, Parycek and Testa 2017: 4).
For Hoon Lee, Phaal and Lee (2013); Inayatullah (2011); Winters (2011); and Pereira (2017:4), the development of ICT promises to transform urban governance into smart governance, because ICT enables city governments to carry out their tasks effectively and efficiently. Moreover, ICT supports relationships among citizens and other organizations and presents new opportunities, particularly for governments, to promote new forms of communication, consultation, and dialogue between public organizations and citizens.

This study aims to provide a conceptual framework gained from the relevant literature in an effort to explain the issues, concerns, challenges and solutions on introducing information and communication technology initiative to create smart governance. The study contextualises the use of ICTs in the City of Ekurhuleni Metropolitan Municipality, thereby aiming to make this key South African Metropolitan Municipality a ‘smart city’ with smart governance offering smart services to community members.

The City of Ekurhuleni is referred to as ‘Africa’s workshop’ because it has the largest concentration of companies producing goods and commodities on the continent. Goods need to be moved, and this is supported by Ekurhuleni’s diverse network of roads and rail lines. To keep pace with the demands of these bulk customers, the metro has put in place a cutting-edge electronic metering-in-place system that allows businesses to track their utilisation throughout the month. This allows them to manage consumption and keep within budget. This will soon be reinforced by a range of new smart meters for both electricity and water, which will improve the efficiency of metering and billing. Some features of the system include remote readings and automated real-time readings (internet source: www.ekurhuleni.gov.za; also refer SALGA 2015: 14).

Ekurhuleni has also taken note of the need to improve its ICT network and to make sure that its fibre and wireless grid is properly connected and maintained. There are plans to introduce an ICT operations centre, to provide the basis for the city delivering Wi-Fi service not only to its employees, but also to households and businesses. This will put Ekurhuleni well on the path to being a Smart City that is able to service both its business and domestic customers in a modern way (internet source: www.ekurhuleni.gov.za; also refer SALGA 2015: 14). This study will investigate the
levels of implementation of initiatives in the City of Ekurhuleni in detail in Chapter Four. Meanwhile, the study discusses the problem statement in the following section.

1.3 PROBLEM STATEMENT

The issue of service delivery in government, probably in local government, is caused by the lack of efficiency and effectiveness in administrative functions in order to render service to the public. The main problem leading to this research is the aim to know how ICTs are promoting smart governance in the City of Ekurhuleni Metropolitan Municipality.

The City of Ekurhuleni Metropolitan Municipality (in this study referred to as City of Ekurhuleni (CoE), was established in 2000, and covers an extensive geographical area from Germiston in the west to Springs and Nigel in the east. Furthermore, Ekurhuleni has a network of roads, airports, rail lines, telephones, electricity grids and telecommunications that rivals that of Europe and America, a first world infrastructure supporting a well-established industrial and commercial complex. Ekurhuleni can, in fact, be regarded as the transportation hub of the country. It is home to the OR Tambo International Airport, the busiest airport in Africa. This airport services the entire continent and links to major cities throughout the world. Similarly, many of the world’s leading airlines fly into OR Tambo International Airport (CoE Service Delivery and Budget Implementation Plan, SDBIP 2016:16).

South Africa’s largest railway hub is in Ekurhuleni (Germiston) and links it to all the major population centres and ports in the Southern African region. A number of South Africa’s modern freeways and expressways connect Ekurhuleni to other cities and provinces. The Maputo corridor development, South Africa’s most advanced spatial development initiative, connects Ekurhuleni with the capital of Mozambique and the largest South African Indian Ocean port. Direct rail, road and air links connect Ekurhuleni to Durban, the biggest and busiest port within South Africa. The OR Tambo International Airport has been identified as the nucleus for the development of the Aerotropolis, which is one of the flagship projects of the municipality to stimulate growth and job creation. However, migration in the city is a major challenge (www.ekurhuleni.gov.za).
Various challenges are confronting the city and are hindering the city from being smart. The challenges are namely as human settlements; this has to do with the housing backlog and the housing solutions targeting poor families, which is constrained by land availability. This is due to the less hectares of developable land in the city. A second challenge is the one of infrastructure, where extensive investments into renewals, maintenance and decommissioning of infrastructure is required and it seems to be a challenge for the city to acquire those investments. Unemployment is also considered as a challenge confronting the city. Attempts are made to minimise the rate by investing in short-term employment solutions, which include community works and expanded public works programme (EPWP). However, these solutions are not sustainable in the long run, and the city will need to find long-term job solutions that will increase growth in employment opportunities (www.ekurhuleni.gov.za). Inadequate skills development is also another challenge confronting the city. It can be argued that in making the necessary strides in skills development, the national government established Skills, Education and Training Authorities (SETAs) to undertake the project of skills development. However, the lack of effectiveness during the implementation of this initiative has raised the need for industry led skills development approaches (City of Ekurhuleni Budget & SDBIP 2016:16).

Intergovernmental weaknesses, is also constrain where by implementing a mandate of two different spheres of government becomes a problem when the priorities are not the same. Furthermore, poor performance of municipality; there are areas of the Ekurhuleni municipalities that are not up to date, and performance barriers need to be identified and be unlocked. Inadequate funding in the city is a major challenge for instance, the City generates annually an average of R2 billion Capital Expenditure (CAPEX) funding to support its infrastructure development programme for growth, renewals and access. This is not adequate as recent studies have indicated that for the City to be sustainable, R4 billion CAPEX will be needed annually. This in the short to medium term, will require that the City re-examines its priorities given the lack of resources in line with what is affordable within the budget (CoE Integrated Development Plan 2016:22). The researcher perceives these challenges as the result of the absence of ICT or ineffectiveness from officials to make use of ICT.
From the preceding background to the research problem, the main research question to be addressed in this study is:

To what extent can information and communication technologies be used to bring smart governance in the local sphere of government in South Africa, and in achieving the objectives of a smart city with particular reference to the City of Ekurhuleni Metropolitan Municipality?

Appropriate research questions and objectives were formulated and the necessary research methodology was employed to guide the research process.

1.4 RESEARCH QUESTIONS AND OBJECTIVES

The study gathers data towards sufficiently answering and achieving the following research questions and objectives respectively:

1.4.1 Research questions

Through the application of a judicious study of primary and secondary sources, the following secondary research questions, which could provide possible solutions to the problem, were addressed:

- What does the information and communication technology (ICT) entail?
- What does the concept smart city entail?
- What does the concept smart governance entail?
- What is the role of ICT in a smart city initiative to improve smart governance?
- What are the statutory, regulatory and policy frameworks guiding ICT in South Africa?
- What are the theoretical approaches of ICT that can be considered applicable in South Africa?
- What are the service delivery challenges experienced in South African municipalities that demand their transformation into smart cities for smart governance?
• Which South African municipalities have implemented ICT for improved smart governance?
• What are the possible recommendations for South African municipalities to implement information and communication technology successfully for smart governance?

1.4.2 Research objectives

The objectives of the study were to:

• Conceptualise ICT; explain the statutory, regulatory and policy approaches guiding ICT in South Africa, and describe the theoretical approaches of ICT that can be considered applicable in South Africa.

• Explore and provide a description of the context in which ICT initiatives were developed, and how they can be applied to establish smart cities with smart governance, and explain how ICT can transform South African municipalities into smart cities with improved smart governance.

• Explore the challenges experienced in the South African municipalities that demand the establishment of smart cities with smart governance, with particular reference to the City of Ekurhuleni Metropolitan Municipality.

• Discuss the research methodology; to analyse and interpret the responses to gain insight regarding the status of ICT for smart governance in the City of Ekurhuleni Metropolitan Municipality.

• Provide possible recommendations for South African municipalities to implement the information and communication technology successfully for smart governance, with particular reference to the City of Ekurhuleni Metropolitan Municipality.

1.5 SCIENTIFIC AND METHODOLOGICAL APPROACH TO THE STUDY

This section discusses the scientific reasoning behind choices made with reference to appropriate research design and methodology in the study.
The study requires the selection of a suitable paradigm. The term 'paradigm' refers to a research culture with a set of beliefs, values, and assumptions that a community of researchers has in common regarding the nature and conduct of research (Kuhn 1977 cited in Thomas 2010: 292). A paradigm hence implies a pattern, structure and framework or system of scientific and academic ideas, values and assumptions (Olsen, Lodwick and Dunlop 1992:16). According to Terre Blanche and Durrheim (1999 cited in Thomas 2010: 292), the research paradigm has three major dimensions: ontology, epistemology and methodology. Thomas further defined a research paradigm as an all-encompassing system of inter-related practice and thinking that define the nature of enquiry along these three dimensions. This statement is supported by Flick (2007 cited in Auriacombe 2016: 3), emphasising that the choice of a paradigm is therefore dependent on the way in which reality should be viewed (ontology) and studied (epistemology) and methodology used (Cantrell 2001:14).

In addition, the appropriate research paradigms need to be carefully considered so to select suitable research methods for the study. As adopted by Maseko (2018: 7) citing Mackenzie and Knipe (2006:196), that “the mixed methods could be used with any paradigm”, hence this particular study was built upon the post-positivist-constructivist paradigm as explained as follows.

A post-positivist approach shows a much greater open-ness to different methodological approaches, and often include qualitative, as well as quantitative methods (Glicken, 2003:28). In addition to that, Glicken (2003:29) further emphasised that post-positivist research offers the social scientist the ability to do research on a small scale by using very creative methodologies. Thus, a triangulation method was used in the study. According to Leedy (1993: 143), the “triangulation approach is when different approaches are combined in a single study. For example, when qualitative and quantitative approaches are used to instrument development and data collection”. The researcher perceives triangulation approach as a process where a technique is borrowed from the two research approaches to conduct a single study. For example, when a researcher is using a qualitative approach and then decides to uses a technique that belongs to quantitative approach, the approach is known as triangulation approach. In this study, a combined mixed-method approach will be used.
where the researcher employed quantitative and qualitative techniques to collect, analyse and interpret data for the investigation. The researcher chose the triangulation approach for this study because it provides confirmation of findings, more comprehensive data, and increased validity and enhanced understanding of the studied phenomenon. In addition to that, it gives strength to the outcome of the study.

Interpretivism or constructivism focuses on exploring the complexity of social phenomena with a view to gaining understanding. The purpose of research in interpretivism is understanding and interpreting everyday happenings (events), experiences and social structures as well as the values people attach to these phenomena (Collis and Hussey, 2009:56-57). Interpretivists or Constructivists, according to Vosloo (2014:305), believe that social reality is subjective and nuanced, because it is shaped by the perceptions of the participants, as well as the values and aims of the researcher. Constructivism therefore, “attaches importance to a range of research techniques focusing on qualitative analysis, for instance, personal interviews, participant observations, account of individuals, personal constructs.” (Dash 2005: 5).

In summary, research is viewed as a scientific and systematic search for pertinent information on a specific topic (Kothari 2004:1). This search involves questions such as “How do we attain knowledge? How do we ensure that we reach our research objective or goal?” (Mouton 1996:35). The information therefore can be obtained through the application of a variety of standardised methods and techniques in pursuit of valid knowledge (Mouton 1996:35). The research design, on the other hand, according to van Wyk (Undated: 4), articulates what data is required, what methods are going to be used to collect and analyse this data, and how all of this is going to answer the research question.

1.5.1 Mixed-method approach to the methodology

The selection of paradigms, research methodology and research design guided the researcher to identify appropriate methods (qualitative, quantitative or mixed-method) for utilisation in this particular study. The researcher utilised both qualitative and quantitative research approaches (mixed-method approach) in this study. The Qualitative research approach to research is concerned with subjective assessment of
attitudes, opinions and behaviour. Research in such a situation is a function of researcher’s insights and impressions (Kothari 2004:18). Quantitative research focuses on gathering numerical data and generalizing it across groups of people or to explain a particular phenomenon (in Labaree 2009: 1). The research includes qualitative research approach (exploratory, includes interviews) and the quantitative research approach (descriptive, includes surveys) to realise the outcomes of the research questions formulated for this study. This particular study therefore utilised the mixed-method approach that, according to Bian (Undated: 3), focuses on collecting, analysing and mixing, both quantitative and qualitative data in a single study.

The central premise is that the use of quantitative and qualitative approaches, in combination, provides a better understanding of research problems than either approach alone. The mixed-method approach in this research utilises the triangulation of data (documents, interviews and questionnaire surveys), to strengthen validity and reliability in the research process. The findings obtained through mixed-method research approach form part of Chapter Five. This researcher utilised the case study approach and selected the City of Ekurhuleni Metropolitan Municipality as it is a case study (Chapter Four).

1.5.2 Social science approach to the methodology

Both disciplines, social science and applied science, can be corroborated to bring contribution in the field of public governance. Furthermore, the rationale is that often particular social science studies may require technology-based assessments (Maseko 2018:10). There are various theories exploring the interconnection between technology and smart city governance, such a, the systems theory; the democratic model of society and electronic government; the critical flow model of e-government; the e-governance layer model; the Hiller and Belanger model; the Nabafu and Maiga’s four-stage model; Phang and Kankanhalli framework on e-participation; technology acceptance model; Ojhai, Palviaz and Gupta’s self-service model, and the e-service delivery model. These theories and models are discussed in Chapter Two of the study. The e-service delivery model is used as a theoretical framework for this particular study.
1.6 APPLICATION OF KEY RESEARCH CONCEPTS OF THE STUDY

The section discusses the type of research, unit of analysis, and validity and reliability in the following sub-sections:

1.6.1 Type of research

Researchers can begin exploring something new with exploratory research. Then, conduct descriptive research to increase knowledge of it (internet source: http://www.study.com). Exploratory research is initial research conducted to clarify and define the nature of a problem (Manerikar and Manerikar 2014:1). Descriptive research is based on the premise that problems can be solved and practices improved through observation, analysis, and description (Koh and Owen 2000:1). The focus in the case of this research, was an exploratory investigation on the use of ICT for transforming South African municipalities into smart cities, asking description questions such as ‘what is’?

1.6.2 Unit of analysis

Units of analysis are the objects of study within a research project. The most common units of analysis are individuals, groups, social interactions, organizations and institutions, and social and cultural artefacts (Cole 2017:1). In this specific study, the unit of analysis is the City of Ekurhuleni. This municipality was selected for study as it is currently considering the implementation of various ICT-led initiatives aiming to becoming a smart city with smart governance in the near future.

1.6.3 Validity and reliability

Validity in research is concerned with the accuracy and truthfulness of scientific findings. A valid study should demonstrate what actually exists and a valid instrument or measure should actually measure what it is supposed to measure (Brink 1993: 35). Reliability, according to Davis (Undated: 1), refers to the repeatability of findings. If the study were to be done a second time, would it yield the same results? If so, the data are reliable. If more than one person is observing behaviour or some event, all
observers should agree on what is being recorded in order to claim that the data are reliable.

1.7 RESEARCH TECHNIQUES APPLIED FOR THE PURPOSE OF THIS STUDY

The following research techniques were utilised in the study:

1.7.1 Literature review

A literature review surveys books, scholarly articles, and any other sources relevant to a particular issue, area of research, or theory, and by so doing, provides a description, summary, and critical evaluation of these works in relation to the research problem being investigated. Literature reviews are designed to provide an overview of sources explored while researching a particular topic and to demonstrate to readers how research fits within a larger field of study (Labaree 2009:1). A comprehensive literature study on information and communication technologies, smart cities, and smart governance was conducted to compile information in Chapters Two and Three. A detailed study of the official documents of the City of Ekurhuleni was conducted to compile Chapter Four.

1.7.2 Interview

The purpose of the research interview is to explore respondents’ “perspectives on a particular idea, programme or situation” (Boyce and Neale 2006). In this research, individual interviews were conducted with the personnel of the Information Technology (IT) Unit to receive understanding regarding the challenges of implementing ICT initiatives to transform the municipality into a smart city. The purposive sampling method was utilised to approach personnel of the City of Ekurhuleni. The responses are stated and interpreted in Chapter Five.

1.7.3 Questionnaire survey

Survey research is when the investigator selects a sample of respondents from a larger population and administers a questionnaire or conducts interviews to collect
information on variables of interest (McMillan and Schumacher 2006:233). The study utilised a survey questionnaire to gather opinions from the community members of the City of Ekurhuleni. It was considered significant to understand the level of implementation of information and communication technology initiatives and their impact on smart governance. The convenient sampling method was utilised to distribute survey questionnaires to the community members of the municipality. The responses are stated and interpreted in Chapter Five.

1.8 SECONDARY AND PRIMARY DATA COLLECTION TECHNIQUES

The study utilised both primary and secondary sources of information. The primary data was collected through interviews and questionnaire survey. The secondary information was collected by means of a careful literature review. A triangulation of data was considered to analyse the information obtained through primary and secondary sources, thus leading to un-obtrusive information for the study.

1.9 RESEARCH ETHICS

The study conformed to the academic ethics of informed consent, confidentiality, integrity and honesty and adhered to the non-plagiarism rules of the University of Johannesburg. A Research Ethics Committee Clearance Certificate from the Research Ethics Committee of the College of Business and Economics at the University of Johannesburg, was received by the researcher. Conforming to ethical principles was considered seriously by the researcher. The permission of the city management was obtained to conduct research in the City of Ekurhuleni. Consent forms were utilised, guaranteeing the anonymity and confidentiality of participants. The study also utilised the documents that are in public domain.

1.10 TERMINOLOGICAL CLARIFICATION

This section conceptualises the key concepts that are utilised in the study:
1.10.1 Information and Communication Technology

ICT is defined by Oliner and Sichel (1994:1) “as a concept that includes computers and other information equipment as well as computer software, that covers computers, peripheral equipment and other information-related office equipment (photocopiers, cash registers, calculators), communications equipment, and instruments”. Oliner and Sichel (1994:1) view ICT as “the combination of electronics, telecommunications, software, networks, and decentralized computer work stations, and the integration of information media, all of which impact firms, industries, and the economy as a whole. ICT is comprised of a variety of “communication equipment” which includes radio, television (TV), and communication equipment and software. Therefore, ICT investment includes investments in both computer and telecommunications, as well as related hardware, software and services.”

1.10.2 Smart city

A smart city is “a city that can be defined as ‘smart’ when investments in human and social capital and modern transport and communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance” (Arroub, Bassma, Essaid and Mohamed 2016: 2). Governments of smart cities, according to Glasmeier and Christopherson (2015: 2), are transforming from a traditional model of a silo-based organization to a more collaborative, integrated service delivery model. Cities will collaborate with each other to drive smart city innovation by entering into partnerships with each other. Technology and ecosystem convergence, collaboration and partnerships between stakeholders from different industries, such as energy and infrastructure, IT, telecoms and government will also expedite the delivery of integrated services.

1.10.3 Smart governance

The smart governance is defined as a government that uses, “new channels of communication for the citizen, for example, ‘e-government’” (Bolivar and Meijer, 2015: 9). The growing role of technologies in the functioning of urban systems is making
governments rethink the role they must have in a knowledge-based society. This role has been referred to as ‘Smart governance’ (Bolivar and Meijer 2015:2).

1.11 OUTLINE OF THE DISSERTATION

The following chapters form part of the study:

**Chapter One** provides a general conceptualisation of the scientific and methodological orientation of the dissertation. It highlights the background, rationale, problem statement, research question and research objectives which the study aims to achieve.

**Chapter Two** conceptualises Information and Communication Technologies in detail. The chapter explains the statutory, regulatory and policy frameworks that guide ICT in South Africa, and theoretical approaches of ICT.

**Chapter Three** discusses the use of ICT significant for transforming municipalities into smart cities with smart governance. The chapter also provides a clear understanding of the service delivery challenges experienced in municipalities that demand their transformation into smart cities. The chapter also explores the nexus between information and communication technologies, smart cities and smart governance.

**Chapter Four** contextualises information and communication technologies for creating the City of Ekurhuleni Metropolitan Municipality. The chapter provides a comprehensive discussion of the smart city with smart governance in the City of Ekurhuleni as a case-study.

**Chapter Five** discusses the research methodology, methods and techniques utilised to gather data. The responses are interpreted and analysed in detail.

**Chapter Six** provides a synthesis of the research objectives and findings, and makes recommendations.
1.12 SUMMARY

This chapter discussed the orientation and background guiding the study, and gives an indication of the structuring of subsequent chapters. The chapter highlighted the main guiding question, research questions and objectives to guide the research process. The research methodology was explained highlighting the use of primary sources, the interviews and questionnaire survey, and the secondary sources of information, the literature and documentary review. The research ethics were discussed to maintain the integrity of the research process. In conclusion, it is asserted that the chapter is relevant to the study as it highlights the main problem leading to the research and also touches on ICT-related challenges that need to be addressed specifically in the City of Ekurhuleni. The next chapter, Chapter Two, describes in detail the conceptual framework of information and communication technology.
CHAPTER TWO
CONCEPTUAL, STATUTORY, REGULATORY AND POLICY
FRAMEWORKS AND THEORETICAL APPROACHES OF ICT

2.1 INTRODUCTION

This chapter conceptualises the concept Information and Communication Technology (ICT). It will then discuss the ICT in South Africa, statutory regulations and policy frameworks regulating ICT in South Africa, and the theoretical approaches to ICT. The chapter aims to realise the research objective, viz “Conceptualise ICT; explain the statutory, regulatory and policy approaches guiding ICT in South Africa, and describe the theoretical approaches of ICT that can be considered applicable in South Africa” (see Chapter One, section 1.4.2).

2.2 CONCEPTUAL FRAMEWORK OF INFORMATION AND COMMUNICATION TECHNOLOGY

ICT, according to Gokhe (Undated: 1), is a “technology that supports activities involving information. Such activities include gathering, processing, storing and presenting data. Increasingly these activities also involve collaboration and communication. Hence IT has become ICT: information and communication technology”. The understanding, management and configuration of the available technology might vary the concept of ICT from Gokhe (Undated: 1):

- a collection of tools and devices used for particular tasks, e.g. publishing, course delivery, transaction processing;
- an organised set of equipment (like a 'workshop') for working on information and communication;
- components of integrated arrangements of devices, tools, services and practices that enable information to be collected, processed, stored and shared with others; and
components in a comprehensive system of people, information and devices that enables learning, problem solving and higher order collaborative thinking, that is, ICT as key elements underpinning a (sharable) workspace (Gokhe Undated: 1).

Information and Communication Technology (ICT), therefore, “is a field of work and study that includes technologies such as desktop and laptop computers, software, peripherals, and connections to the Internet that are intended to fulfil information processing and communications functions” (Statistics Canada 2008 in Freeman and Hasnaoui 2010: 5). ICT can also be considered as “the combination of informatics technology with other, related technologies, specifically communication technology” (in Freeman and Hasnaoui 2010: 5). However, these technological devices with hardware and software packages demands inter-linking relationship with people who are the feeders of data and information and procedures to signify the use of data, as depicted in Figure 2.1.

Figure 2.1:  THE INTERRELATION BETWEEN INFORMATION SYSTEM COMPONENTS

Source: (Ching 2007: 1)
The introduction of ICTs, as cited by Sefuli (2012: 12-13), “leads towards a new form of governance in which different actors from the public as well as private sector collaborate to produce public services. In these new forms of co-production of public services, classic forms of government are substituted by new forms of governance based on the principles of participatory governance; an outcome-based governance; and an open governance through interaction of people, processes, data and information”.

In the field of public governance, according to Kwadeli (2011: 4), ICT is linked with e-governance. The rationale behind e-governance is to enhance communication between the government and the communities. Previously, the modes of communication were radio, newspapers, meetings and television. Presently, the updated forms of communication utilize internet, satellite and mobile services. Tlagadi (in Kwadele 2011: 4) further states that “e-governance involves new styles of leadership, new ways of debating and deciding policy and investment, new ways of accessing education, new ways of listening to citizens and new ways of organising and delivering information and services”. This is achieved with the use of e-administration or electronic administration that is a technological element of e-governance. E-administration, according to Balancing Act’s News (in Kwadeli 2011: 3), “refers to any of a number of mechanisms which convert what in a traditional office are paper processes into electronic processes, with the goal to create a paperless office. This is an Information and Communication Technology (ICT) tool to improve productivity and performance”. Information and Communication Technologies therefore, according to Heginbothman (2006 in Sefuli 2012: 11), are rapidly changing the future of public administration. The desire to become part of the information age has instigated a world-wide transformation process that puts information communication technology at the heart of government processes and practices.

The inter-linking relationship (refer Figure 2.1) therefore results in creating the following three dimensions of ICT/e-government, significant in the governance structures and processes. These dimensions are (Ntiro 2000 in Sefuli 2012:75):

- **E-Administration**: While E-services focus on the extra-organisational relations, E-Administration focuses on the behind-the-scene information systems
supporting the management and administration of function of public institutions, including data and information management, electronic records management, and cross-departmental flow of information-government initiatives which this domain deals with, particularly in terms of improving management of government from streamlining business processes to develop entrance out of sorts departmental stream in sequence (Ntiro 2000 in Sefuli 2012:75).

- **E-citizen or E-services**: E-citizen refers to improved delivery of public services to citizens. Some examples of interactive services are: requests for public documents, requests for legal documents and certificates, issuing permits and licenses. It describes a situation in which citizens’ needs are met through a single contact with the government. At the same time, E-services emphasize innovative forms of citizen involvement and offer services (Ntiro 2000 in Sefuli 2012:75).

- **E-Society**: E-society can be defined as a revolution in the way people interact with each other and in the way the government conducts business. This revolution has been triggered by two phenomena: first, the digitalization of any form of multimedia information -- be it voice, video, data or any other form of signal which can now be easily compressed and elaborated; and second, the capability offered by the web of reaching in real-time any location in the world from any other location on the globe. E-Society is therefore the result of our new ability to compress almost infinitely both time and space. Today, this allows the transmission of practically unlimited amounts of data, in real time, anywhere in the world (Ntiro 2000 in Sefuli 2012:75).

South Africa has incorporated ICT since 1994 and thereafter various initiatives and policy frameworks were established to enhance the use of ICT in government processes. The reason for South Africa’s emphasis on ICT is that according to the Department of Public Service and Administration (DPSA in Peters, Smit and Smith 2016:132), “electronic government or e-Government entails the use of information and communication technologies in the public service to improve its internal functioning and to render services to the public”. The overall objective of the public service is to
offer effective, efficient, seamless and smart services to the community, and that is only possible through the use of ICT interventions.

According to Hafkin (2009:3), ICT within a government perspective refers to e-Government reforms that are adopted by government to promote more efficient and effective governance. As is generally accepted, ICT stands for Information and Communication Technology, which is an extended term for Information Technology (IT), highlighting the integration of telecommunications, computers and the necessary relevant systems that enable one to access, share, transmit and store information. In government processes, ICT therefore uses the latest and updated technologies to communicate data and information to stakeholders, businesses and community members.

The government in this technological and digital era is called e-government, whereby it uses ICT “to support government operations, engage citizens, and provide government services” (Shailendra, Palvia and Sharma 2015:1) in a seamless manner, 24/7. The researcher therefore understands ICT as a technological system that integrates telecommunications in the government processes with the use of computer devices of wireless signals and the necessary enterprise software.

Even though there is no universal definition of ICT currently, it is no doubt that ICT is the main influential technology of human society since the second half of the 20th century, especially from the 1990s. During this period, the development of ICT and implementation and services has increased rapidly, and the application of ICT has become increasingly extensive (Oliner and Sichel 1994:5). On a general scale, Oliner and Sichel (1994:5) highlight that “ICT has penetrated all areas of human life, promoting economic and social development and the improvement of people’s living standards” and increasing “empowerment and equity” (Vyas-Doorgapersad and Kithatu 2017: 25). At the same time, the positive outcomes from ICT in turn create more demand for ICT, which further promotes the development of ICT.

Even though the explanation of ICT varies in different sectors, it is acceptable generally that ICT leverages for better economic, social and interpersonal transaction and interaction (Rouse 2017:40). The International Telecommunication Union (ITU,
2014:16) clarified the numerous benefits of ICT as follows:

- Enhance capability to measure progress toward all the sustainable development goals, evaluate the methods used to achieve them, learn what is working and not working, and improve the timeliness and quality of decision-making (ITU 2014:16).

- Provide opportunities to streamline and enhance the efficiency and effectiveness of the activities that are undertaken across the development landscape (ITU 2014:16).

- Provides access to a whole new range of digitally-enabled products and services which strengthen local economies, local innovation and local communities. When it comes to the development of urbanization, ICT is changing the evolution of cities, with the innovative concept to make a city smart (ITU 2014:16).

However, this notion of city smart.smart cities and smart governance, demands that community members who are the end users of service delivery also have access to ICT and ICT-based services. The demographics of South African households that have access to ICT interventions (internet, mobile, web, fibre connection, broadband connectivity, etc.) is discussed in the 3rd Report on the state of the ICT sector in South Africa released by the Independent Communications Authority of South Africa (ICASA) on the 31st March 2018. The following statistics are obtained (ICASA 2018: 5-6):

- According to Stats SA’s General Household Survey (GHS), nationally the number of households that have access to some form of a telecommunication service in 2016, cellular phones accounted for 87.0% (an increase from the 85.5% reported in 2015 (ICASA 2018:5).

- Household internet usage nationally was reported at 59.3%. This essentially means that for 59.3% of households, at least one member in that household
had access to the Internet either at home, workplace, place of study, or Internet café (ICASA 2018:5).

- Access to internet using mobile devices by households nationally, was reported to be 53.9%. Accessing the Internet at home was 9.5%, at work 15.8% and at Internet Café or educational facilities 9.8% (ICASA 2018:6).

The statistics show that South African households, nationally, have access to ICT related interventions and devices, either at work, at home or in the Internet cafes. In this digitally transformed era, “the way people communicate and access information and services and interact with each other and government has changed dramatically over the past twenty years. People now need an electronic address as well as a physical address, access to broadband and not only to a telephone line and the skills, means and knowledge to be able to use communications technology to improve the quality of their lives” (RSA Department of Telecommunications and Postal Services 2016: 6). The access to ICT is considered imperative to receive the benefits of improved services, such as cost-effective, time-effective, geographically-feasible, seamless, convenient, and available 24/7. Due to the benefits of ICT in improving service delivery, South Africa has implemented ICT policies to promote smart governance. The concept ‘smart governance’ is discussed in Chapter Three.

2.3 INFORMATION AND COMMUNICATION TECHNOLOGY IN SOUTH AFRICAN GOVERNANCE

The South African Government aims to delivery better services to community members. Therefore, “the recognition of IT as a strategic enabler can be seen in the ICT House of Value, which depicts the values and where ICT service delivery should be focused” (Njenge 2015: 15). Figure 2.2 depicts the ICT House of Value.
The ICT House of Value aligns with the 13 strategic outcomes of the South African government and thus allows for government service delivery to be enabled through IT. Various initiatives have been done to assess the adequacy of IT-enabled service delivery (Njenge 2015: 16). The Auditor General's information systems review of governance of IT in 2009/2010 recommended the following (in Njenge 2015: 16):

- A government-wide Governance of ICT Framework should be put in place to implement a national ICT strategy to address ICT risks based on defined processes and standards, and

- The Governance of ICT roles and responsibilities should be defined and implemented to ensure adequate Public Service ICT enablement (in Njenge 2015: 16).

- Through this governance of IT or IT Governance, the government is able to offer the following benefits offering services in a beneficial manner (IT Governance Network 2018: 1):
  - Public Service positioned to improve delivery on the 12 strategic outcomes
• Improved achievement of Public Service-wide and departmental strategic goals
• Improved effective public service delivery through ICT-enabled access to government information and services
• Improved ICT enablement of business
• Improved delivery of ICT service quality
• Improved stakeholder communication
• Continuous improvement of business and ICT alignment
• Improved trust between ICT, the business and citizens
• Lower costs
• Increased alignment of investment towards strategic goals
• Improved return on ICT-enabled investment
• ICT risks managed in line with the priorities and appetite of the Public Service and the department
• Appropriate security measures to protect the departmental and employee information
• Improved management of business-related ICT projects
• Improved management of information as it is managed on the same level as other resources such as people, finance and material in the Public Service
• ICT pro-actively recognises opportunities and guides departments and the Public Service in timeous adoption of appropriate technology
• Improved ICT ability to learn and agility to adapt to changing circumstances, and
• ICT executed in line with legislative and regulatory requirements (IT Governance Network 2018: 1).

The other benefits are stated by Kwaledi (2011: 22-23) as follows:

• *Improving government processes by means of e-administration*: The benefits here include cutting process costs and improving the input. Managing process performance is another advantage as is the ability to plan, monitor and control the
performance of process resources (human, financial and other). Making strategic connections in government is also facilitated in order to investigate, develop and implement the strategy and policy that guides government processes (Kwaledi 2011: 22).

- **Connecting citizens: e-citizens and e-services**: The advantages here mainly relate to certain types of accountability, in other words, making public servants more accountable for their decisions and actions. Interacting with consumers/clients and listening to their complaints and concerns is important, as is their input of citizens into public sector decisions and actions. This could be flagged as either democratisation or participation (Kwaledi 2011: 22).

- **Building external interactions in an e-society**: In an e-society, relations and interaction between government and business are expedited. This includes easier regulation of and procurement from the business sector to improve quality, convenience and cost. Building the social and economic capacities and capital of local communities can also be enhanced to achieve economic and social objectives (Kwaledi 2011: 23).

The governance part of ICT, in the researcher’s opinion, is when government departments allows the public to access information through the use of electronic devices and have internet access to make it easy to access government websites. This opinion is based on the review of information that highlights various technological interventions and initiatives that have been established to advance the speed and efficiency of services delivered to community members and are aligned with the Batho Pele principles. Zubane (2011 in Maseko 2018: 36-37) asserts that in line with technological advancements:

- “All government departments have abandoned the traditional methods of communication and now communication is through telephones, faxes, the internet, the worldwide web. Some departments are already taking advantage of video conferencing facilities.
- Technology is being used for access control and security of all government departments.
• There is electronic payment of salaries and an electronic salary advice system. The electronic payment system is also used for the payment of maintenance orders and all social security grants (Zubane 2011 in Maseko 2018: 36-37).

Electronic filing systems and data bases can be easily accessed and these reduce the waiting times at the hospitals, clinics and police stations”. However, it must be considered that ICT interventions and initiatives must be regulated by the relevant statutory, regulatory and policy frameworks, discussed under section 2.4. South African Government is therefore transforming by following “a whole-of-government approach” (RSA Department of Telecommunications and Postal Services (DTPS) 2016: 7). A whole of government is depicted in Figure 2.3.

**FIGURE 2.3: A WHOLE OF GOVERNMENT APPROACH**

Source: (Department of Telecommunications and Postal Services (DTPS) 2016: 7)

The figure shows the inter-connection between various departments linking government services to customers (G2C), Businesses (G2B), entities (G2E), and
government (G2G). There is a single window for government e-services. In South Africa this gateway is www.gov.co.za. Through internet channels, services can be delivered to stakeholders and customers (both internal and external). According to the DTPS (2016: 7), the Constitution recognises that co-operative governance is crucial for required socio-economic transformation in South Africa, which it reinforces through legislation including the Public Administration Management Act, no 11 of 2014. This Act stresses the need for comprehensive and collaborative service delivery and interventions which must be responsive to the needs of all. The DTPS then in collaboration with government departments and public entities (including local government and regulators) will enable South Africa to realise the potential of the ICT and postal sectors and it is this that will promote growth, employment, wealth and equality.

Thus the South African Government acknowledges the significant role of ICT in the integration of services for the development of rural areas as well, and promotes the use of ICT in all sectors, including agriculture and small enterprises (RSA Department of Communications 2011: 6), bringing geographically-scattered communities into the mainstream of government processes. The use of ICT in bringing communities together through digital devices, offering services seamlessly, hence promoting smart governance, is explored in Chapter Three.

However, the implementation of ICT contextually requires the statutory, regulatory and policy frameworks to follow. It also conceptually requires an appropriate theory, model or approach that needs to be applied to guide the study as a theoretical framework. The following section discusses the statutory, regulatory, policy, and theoretical frameworks regulating and underpinning ICT in South Africa.

2.4 STATUTORY, REGULATORY AND POLICY FRAMEWORKS GUIDING ICT IN SOUTH AFRICA

The Government of South Africa has acknowledged the necessity for ICT in enhancing service delivery through e-Government since 1994. South Africa’s ICT policy environment is therefore informed by various pieces of statutory, regulatory and policy frameworks, discussed below:
2.4.1 Statutory Frameworks

The statutory frameworks include the following:

2.4.1.1 Public Service Act No. 103 of 1994

The Public Service Act of 1994, including all its amendments, empowers the Minister of Public Service and Administration (MPSA) to develop and establish norms and standards related to, amongst others, information management and electronic government in the public service. The mandate of the Minister of Public Service and Administration therefore empowers the in full (DPSA) to provide direction on e-Government for the public service (RSA Government Gazette 40772 2017: 11).

2.4.1.2 The Electronic Communication and Transaction Act No. 25 of 2002

The Electronic communication and transaction Act 89 of 2002 aims to provide for the enabling and regulation of e-Government or smart government services and electronic communications and dealings with public and private bodies, institutions and citizens. In addition, the ECT Act of 2002, including all its amendments, empowers the Minister of Telecommunications and Postal Services (MTPS) to develop the National e-Strategy. In the development of the National e-Strategy, all matters involving smart government services shall be determined in consultation with the Minister of Public Service and Administration (RSA 2002).

2.4.1.3 The Electronic Communications Act 36 of 2005

The Electronic Communications Act (ECA) (36 of 2005) endorses the principles of universal service and universal access. One of the objectives of the ECA is that the government has to “provide the universal provision of electronic communication networks and electronic communications services, broadcasting services and connectivity for all” (Department of Communications 2011:7).
2.4.2 Regulatory Frameworks

The regulatory frameworks include the following:

2.4.2.1 White Paper on Telecommunications Policy, 1996

The White Paper on Telecommunication states that the only way to bring innovation in local government is through smart governance. In relation to the study, the Act recognises the importance of access to information for the citizens and the uses of ICT to promote smart governance through the application of modern approaches, instead of the traditional approaches that are currently used in some the cities in the country (Government Gazette 1996).

2.4.2.2 White Paper on Transforming Public Service Delivery, 1997

The Batho Pele White Paper, a document geared at improving service delivery at national and provincial levels, makes it very clear that all government institutions need to be orientated to optimise access to their services by all citizens (RSA 1997).

2.4.2.3 National Integrated ICT Policy Green Paper, 2014

This so-called Green Paper asks how information and communication technologies can be used to advance the country’s developmental agenda. It examines those elements of the communications policy and regulatory environment that have either not been achieved, or are only partially achieved. In some cases, policies were successful in resolving the challenges of the past, but now need to be reviewed to meet the demands of the new technological age (RSA Department of Communications 2014 in Maseko 2018: 57).

2.4.3 POLICY FRAMEWORKS

The policy frameworks include the following:

2.4.3.1 The Presidential Review Report, 1998

Chapter 6 of the Report addresses the problems that are associated with Information Management, Information Systems and Information Technology in the Public Service.
As a consequence of the recommendations of the PRC, the DPSA was granted the administrative responsibility for ICT in government. The formal ICT governance framework of Office of the Government Chief Information Officer (OGCIO) and the Government Information Technology Officer’s Council (GITOC) was established to proactively bring value to government in terms of ICT use, for internal administrative applications and general government service provisioning to citizens and business entities in society (South African Department of Telecommunications and Postal Services 2017: 9).

2.4.3.2 The Public Service Regulations, 2001

The first area is important to electronic government, which requires all departments to manage Information Technology (IT) effectively and efficiently, taking into account that IT must improve the delivery of public services, the productivity of the department and the cost efficiency of the department. The second area relates to information security whereby the MPSA is required to issue a handbook called the Minimum Information Security Standards (MISS). All persons working with public service information resources will be required to comply with the MISS. The final area deals with interoperability whereby the MPSA in consultation with the Government, Government Information Technology Officer Council (GITOC) is required to issue handbook on Minimum Interoperability Standards (MIOS). All departments are required to comply with MIOS, as this is essential for seamless and integrated service delivery (DPSA 2006:60).

2.4.3.3 Electronic government: The digital future and a Public Service IT Policy Framework, 2001

Governments, today, according to Department of Public Service and Administration (DPSA 2001: 4), in both developed and developing nations, are following the ‘new economy’ transformation of manufacturing and service industries, which turned the customer from ‘product taker’ to ‘product maker’. Governments move away from the bureaucratic organisation around agencies operating like ‘stove pipes’, and streamline their functions according to the needs of the citizens. At the same time, governments strive to dramatically improve their internal efficiency and effectiveness - the costs and
quality of governance. The Framework therefore proposes that an electronic (‘e-’) government initiative must address at least three major Issues, such as e-governance, e-services, and e-business (DPSA 2001: 4-5).

2.4.3.4 South African e-government Policy, 2001

In South Africa, the e-government policy was drafted by the Department of Public Service and Administration (DPSA) in 2001. This draft was preceded by “an extensive two-year consultation process with various private sector representatives, community organisations and public service officials (DPSA 2001 in Maseko 2018: 53). The South African e-government policy (2001) discussed in Vyas-Doorgapersad (2009 in Maseko 2018: 54), defines e-government as “the continuous optimization of government service delivery, constituency participation, and governance by transforming internal and external relationships through technology, the internet and the media”.

2.4.3.5 National e-government Strategy and Roadmap

The Minister of Telecommunications, in terms of Section 5(5) of Postal Services, the Electronic Communications and Transaction Act, 2002 (Act No.25 of 2002) and Chapter 10 of the National Integrated ICT Policy White Paper of 2016, publishes the National e-Government Strategy and Roadmap (RSA Department of Telecommunications and Postal Services 2017: 1). The National e-Government Strategy and Roadmap is to guide the digital transformation of public service in South Africa into an inclusive digital society, where all citizens can benefit from the opportunities offered by digital technologies to improve their quality of life (RSA Department of Telecommunications and Postal Services 2017: 5).

2.4.3.6 National Development Plan, 2030

The National Development Plan (NDP) 2030, regards the vision for Information and Communication Infrastructure, as *inter alia*, the formation of a seamless information infrastructure that will meet the needs of citizens, business and the public sector, providing access to the wide range of services required for effective economic and social participation. This vision also includes the use of multicasting and instant online
translation, digitisation and ICT applications which will make it easier for people to communicate and obtain information using different languages. It also promotes the development of mobile government (m-Government) services (South African National Gazette No. 40772).

2.4.3.7 Broadband Policy, 2013

The Policy focuses “on increasing the accessibility, availability, affordability and usage of Broadband services throughout South Africa” (Department of Communications, 2013:6). Broadband services promote economic growth, for instance, by reducing the cost of communication. Increased access to information can also make it easier for SMMEs to promote and sell their products and services (Sekeleni 2015:20). Broadband services also promote social benefits, such as improved quality of education and improved quality and access to health services.

2.4.3.8 Vision 2014

Vision 2014 was embodied in the document entitled Electronic Government: The Digital Future, a Public Service IT Policy Framework. The Vision, as emphasised by Farelo and Morris (Undated in Maseko 2018: 56-57), “aspires to move the country from being a consumer of ICT products and services to being a major player in the production and innovation of these products and services. The cornerstones of this envisaged inclusive information society are a vibrant and thriving ICT sector; an enabling policy and regulatory environment; an accessible ICT infrastructure and broadband connectivity, and an appropriately skilled and knowledgeable citizenry”.

2.4.3.9 ICT Vision 2020

In his Budget Vote Speech of June 2009, then-Minister, Siphiwe Nyanda, launched the ICT Vision 2020 process, announcing his intention to develop an Integrated National ICT Policy Framework (Gillwald, Moyo and Stork 2012: 13). Under the direction of the Minister and the DoC, the ICT Vision 2020 was to (Gillwald et al. 2012: 13): provide a roadmap for the ICT industry’s long-term development and growth and for South Africa to become a leading country in the information era, and ensure the
development by industry, in partnership with government, of a unified vision and strategy towards clearly defined goals and an aspirational vision of the industry to be achieved by 2020.

Through the review of statutory, regulatory and policy frameworks, it can be considered that informed by the Constitution of the Republic of South Africa (1996), the current South African ICT policy upholds “the idea of universal service or equitable provision of ICT services based on the principle of equality before the law, in terms of provision of telecommunication services in all areas, regardless of whether the area is urban or rural or whether the persons are poor or rich” (Lesame 2011:207). The aim of the various policies is to address issues of accessibility, availability and affordability of ICT services in the country (Nyamukachi 2006:12).

In addition to the frameworks, there are institutions that regulate ICT in South Africa. e-Government in South Africa can be traced back to the recommendations by the Presidential Commission on the Transformation of the Public Service (Presidential Review Commission (PRC) 1998, Section 6.9), which required that the role of IT in government should be strengthened through the formulation of a national information management strategy, a Chief Information Officer (CIO) based in the Presidency, a policy committee and a technology forum comprising managers and users of the System (Cloete 2012: 131). The State Information Technology Agency (SITA), is established “to rationalise information technology (IT) procurement, provide IT-related services and support effective use of IT in government” (Cloete 2012: 131). With the adoption of the e-government policy in 2001, the Government Information Technology Council (GITOC), consisting of government information officers (GIOs) from all departments, was established as a third agency to monitor and coordinate government IT initiatives and give direction to SITA (GITOC, 2011). GITOC reports to the MPSA, and the Government Chief Information Officer (GCIO) in the Department of Public Service and Administration acts as the Secretariat of GITOC (Cloete 2012: 132).

Another important player in this field is the Ministry of Communications, which is politically responsible for electronic communications policy, strategy and legislation. This political mandate overlaps with that of the MPSA, which is politically responsible for government information systems and electronic government, with both GITOC and
SITA reporting to it. In 2002, the Presidential International Advisory Council on the Information Society and Development (PIAC on ISAD) and the Presidential National Council on Information Society and Development (PNC–ISAD) were created in the Presidency. The PIAC was constituted of global industry leaders and the PNC of high-profile national stakeholders and industry leaders in the IT and development sectors. The Secretariat of the PNC reports to the Department of Communications (DoC) (Cloete 2012: 133).

2.5 THEORETICAL APPROACHES FOR INFORMATION AND COMMUNICATION TECHNOLOGY

This section discusses the theoretical approaches of ICT. Their applicability depends upon the social, economic, political and technological feasibility of countries in their individual contexts. Some of the theoretical approaches significant to study are discussed below.

2.5.1 System theory

The system, according to Batane and Motshegwe (Undated: 3), is made up of four main elements, which are inputs, transformation processes, outputs, and feedback, and all of the four elements share feedback among themselves. The inputs are the resources, both capital and human needed to run an organization. Processes refer to the different rules and guidelines regarding the use of the resources. Outputs refer to the products and services offered by the organization. Feedback comes from the human resources carrying out the processes (employees) and many other areas affected by the organization. According to Nevo and Wade (2010 in Ceric 2015: 19), systems theory posits that a system is created and determined by interactions among a system’s elements. It has been recognised that ICT value emerges as a result of complex interactions between ICT and other organisational resources.

2.5.2 Democratic Model of Society and Electronic Government

The Organization for Economic Cooperation and Development (2003 in Estevez and Janowski 2013: 98) introduced four definitions of Electronic Government: 1) Internet
service delivery and other Internet-based activities by government; 2) all uses of ICT by government; 3) transforming public administration through the use of ICT, and 4) the use of ICT, particularly the Internet, as a tool to achieve. Grönlund and Horan (2005 in Estevez and Janowski 2013: 97) further mapped these definitions into a democratic model of society with interrelated spheres of the political system, administrative system and civil society and the following four definitions of Electronic Government mapped into these spheres: definition 1 belongs to the intersection between the administrative system and the civil society; definition 2 belongs to the administrative system; definition 3 belongs to the intersections between the administrative and political systems and between the administrative system and the civil society, and

2.5.3 The critical flow model of e-government

The model is based definition 4 belongs to the intersection between all three spheres on challenging information of critical value to a targeted audience or spreading it in the wider public domain through the use of ICT and convergent media. The model requires foresight to understand the significance of particular information set and use it strategically. It may also involve locating users to whom the availability of a particular information set would make a critical difference in initiating good governance. The strength of critical flow model is the inherent characteristics of ICT that makes the notion of distance and time redundant. This reduces the cases of exploitative governance possible earlier due to time lag between availability of information to different users (internet source: http://shodhganga.inflibnet.ac.in/).

2.5.4 E-governance Layer Model

It can be argued that this model is based on different or various layers and one of the layers is known as access layer. This layer can be referred to as the interaction process government, citizens and businesses or business stakeholders. The basic information that citizens can access is through the government website, where they get to apply for jobs, search for job vacancies, sending emails and SMSs responding to the government about the service being provided or maybe complaining about public issues. In addition, this can be considered as a one-way communication between
government and government users mentioned above. This one-way communication can also be referred to as online communication channel where service is being accessed or rendered by the government to the citizens of the country (Irani 2005:589).

2.5.5 Hiller and Belanger Model

This particular model was created by Hiller and Belanger in 2001 and accommodates political will and citizen participation via online platforms (in Maseko 2018: 50). According to Pillay (2012 in Maseko 2018: 51), in this model, “the stages of e-government are defined at various levels of type of government. For example, they are designed to fulfil an individual service such as medical benefits or tax payments. Alternatively, they are defined for political services like voting. The government to business category includes making regulatory information available online”.

2.5.6 Nabafu and Maiga’s Four-Stage Model

Nabafu and Maiga (2013 in Sithole 2015: 70) designed the Four-Stage Model for e-governance, which comprise of four stages: “(a) web-presence stage; (b) interactive stage; (c) transaction stage; and (d) transformation stage”. According to Sithole (2015: 70), “the web-presence stage is the phase in the incremental development and adoption of e-governance applications in a country. This stage is usually characterised by a website which enables the government to offer static information to citizens. The next stage in this evolutionary process is the interactive stage where search functionality is added to the existing website. This functionality enables citizens to interact more directly with government institutions”. Sithole (2015: 70) further explains that “the third stage is the transaction phase that enables direct exchange of services such as making payments and receiving services online. The final transformation stage entails the complete online execution of public services by electronic means. This requires the integration of services from all ministries and government departments to provide all kinds of information to citizens through a ‘one-stop’ government web portal”.

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2.5.7 Phang and Kankanhalli framework on e-participation

Phang and Kankanhalli proposed a framework of ICT exploitation for e-participation in 2007. E-Participation initiatives, according to Phang and Kankanhalli (Undated: 3), offer a number of advantages over offline channels of participation such as public hearings or newspaper forums. They can enhance accessibility by overcoming the offline physical constraints of time and space. The internet's capabilities of mass transmission and reception of information allow citizens to participate anytime and anywhere convenient to them.

2.5.8 Technology acceptance model (TAM)

This model is aimed at predicting and explaining the manner in which ICT is used and measure the causes or reasons behind the rejection or acceptance of the use of ICT by potential adopters. Furthermore, the model can be used indifferent ways namely, in comparison of different adopted models or replicate. For instance, the mobile device companies in the country they measure the level of technology acceptance according to the number of people purchasing or using the devices. This model is mostly applicable to the private telecommunications companies such as MTN, Vodacom, Cell C and Telkom where they measure the success of their respective strategies they come up with to win customers. The number of people using the network or rejecting the network would determine the level of acceptance of the network (Davis 1989:320 in Korpelainen 2011:14).

2.5.9 Ojhai, Palviaz and Gupta’s Self-service Model

According to Ojhai, Palviaz and Gupta (in Sithole 2015: 69), the three e-governance facets on which the models are based, are services, characteristics, and benefits. E-governance services refer to government-to-government (G2G), government-to-business (G2B), and government-to-community (G2C) services. The e-governance characteristics in turn, refer to low uncertainty, online availability, 365 days of services, disintermediation, automated processing, low information asymmetry and interactions. The benefits facet refers to government efficiency, user satisfaction, improved surveillance, early warning on issues and extensive audits.
2.5.10 E-service delivery model

The E-service delivery model was designed by Islam and Ahmed (2007 in Maseko 2018: 52). In this model “e-governance is based on engagement and the depth and quality of the relationships that surround both citizens and the government” (ref here). They (ref) explain that the model uses an “agency-level, back-end computerisation database of customers” which provides a one-stop service centre in rural and urban settings, as in Figure 2.4.

FIGURE 2.4: E-SERVICE DELIVERY MODEL


According to Sithole (2015 in Maseko 2018: 52), the agency-level (i.e. government departments) websites and portals are linked directly to the customer data base and thus accentuates the necessary interface between government and citizens. Governments are able to disseminate information to citizens, business and service providers and are able to provide feedback and interact closely with the government.

A study was conducted by Maseko in 2018 exploring the use of alternative service delivery mechanisms in the City of Johannesburg Metropolitan Municipality. The researcher utilised the e-service delivery model with a reason that e-governance is based on “engagement and the depth and quality of relationships that surround both citizens and the government” where the “agency-level, back-end-computerisation
data-base of customers serves as a basis for the model”, providing e-services in both rural and urban areas. Here the agency-level or government department and its websites and portals, need to be linked seamlessly to the customer data base; there needs to be inter-connectedness between government and citizens. Only then can governments “disseminate information to citizens, business and service providers, while they are able to give feedback and interact with the government” (Islam and Ahmed 2007: 3; Sithole 2015: 74; also refer Maseko 2018: 122). The successful utilisation of the underpinning of e-service delivery model in the City of Johannesburg guided the researcher to apply the same underpinning in this study, which is focussed on the City of Ekurhuleni. The rationale is that this model involves creating a networked society through interlinking systems of service delivery (with the focus on the case study of the City of Ekurhuleni); it provides a one-stop service centre in rural and urban settings, and hence meets with the objectives of this study.

2.6 SUMMARY

The chapter conceptualised ICT in general and in South African context, outlining the statutory, regulatory and policy frameworks, and theoretical approaches to ICT in the country. It notes that these measures and legislative frameworks for e-Government need to be put in place by Government to ensure proper access and use by public departments and to ensure confidentiality, especially of State information.

The next chapter discusses the ICT in municipalities identifying the elements of smart governance required to transform municipalities into smart cities.
CHAPTER THREE
ICT IN MUNICIPALITIES FOR SMART GOVERNANCE

3.1 INTRODUCTION

There are service delivery challenges exist in South Africa, especially at the municipal level, that demand the implementation of ICT initiatives for improvement. The incorporation of ICT initiatives in municipal governance has assisted municipalities to become smart cities that demand smart governance. This chapter therefore discusses the service delivery challenges that compel municipalities to consider this transformation into smart cities. This initiative is aimed at improving service delivery through smart governance. The focus of this study is exploring ICT for smart governance in the South African municipal context. This chapter therefore conceptually explains the notion of smart governance and smart cities, and explains the benefits of smart governance to improve service delivery challenges in the South African local government context. Chapter Four thereafter contextualises this aspect in the City of Ekurhuleni as a locus of this study. The chapter aims to achieve the research objective, such as, “Explore and provide a description of the context in which ICT initiatives were developed, and how they can be applied to establish smart cities with smart governance, and explain how ICT can transform South African municipalities into smart cities with improved smart governance” (see Chapter one, section 1.4.2).

3.2 SERVICE DELIVERY CHALLENGES IN SOUTH AFRICAN LOCAL GOVERNMENT

Service delivery challenges are divided into three categories: regulatory services, social services and commercial services, discussed next.

3.2.1 Regulatory services

The study aims to explore regulatory services that are a challenge in the local sphere
of government.

### 3.2.1.1 Lack of building control services

Building control services include the approval of building plans, inspections of building sites, general inspections to detect illegal building activities, legal action against transgressors and construction and maintenance of all municipal buildings. In a practical sense, it implies that engineers, health officials and fire officials have to examine building plans to ensure public safety. Such plans should also be checked to ensure that they comply with the National Building Regulations (103 of 1977), the zoning scheme and municipal regulation. Furthermore, every municipality requires office buildings and workshop to operate from. The construction and maintenance of these buildings, should be attended to meticulously to prevent substandard buildings and that buildings fall into disrepair (Cloete 1997:106).

### 3.2.1.2 Poor disaster management and preparedness

Section 1 of the Disaster Management Act (57 of 2002) defines a disaster as a progressive or sudden, widespread or localised, natural or human caused occurrence that causes or threats to cause death, injury and disease; damage to property, infrastructure or the environment and hence disrupt a community. It is also of a magnitude that exceeds the ability of those affected by the disaster to cope with its effects by using only their own resources. Disaster management activities should aim to protect local inhabitants during or after such crises. These activities include emergency planning coordinating civil protection, operating the central communications systems implementing preparedness campaigns and volunteer public awareness campaigns. The Disaster Management Act (57 of 2002) requires that municipalities plan for emergencies and disasters such as floods, the washing away of roads and possible disasters when hazardous substances are transported through their jurisdiction area (Constitution of the Republic of South Africa 1996).

### 3.2.1.3 Land-use control services

Land-use control services that a municipality should provide include inspection of
properties for contravention of zoning regulations and implementing legal action against transgressors (Gildenhuys 1997:18). Municipalities have to deal with land-use planning by: allocating uses to specific areas of land on a map and subsequently regulating their implementation through zoning scheme or town-planning regulations. This is no simple task for town-planning. It requires compiling local structure plans within an overall zoning or town-planning scheme, noting regional, provincial and national development plans. It is noted that land has become a critical issue in South Africa and with regard to service delivery.

3.2.1.4 Lack of proper pollution control services

Pollution control services include measuring air and natural water pollution, inspecting sites for land pollution, testing municipal water supply for chemical and bacterial contamination on a regular basis, and implementing legal action against transgressors. Due to their proximity to the people who destroy and pollute the environment, municipalities are best suited to play a significant role in the environmental conservation (Netshakhuma 2006:67).

3.2.1.5 Poor traffic and policing services

A traffic service should be a disciplined (incorruptible) service under almost military style command and control. For this reason, there should be a single chain of command and control (Craythorne 1997:432). Traffic and policing service activities include the registration and licensing of motor vehicles and issuing roadworthy certificates, testing and licensing motor vehicle drivers, law enforcement, and general municipal policing.

3.2.2 Social services

Social services will be discussed as follows:

3.2.2.1 Poor environmental health services

Environmental health services include removing night-soil and sewage removal from
septic tanks; street-cleaning; removal and disposal of carcasses, pest control; inspecting premises for health hazards and food inspection at stores (Solomon and Benatar 2006:81). Even the smallest municipality should provide services for refuse and night-soil removal in order to prevent unhygienic conditions and garbage from pilling up.

3.2.2.2 Personal healthcare services

The implementation process when it comes to the rendering of specified personal healthcare services to prevent unhygienic conditions from developing in its jurisdiction area by respective municipalities, has become a major challenge. These services include providing maintaining clinics pre- and post-natal care; providing nutrition to the malnourished and needy proving medication and fighting HIV/AIDS (Sahahi 2012:20).

3.2.2.3 Shortage of park sports and recreation services

The shortage of parking sports is also a challenge to the citizens of the country. It is expected that a municipality should render certain parks sports and recreation services. This includes the development and maintenance of parks, pavements, roads reserves, public open spaces, nature conservation, cultivating plants and seedlings in nurseries for own use, making provisions for and the maintenance of sports facilities, and developing sports and organising sporting events (Craythorne 1997:430).

3.2.3 Commercial services

This section of the study clarifies commercial services as follows:

3.2.3.1 Electricity supply services

A municipality’s electricity supply services include proving and maintaining an electricity supply network; building and maintaining high and low-voltage conductors; sub-stations inspecting buildings electrical wiring and supplying and maintaining of street lights. According to Cloete (1997:101), a few municipalities generated their own electricity before the end of the nineteenth century, resulting in a situation where a
A considerable number of South African municipalities had their own power stations. After the establishment of the Electricity Supply Commission (ESKOM) in terms of the Electricity Act of 1922 (Act 42 of 1922) municipalities can buy electricity in bulk from Eskom and resell it to residents at a profit. This is utilised to supplement the municipality’s income from taxation to provide unprofitable services such as cleaning streets. However, selling electricity to residents can be seen as a challenge on its own since some people might not afford to buy the electricity; furthermore, a city cannot be considered as smart if it is failing to take care of its people in terms of free electricity supply (Sepotokele 2001:7).

3.2.3.2 Poor public transport services

The country is still suffering from poor public transport services; for instance, people are being transported by taxis that are not even roadworthy, which results in increasing the rate of accidents and loss of human life. The public transport services that a municipality could render, include providing and maintaining public transport facilities, pontoons, ferries, jetties, piers and small boat harbours and providing and maintaining parking facilities and taxi ranks (Province of the Eastern Cape Gazette 2003:11).

3.2.3.3 Lack of proper infrastructure

The previously mentioned services include constructing and maintaining local roads and streets, traffic signs and marks, paved sidewalks, rainwater drainage systems, as well as traffic engineering, roads and rain water drainage services. Due to economies of scale, road maintenance has to be decentralised into districts, which serve specific groups or suburbs (Craythorne 1997:429). Roads are expensive to build and should be maintained efficiently. Drainage refers to storm water and sewage systems. Both these services consist of widely dispersed underground pipes or surface works and should be maintained kept operating at municipal level (Craythorne 1997:429).

3.2.3.4 Poor sewage disposal and reticulation services

The sewage disposal service that a municipality should supply includes the construction and maintenance of sewage systems, supplying sewage connections to
individual user's premises and inspecting sewage connections. However, this is a challenge to the South African government. For instance, in townships like Alexandra people are still using buckets for sanitation services (Wilber and Zareba 2006:70). Furthermore, solid waste, also known as refuse, is an issue for the country. This service includes regularly collecting and removing refuse, recycling solid waste, and collecting and removing garden refuse (Solomon and Benatar 2006:81).

3.2.3.5 Water supply services

Water is a basic and fundamental need for humans. Sustainable Development Goal 6, one of 17 Sustainable Development Goals established by the UN in 2015, calls for clean water and sanitation for all people. Water supply services is one of the service delivery challenges in the country which is delaying the cities of country from becoming smart cities. Water supply services include constructing and maintain bulk water supply and water reticulation networks, as well as supplying water connections to individual consumers. The municipality’s goal should not only be to supply sufficient water, but also to prevent diseases. Consequently, as a town expands, the municipality has to find funds for establishing reservoirs, purification works and a water reticulation system (United Nations Human Settlements Programme 2013:14).

These challenges coupled with service delivery blockages, resulted in the municipal governments re-thinking the manner in which services need to be delivered to community members. Local “government in South Africa, undoubtedly faces various challenges in delivering services including: slow response rates to citizens requests, lack of customer service orientation from public sector staff, limited and inconvenient hours offered by government institutions and long distances to reach government offices (particularly in rural areas)” (Nkosi and Mekuria 2010 in Mawela, Ochara and Twinomurinzi 2017: 149). The emphasis has therefore shifted to “managing and regulating the private sector which is contracted to carry out these projects. Another reason for this shift is that local government administrations are unable to meet these challenges because their internal structures are inadequate. There is also a line of thinking that argues that because local government administrations have not been structured like businesses, they are sometimes inefficient, wasteful and unable to meet the new demands that confront them. In order to redress this, new ways of delivering
services” are required, according to Joseph (2002 in Maseko 2018: 37). These new ways demand the transformation of municipalities into smart cities for smart governance. If municipalities implement smart governance ways, then the following benefits can be achieved (internet source: http://www.belabela.gov.za/docs/):

- Establishment of ICT as a strategic enabler in a municipality;
- Improved achievement of municipal integrated development plans;
- Improved effective service delivery through ICT-enabled access to municipal information and services;
- Improved ICT enablement of a municipality;
- Improved delivery of ICT service quality;
- Improved stakeholder communication;
- Improved trust between the municipality and the community through the use of ICT;
- Lower costs (for ICT functions and ICT dependent functions)
- Increased alignment of ICT investment towards municipal integrated development plans;
- Improved return on ICT investments;
- ICT risks managed in line with the ICT priorities and risk appetite of the municipality;
- Appropriate security measures to protect both the municipality and its employees' information;
- Improved management of municipal-related ICT projects;
- Improved management of information as ICT is prioritised on the same level as other resources in municipalities;
- ICT pro-actively recognises potential efficiencies and guides municipalities in timeous adoption of appropriate technology;
- Improved ICT ability and agility to adapt to changing circumstances, and
- ICT executed in line with legislative and regulatory requirements (internet source: .belabela.gov.za).

It is therefore argued that “local government is at the forefront of understanding citizen’s needs and is the ‘delivery arm’ of government. It is the obligation of
municipalities to ensure that there is an improvement in services for underdeveloped communities. This will ensure that there is an equitable provision of services to all citizens” (South African Local Government Association 2014 in Mawela, Ochara and Twinomurinzi 2017: 149), through smart governance, incorporating ICT-based service delivery.

3.3 TRANSFORMATION OF MUNICIPALITIES INTO SMART CITIES THROUGH ICT

A smart city is a municipality that uses Information and Communication Technologies to increase operational efficiency, share information with the public and improve both quality of government services and citizens welfare. It is also known as an environmentally friendly city. According to Caraglin and Nijkamp (2009:50), a city can be defined as smart when investments in human and social capital and traditional (transport) and modern (ICT) communication and infrastructure, fuel sustainable economic development and high quality of life, with a wise management of natural resources. A smart city is a city that is focused on investing in people and social capital and transportation (Abbas 2017:1).

The smart city is viewed “as a city whose government is electronically connected to its citizens, for instance in terms of online public participation, where people are given the right to raise their concerns, needs and demands through the uses of internet. When the services and infrastructures of a city are supported by using information and communication technologies, that particular city can be regarded as being smart” (Mitchell 2007:3). ICT on the other hand, according to Komninos (2008:3), can be understood as electronic devices that are used to improve communication channels and speeding up the service delivery process by government, such tablets and computer devices.

The researcher's perspective of smart city initiative is when the country is moving from the traditional government to the modern government; in simple terms, it means moving from the paperwork government to the paperless government. According to the SALGA (2015:5), “the definition of a smart city differs according to where individuals come from”. Moving from the traditional government to the modern
government way also aids in minimising the bureaucracy in the processes, hence improving delivery of sources.

In order for the smart city project to be fully realized or successfully implemented, ethical conduct is central. For example, human conduct is a driving factor in a smart city initiative. However, having ICT in place would minimise the rate of corruption which result on insufficient service delivery (Abbas as cited in Pielage 2000:5). In simple terms, the use of ICT will remove the human error factor, in promotion of smart economy, smart environment, smart living, smart people and smart governance. For example, ICT can help in providing fraud prevention systems to ensure environmentally friendly societies. It can also be used in terms of improving communication channels especially for whistle blowers (Abbas as cited in Pielage 2000:5).

A smart city, therefore, is a “city combining ICT and the website (Web 2.0) technology with other organizational design and planning efforts to dematerialize and speed up bureaucratic processes and help to identify new, innovative solutions to city management complexity, in order to improve sustainability and livability. Furthermore, it can also be understood as a city striving to make itself smarter (more efficient, sustainable, equitable and liveable)” (Gitter, Kramer and Haind 2008:24). The smart city, according to Gitter et al. 2008:24) makes use of smart computing technologies to make the critical infrastructure components and services of a city, which include city administration, education, healthcare, public safety, real estate, transportation and utilities, more intelligent, interconnected and efficient.

According to Gil-Garcia and Pardo (2005:26), a smart city relies, among other things, on a collection of smart computing technologies applied to critical infrastructure components and services. Smart computing refers to new generation of integrated hardware, software and network technologies that provide IT systems with real time awareness of the real world and advanced analysis to help people make more intelligent decisions about alternatives and actions that will optimize business processes and business balance sheet results. Characteristics of a smart city are based on citizen participation and private or public partnership (Gil-Garcia and Pardo 2005:26).
The notion of smart city refers to using pervasive communication technologies and smart devices to accomplish the urban environments and development (Kitchin 2013:51). The Smart City as a concept intended to boost the quality of life of citizens, has been gaining increasing impact in policy-making at a different level. However, there is no common definition of the smart city available and it is difficult to identify common universal trends. With the immense numbers of interconnected citizens, businesses, and different means of transport, communication networks, services, and utilities, cities are becoming more complex than ever before. This leads to growth in population with urbanization, which also raises a diversity of problems such as technical, social, economic and organizational issues (Neirotti and Marco 2014:51). Hence the demand to have cities more sustainable and smart, is increasing.

The rapid development in cities has raised traffic, pollution, and growing social inequality. From this perspective, a discussion has begun on the means to new technology-based solutions and to use of ICT, as well as innovative methodologies for urban planning, which assure future feasibility and sustainability in the urban area. In this debate, the concept of smart city has been one of the main the subject of growing awareness and it now appears as a new paradigm of urban planning and development and sustainable socio-economic growth (Neirotti and Marco 2014 52). Even though the rise in the smart city in the urban planners’ debate on the planning future of cities, the dispersion of smart city initiatives in countries with different requirements and economical levels make it challenging to identify shared current trends in a global context and scale (Paskaleva 2009:406). As discussed earlier, there is still no general definition of the term ‘smart city’.

In spite of the rapidly evolving ICTs and the passed legislation promoting the paperless office, a great number of governments, businesses and citizens still prefer paper records, manuscript signatures and traditional public services instead of their electronic alternatives. On the other hand, there are states known as, ‘digital societies’ which conduct almost all public sector transactions digitally (Batty, Axhausen, Pozdoukhoz and Giannotti 2012:482). Nevertheless, the common agreement about the smart city is the fact that it characterised by a greater use of ICTs. In different urban settings, ICT seeks to make the best use of scarce resources. However, ICT-based
solutions are known to enhance resources planning and initiatives in urban planning and development to improve sustainability of the economy, society and environment in a city. However, a city having a rich ICT infrastructure still needs to reflect transition towards a smarter city to enhance future possibilities.

The smart city literature emphasizes the need for urban planning and regulation and the central goal of the ICT system as a city digital and intelligent nervous system that manages data and information from different sources. Thus, many intelligent cities are complex systems of, ‘sense and act’, that is, a large number of real-time information and data are analysed and combined with multiple systems, organizations and value chains to optimize operations and inform the authorities of initial issues (Chourabi and Nam 2012:14). The role that ICT plays in cities is equivalent to the ICT technologies, which are used in private organisations. It has been described in Information Systems literature and organization studies as a way of improving productivity through automatic routine processes while supporting decision-making, planning, and management activities (Chourabi and Nam 2012:14). In urban and city development, ICT is expected to contribute to solving the emerging urban problems of citizens in order to achieve city sustainable development.

Nevertheless, it has been proven that benefits of e-governance include enhancement of governance efficiency and transparency, elimination of corruption factors, improvement in the quality of public services, provision of better access to public services. All of this leads to democracy by transforming traditional relationships between public agencies, citizens, and businesses (Kramers, Wangel and Hojor 2014:50). It is further highlighted by (Kramers et al. 2014:50) that “the introduction of different ICT solutions by the governments might erupt controversial reactions within the respective societies. As a matter of fact, it is always important to characterize the society by its nature, cultural and social differences. Religious and political heritages also play a crucial role in this regard, as in traditional communities, whose history is shaped according to these features, general acceptance of innovation and globalization is always law”.

According to preceding insight on the smart city, the distribution of ICT infrastructure should not be recognized with the standardization of a smart city. The smart city
approach does not only reflect technology changes, but also development in human capital and changes in urban living practices (Neirotti, Marco, Cagliano, Mangano and Scorrano 2014:20). ICT, therefore, according to Neirotti, Marc et al. (2014:20), is assisted as a general-purpose technology, where it helps to improve the quality of human and organizational capital. In other words, depending on political decisions and urban ecosystem (citizens, tech vendors, and local authorities), ICT helps to shape future of a city. This gives directions towards researching various dimensions of smart city initiatives around the world.

As ICTs cannot transform the city without human capital, another focus is on the role of human capital in improving urban housing capacity. Therefore, the social science programme can also include human capital investment designed to promote urban learning and innovation. It also supports and encourages the role of local residents in education, and improve their own lives.

### 3.4 FOURTH INDUSTRIAL REVOLUTION AND SMART CITIES

The ‘fourth industrial revolution’, a term coined by Klaus Schwab, founder and executive chairman of the World Economic Forum, describes a world where individuals move between digital domains and offline reality with the use of connected technology to enable and manage their lives (Xu, David and Kim 2018:1).

Municipalities with “smart city thinking offers ways to leverage the opportunities of the fourth industrial revolution for the betterment of urban living. Key technologies will underpin this, from the ubiquitous connectivity of our built environment and everyday objects, forming an Internet of Things enabled by 5G, to the automation of repeatable tasks, artificial intelligence and the growing potential for security and assurance in distributed ledger technologies (DLT)” (Copping, Eskelinen, Figueredo, Fisher and Frost 2018: 5).

Indisputably, local government in South Africa has undergone significant transformation during the past 20 years. While more people benefit from access to basic services today than ever before in the history of this country – in itself a laudable achievement – the sector continues to face legacy and new problems that undermine
development and transformation. Therefore, there is a need to do much more than address old and new problems. In the era of the Fourth Industrial Revolution, defined as a technological revolution that will fundamentally alter the way we live, work and relate to one another, the business as usual approach will no longer work. New ways of thinking, fresh approaches are needed to solve legacy and new problems faced by municipalities today (Internet source: https://www.salga.org.za/).

However, municipalities require ICT infrastructure and employees require ICT based training and competence to meet with the demands of the Fourth Industrial Revolution (4IR). The concern is whether the South African municipalities ready to embrace the 4IR. With the “recent spending cuts and their knock-on effects on infrastructure projects in metros mean cities are unlikely to be leading players in the short to medium term in positioning SA on the frontier of what President Cyril Ramaphosa terms a ‘digital industrial revolution’” (internet source: https://www.businesslive.co.za/).

For municipalities to embrace 4IR require skills, competence, resources, and mind-shift “to embrace a new wave of infrastructure – the municipal 4th Industrial Revolution – and deliver smarter, cheaper, citizen-focused, services with a solid return on investment” (Copping et al. 2018: 4). This aspect of the implementation and impact of 4IR on smart cities and the success of municipal 4IR, will be researched and assessed in the coming years.

3.5 ICT TO PROMOTE SMART GOVERNANCE IN MUNICIPAL GOVERNMENTS

Smart governance is also known as transparent governance, meaning that everything that is done in the city or the state is somehow controlled and checked for fraud. Decision-making should be transparent in smart governance especially in cases such where there is no financial metric to defend the decision. Smart government uses a central applications, such as, phones where citizens can report problems such as vandalism or failing to collect waste and can see reports that others have made. Furthermore, smart government comes with smart solutions which help the government to run the city in an effective way (Government Certificate of Competency (GCC) 2014:20).
Smart governance refers to the governance system that generates strategic plans and sustainable public services that are being operated efficiently and economically. It also allows citizens to play a definite role in decision-making given that accessing management information and the relevant data is available. It enhances collaboration and communication between the citizens and government within the society, and strengthens the ICT infrastructure. According to Pardo (2011:22) the concept smart government is consist of two dimensions, which are public service management and local government administration.

Many scholars often take smart city and smart governance as the same; however, they differ in terms of the main drivers of each. For instance, the main drivers for a smart city are mostly economic development, competitiveness and environmental sustainability where it focuses on multiple domains in one city, that are usually led by stakeholders, technology and enterprise service providers. Smart governance, on the hand, is concerned with public values with one or multiple domains in multiple cities as the major driver. Also, smart government technology domains are more into business processes and technologies to ensure flawless information across government organisations (Walravens 2015:283).

According to Abbas (2017:15), smart governance means that various stakeholders are engaged in decision-making and public services; it also refers to information and communication technologies, mediated governance and also called e-governance, which is fundamental in bringing smart city initiatives to citizens to keep the decision and implementation process transparent.

Smart governance encompasses facets of political participation, services for citizens and functioning of the administration. It does its administrative work electronically. For example, the public or citizens communicate with their government online, job applications are done online, and no hand delivery allowed. According to Nam and Pardo 2011, “smart governance is when government is performing in a forward-looking way in economy, people, mobility and living”. Smart governance as further highlighted by Vasseur and Drunkels (2010:45), improves the quality of life for the citizens, encourages businesses to invest, and create a sustainable urban environment.
Smart governance in the context of smart cities is defined “as the ability of governments to make better decisions through the combination of ICT-based tools and collaborative governance” (Pereira, Parycek, Falco and Kleinhans 2018: 143). In this sense, the researcher understands that smart governance “is the use of evidence (data, people, and other resources) to improve decision making and deliver results that meet the needs of the citizens. This is particularly important for smart cities initiatives which are usually technology-grounded. Among the main success factors in smart-city initiatives are ‘reshaping administrative structures and processes across multiple local government agencies and departments’ as well as ‘stakeholder involvement in governance’” (Alawadhi and Scholl 2016 in Pereira, Parycek, Falco and Kleinhans 2018: 4). The aim is to improve the delivery of services making them more conveniently available. This ‘smart’ approach towards service delivery has transformed, according to Alawadhi and Scholl 2016 in Pereira et al. (2018: 4), “the relation between government and the public, and the collaborative governance as a key aspect of smart governance leads us to the concept of participatory government, which is strongly related to the new governance model (as a method) in promoting communication, interaction, collaboration, participation in decision-making and direct democracy”.

The interconnectedness between smart city and smart governance has resulted in a new concept called smart city governance. Meijer and Bolívar (2016 in Pereira et al. 2018: 20) identified four ideal-typical conceptualizations of smart city governance: (1) government of a smart city, (2) smart decision-making, (3) smart administration and (4) smart urban collaboration”. The smart city governance is possible due to the use of ICTs creating a nexus between ICT, smart governance and smart cities, discussed in the next section.

Smart governance and smart city, therefore, are two correlated concepts which are also linked to good governance. Good governance is defined by Weiss (2000:797) as government that governance that brings in happiness and welfare of the people and also associated with efficient and effective administration in a democratic framework. These concepts are linked to each other in terms of characteristics, namely, participatory, consensus-oriented, accountable, transparent, ethical, meritocratic,
responsive, effective and efficient, quality-oriented, equitable and inclusive, decentralized and follows the rule of law (Vyas-Doogapersad 2015:7).

ICT, henceforth according to Banister and Connolly (2011:216), is considered as the main driver of the initiative process of smart city, smart governance and good governance. It ensures transparent and open government, which is the result of a smart governance. The concept of transparent and open government can be traced to internet developments for providing services to citizens in participative, transparent and collaborative environments.

3.6 ICT, SMART GOVERNANCE AND SMART CITY: A NEXUS

The smart city as a concept intended to boost the quality of life of citizens has been gaining increasing impact in the policy-making at a different level. The rapid development in cities raised traffic, pollution, and growing social inequality (Neirotti and Marco 2014:18). From this perspective, a discussion has begun on the means to new technology-based solutions and the use of ICT, as well as innovative methodologies for urban planning, which assure future feasibility and sustainability in the urban area. In this debate, the concept of smart city has been one of the main the subject of growing awareness and it now appears as a new paradigm of urban planning and development and sustainable socio-economic growth (Neirotti and Marco 2014:18). It was added by Paskaleva (2009:22), that “even though the rise in the smart city in the urban planners’ debate on the planning future of cities, the dispersion of smart city initiatives in countries with different requirements and economical levels makes it challenging to identify shared current trends in a global context and scale”.

The smart city literature emphasises the need for urban planning and regulation and the central goal of the ICT system as a city digital and intelligent nervous system that manages data and information from different sources. Thus, many intelligent cities are complex systems of ‘sense and act’, that is, a large number of real-time information and data are analysed and combined with multiple systems, organizations and value chains to optimize operations and inform the authorities of initial issues (Chourabi and Nam 2012). The role that ICT plays in cities is equivalent to the ICTs they have played in organisations. It has been described, in information systems literature and
organization studies as a way of improving productivity through automatic routine processes while supporting decision-making, planning, and management activities. In urban and city development, ICT is expected to contribute to solving the emerging urban problems of citizens in order to achieve city sustainable development (Pielage 2000:12) with smart governance.

It has been proven that benefits of e-governance include enhancement of governance efficiency and transparency, elimination of corruption factors, improvement in the quality of public services, provision of better access to public services. All of this leads to democracy by transforming traditional relationships between public agencies, citizens, and businesses (Batagan 2011:5). It was further highlighted by Batagan (2011:5) that “the introduction of different ICT solutions by the governments might erupt controversial reactions within the respective societies. As a matter of fact, it is always important to characterize the society by its nature, cultural and social differences. Religious and political heritages also play a crucial role in this regard, as in traditional communities, whose history is shaped according to these features, general acceptance of innovation and globalization is always law”.

According to the literature on the smart city, the distribution of ICT infrastructure should not be recognized with the standardization of a smart city. The smart city approach does not only reflect technology changes, but also development in human capital and changes in urban living practices. ICT is assisted as a general-purpose technology, where it helps to improve the quality of human and organizational capital. In other words, depending on political decisions and urban ecosystem (citizens, tech vendors, and local authorities) the ICT helps to shape future of a city (Pielage 2000:5). Henceforth, as emphasised by Pielage (2000:5), this gives directions towards researching various dimensions of smart city initiatives around the world.

As information and communication technology cannot transform the city without human capital, another focus is on the role of human capital in improving urban housing capacity. Therefore, the social science programme can also include human capital investment designed to promote urban learning and innovation and support. It further encourages the role of local residents in education, and improves their own lives, attract and retain other valuable external inputs talented and highly educated
people and innovative companies. Additionally, it also attracts investors and entrepreneurs to invest capital and human capital, start a new business.

It can be considered that “in the context of smart cities, smart governance is a key issue. Smart governance means that various stakeholders are engaged in decision-making and public services, it also means that new technologies that is, social media, the internet, open data, citizen sensors, and serious games are used to strengthen the collaboration between citizens and urban governments” (Giffinger 2007:935). From this perspective, one important element of governance is collaboration both across departments and with communities and making operations and services truly citizen-centric (Giffinger 2007:935). “For some authors, the development of ICT promises to transform urban governance into smart governance because ICT enables city governments to carry out their tasks more effectively and efficiently. Moreover, ICT supports relationships among citizens and other organizations and presents new opportunities, particularly for governments, to promote new forms of communication, consultation, and dialogue between public organizations and citizens” (in Pereira, Cunha, Lampoltshammer, Parycek and Testa 2017: 4).

Based on the literature review, it is deduced that the smart governance, through incorporation of ICT and in the context of smart cities, may bring the following smartness in municipalities:

3.6.1 Smart transportation

With the accelerated pace of urbanisation, the number of motor vehicles grows rapidly. However, the road network construction is lagging behind, and the level of traffic management is not high, which results in congestion problems and frequent traffic accidents. Urban road traffic management is facing major challenges and has become one of the most urgent problems in the city that need to be solved. In spite of rational planning and construction of roads and transport facilities, it is now necessary to speed up the traffic management in a scientific, informative and intelligent way, which result in reducing the pressure on government and improving the city road traffic conditions (Pielage 2000:20).
3.6.2 Comprehensive traffic sensing system

Smart city initiatives come with the introduction of intelligent video surveillance platform as the core, in terms of building various systems throughout every street of the city, including traffic video surveillance system, traffic guidance, signal control system, flow volume acquisition, and other information systems (Abbas 2017:20). This will mean comprehensive traffic systems and less accidents and loss of life.

3.6.3 Unified cloud traffic command platform

Huawei establishes the traffic cloud data centre as the basis, in order to build traffic management platforms, achieving a high degree of traffic data resources sharing. With full use of traffic data, it is possible to realise comprehensive utilisation and enhance the scientific and efficient management, so that multi-department can visualise coordination of operations and improve traffic management level (internet source: https://e.huawei.com/).

3.6.4 E-police

Like other e-government related services, an e-police system is also an e-government related service which makes the communication process a possibility; it is a great success for modern era, increasing the professional efficiency for the government’s police administrations (Mollah, Islam and Islam 2012: 1). The researcher understands the e-police system as a good system to be implemented in order to reduce the rate of crime and the chances of criminals running away unnoticed because of the late arrival of police on the crime scene.

3.6.5 Real-time traffic emergency command

The deployment of a smart video conferencing systems can be regarded as a fundamental role in traffic control, and integrates intelligent traffic emergency command platforms. In this case, a reasonable decision could be made in time; for example, if there is a traffic accident, the real-time command can dispatch police, inform the hospital timely and get a quick response to the situation. According to the
researcher, this is a useful system to be put in place as it comes with the benefits of minimising the death rate in the country, and ensures a quick arrival of the first aid people whenever they are needed (Abbas 2017:26).

3.6.6 Smart hospital solution

A smart city will come with smart hospital solutions which involve the rich harvest of medical ICT systems such as wired and wireless networks, data centres, medical systems and hospital management systems. According to service needs, Huawei has modified the cloud computing platform, providing telemedicine, mobile medicine, unified communications, hospital office collaboration, video surveillance and related medical information sharing (internet source: https://www.iotone.com/).

3.6.7 Smart economy

Smart economy refers to “parameters around economic competitiveness such as, innovation, entrepreneurship, trademarks, productivity and flexibility of the labour market as well as integration in the national ad international market. A smart economy consists of various elements such as competition, simplified and supported entrepreneurship, productivity and creativity and labour market flexibility. The aim is to increase the Gross Domestic Product” (Giffinger 2007:933). According to the researchers understanding of smart economy concept, this is when the Gross Domestic Product of a particular country is stable.

3.6.8 Smart environment

This refers to an environment that is consist of a reduced air pollution, water pollution, and noise pollution and carbon dioxide emissions. Furthermore, clean air, clean energy, resource management are elements of a smart city (Nam and Pardo 2011:22). The researcher perceives smart environment as an environment that is conducive for people to have businesses as a source of income, where everyone who lives in can be regarded as middle class upwards.
3.6.9 Smart people

This is closely related to the diversity of people, the level and quality of education of the people and the quality of social interaction and creativity and innovation from the people (Nam and Pardo 2011:22). Many would argue that smart people can be measured through their academic level and technical degrees; however, state of mind determines the level of smartness, and education is an additional factor (Abbas 2017:4). This is currently demonstrated in the City of Ekurhuleni, where young kids are encouraged to familiarise themselves with electronic devices to access information and the youth are also encouraged to focus on education as a weapon to change the world.

3.6.10 Smart living

This is when the citizens are being provided a better life through health care, safety and higher quality of housing, social cohesion and other activities in a better society, which is one of the goals for a smart city (Batagan 2011:5). The City of Ekurhuleni has excelled in the department of health where they provide mobile clinics to ensure a better health for everyone, and that every citizen has access to health services.

Smart governance, therefore, “encompasses facets of political participation, services for citizens and functioning of the administration. It does its administrative work electronically. For example, the public or citizens communicate with their government online, job applications are done online, and no hand delivery is allowed in a smart governance”. The notion of smart governance in the context of smart cities, therefore has three fundamental implications (Pereira et al. 2018: 29-30):

- It strongly focuses on government decisions for improving the quality of life in cities, which are the intersection of various dimensions (Smart Living, Smart Mobility, Smart People, Smart Economy and Smart Environment; (refer sub-section 3.6.1-3.6.10 for more dimensions)
• It represents an indispensable role of widely-available, user-friendly and interactive technology that goes beyond the traditional objectives of supporting engagement of citizens and other stakeholders, to optimize and co-produce services and improve the quality of life; and

• It has a strong focus on citizens, acknowledging their key role in collaborative decision-making processes to increase public values creation (Pereira et al. 2018: 29-30).

In addition, according to Nam and Pardo (2011:25), “smart governance is when government is performing in a forward-looking way in economy, people, mobility and living”. Smart governance improves the quality of life for the citizens, encourages businesses to invest, and creates a sustainable urban environment (Vasseur and Drunkels 2010:45). According to the researcher, smart governance is not only about electronic administration, but also about public participation in a way that the online views of the public are considered in decision-making by the government. The municipalities that have already transformed themselves to meet the demands of smart cities with improved smart governance, are:

• **City of Johannesburg Metropolitan Municipality:** To provide effective, efficient and seamless services to citizens, the City of Johannesburg has plans to utilise technology (e-governance) and be creative by implementing, among others, the following innovations: affordable broadband connectivity among City-owned facilities, and access in the City through the creation of wireless hotspots at all Rea Vaya stations and in the buses, as well as selected open spaces; an Intelligent Operation Centre; smart transport technology, and promoting ICT literacy via public access to internet (for a complete list of City of Johannesburg plans refer to SALGA 2015; also refer Maseko 2018: 67).

• **eThekwini Metropolitan Municipality:** The Revenue Management Unit of the municipality has launched Smart Community a smartphone application that will allow customers to interact with Municipality. Residents who own smart phones or tablets can now download this app from the Google Play and Apple Store. Residents can use
this app to report faults using GPS to record the accurate location, view emergency contact numbers and receive their revenue balances and municipal alerts (internet source: http://www.durban.gov.za/). Due to the smart governance initiatives in the municipality, Durban (a city of the municipality) has therefore won the International Business Machines (IBM) Smarter City Challenge that will see IBM experts providing expertise and working with the City’s leadership to develop a roadmap to a smart city which is aligned to the economic development and job creation plan for the City (internet source: http://www.durban.gov.za/).

• City of Cape Town: The main emphasis of Cape Town smart governance and smart city strategy is “on e-Government to provide better access to and more efficient delivery of human facing services. Providing social and economic development by improving ICT skills is also an area of priority for Cape Town. This accounts for the city’s relatively high ‘smart’ score. Cape Town’s principal smart city activities have, to date, include: Public Wi-Fi. Being rolled out during 2016; CCTV. With 560 cameras located throughout the city; Open Data Portal. Launched in 2015; and Smart grid. Several pilots underway through DEDAT” (Lourie 2017: Internet source).

• City of Tshwane Metropolitan Municipality: This metropolitan municipality has established an e-government-based Innovative Hub to advance research-based opportunities and collaborations between the industries operating within the City of Tshwane. There is also an e-Health Project under way to establish an electronic health record-base in the city’s clinics. A detailed description of these projects is available at the municipality’s website (www.tshwane.gov.za/; also refer Maseko 2018: 68). The Tshwane Smart City Project for the City of Tshwane Metropolitan Municipality and its residents aims to enhance the city’s “operations through use of smart technologies to provide efficient service to the residents” (internet source: http://unpan1.un.org/).

• City of Ekurhuleni Metropolitan Municipality: In order to be transformed into a smart city with smart governance, the municipality has developed the following eleven IT strategies: deliver business solutions; optimize IT management and governance; improve IT organization and employee capabilities; reduce IT costs; integrate IT operation and resources; expand the scope of informatisation and data analysis;
deploy mobile solutions; simplify business processes; integrate main businesses; improve the relationship between business departments; and facilitate infrastructure development or management (internet source: https://e.huawei.com/za/). Tumelo Kganane, Chief Information Officer of the City of Ekurhuleni stated that: “Ekurhuleni has deployed city-wide wired and wireless networks, powerful cloud data centres, and government applications. These are the cornerstones of a Smart City. We plan to build other IoT applications, such as Smart Transportation, Smart Buildings, Smart Meter Reading, and Smart Education. We will also build a command and control system based on unified communications to further improve city operation efficiency. We are determined to be a Smart City pioneer in South Africa by staying focused on good governance, people’s welfare, and economic revitalization” (internet source: https://e.huawei.com/za/).

3.7 SUMMARY

This chapter conceptualised the concept of smart governance in detail. The chapter firstly discussed the service delivery challenges experienced in the South African local governments that demand municipalities to be transformed into smart cities. The chapter thereafter highlighted the benefits of smart cities with smart governance to offer effective, efficient and smart delivery of services to community members. The chapter is relevant to the study as it highlights the conceptual framework of ICT, smart city and smart city governance. The next chapter discusses the use of ICT for smart governance in the City of Ekurhuleni Metropolitan Municipality, and explores the steps that are required if the City of Ekurhuleni is to embark on the transformation process to become a fully-fledged smart city with improved smart governance.
CHAPTER FOUR
THE USE OF ICT FOR SMART GOVERNANCE IN THE CITY OF EKURHULENI METROPOLITAN MUNICIPALITY

4.1 INTRODUCTION

The chapter explores the overview of the City of Ekurhuleni, where it focuses on the history, geography and the economy of the city. It gives some insight into the broadband policy of the city. It further discusses its demographics and Growth Development Strategy (GDS). Lastly, it discusses the city in terms of smart city level. The chapter aims to realise the following research objective, such as, “To explore the challenges experienced in the South African municipalities that demand the establishment of smart cities, with particular reference to the City of Ekurhuleni Metropolitan Municipality” (see Chapter One, section 1.4.2).

4.2 CITY OF EKURHULENI METROPOLITAN MUNICIPALITY: AN OVERVIEW

The City of Ekurhuleni was established in the year 2000 from the amalgamation of two existing regional entities, namely, Kyalami Metropolitan and the Eastern Gauteng Services Council. This is unlike the other metropolitan regions formed after the 2000 local government elections, which were formed around large cities (internet source: www.ekurhuleni.gov.za). The City of Ekurhuleni Metropolitan Municipality as a Category A municipality covers an extensive area from Germiston in the west to Springs and Nigel in the east. Chapter 1 of the Local Government: Municipal Structures Act (117 of 1998) refers to a category A municipality as municipality that has both exclusive and legislative authority in its designated area of jurisdiction (internet source: www.ekurhuleni.gov.za).

The former administrations of the nine towns in the former East Rand were amalgamated into the metropolitan municipality, along with the Khayalami Metropolitan Council and the Eastern Gauteng Services Council. It is one of the most densely populated areas in the province, and the country. The economy in the region
is larger and more diverse than that of many small countries in Africa. It accounts for nearly a quarter of Gauteng's economy, which in turn contributes over a third of the national Gross Domestic Product. Many of the factories for production of goods and commodities are located in Ekurhuleni, often referred to as Africa's Workshop (internet source: www.ekurhuleni.gov.za). The network of roads, airports, rail lines, telephones, electricity grids and telecommunications found in Ekurhuleni rivals that of Europe and America. It can be regarded as the transportation hub of the country. It is home to OR Tambo International Airport; South Africa's largest railway hub, a number of South Africa's modern freeways and expressways, the Maputo Corridor Development, direct rail, road and air links connecting Ekurhuleni to Durban, the Blue IQ projects, with linkages to the City Deep Container terminal, the planned Gautrain rapid rail link to Johannesburg and Pretoria, and the OR Tambo International Airport Industrial Development Zone (IDZ) (internet source: www.ekurhuleni.gov.za).

The city consists of different towns: Alberton, Bedfordview, Benoni, Birchleigh, Boksburg, Brakpan, Clayville, Daveyton, Dunnottar, Edenvale, Geduld, Germiston, Katlehong, Kempton Park, Kwa-Thema, Machenzieville, Nigel, Olifantsfontein, Springs, Tembisa, Tocoza, Vosloorus and Vorsterkroon. Furthermore, the city's main economic sectors are manufacturing (23%), finance and business services (22%), community services (19%), trade (15%), transport (11%), construction (5%), electricity (3%), and mining (2%). Figure 4.1 shows the different towns that comprise the city (internet source: www.ekurhuleni.gov.za).

Ekurhuleni’s journey, according to the City of Ekurhuleni IDP and Budget (2018:18), is towards “establishing an effective and efficient local government started with the mammoth task of having to merge the different administrative systems responsible for governance and service delivery in the nine towns and seventeen townships. The City differs vastly from other large cities in the country like Johannesburg, Cape Town, Pretoria and Durban that re-invented themselves around relatively mature colonial city centres”. The City of Ekurhuleni IDP and Budget (2018:18) further highlights that “much like the heterogeneous confluence of locals that make up its citizenry, the City of Ekurhuleni had to chart a new path in rationalizing its administration, and consolidating its spatial footprint into a single identity. The city was confronted with having to create a single uniform identity, and to create and optimise linkages between...
towns, townships and economic centres. This included the promotion of access to services and facilities and the protection and maintenance of open spaces and lakes with the vision of the Gauteng City region in mind”.

FIGURE 4.1: MAP OF THE CITY OF EKURHULENI

Source: (Internet source: www.ekurhuleni.gov.za)

The demography of the City of Ekurhuleni is as follows:

4.2.1 HISTORY, GEOGRAPHY AND ECONOMY

The City of Ekurhuleni, was established in the year 2000 from the amalgamation of two existing regional entities, namely, Kyalami Metropolitan and the Eastern Gauteng Services Council. Unlike the other metropolitan regions formed after the 2000 local government elections which were formed around large cities, Ekurhuleni is a set of smaller, fragmented nine towns (City of Ekurhuleni 2018). It comprises 9 towns and 17 townships, previously without a single large administration, as in the case of the former cities of Johannesburg, Cape Town, Pretoria and Durban. These had to coalesce around relatively mature big city administrations. This resulted in fragmented and dispersed urban structure and the City had no identifiable city Centre.
Furthermore, it suffers from a diffuse and problematic civic identity gravely challenged by the relics of the former East Rand identity (City of Ekurhuleni 2018).

The inherited fragmentation also manifests itself through extreme social isolation and as the worst excesses of apartheid planning placed ever-larger townships on the periphery of a weakened urban spine. Four major concentrations of previously disadvantaged communities exist in the area. These include Tembisa, the Katorus complex, the Kwatsaduza complex, and the Daveyton Etwatwa area (internet source: Local government Handbook 2017). These (according to the document Local government Handbook 2017 (internet source), are low income residential clusters located on the urban periphery and are far removed from the majority of social and economic opportunities in the metropolitan area. They are linked to the main economy via rail and/or road networks. Collectively, these areas represent approximately 61% of the total population of Ekurhuleni. The cumulative effect of all this includes high levels of poverty and homelessness for the majority of citizens. Further to this, is ageing infrastructure together with vast service areas. Already, these attest to the magnitude of service delivery challenges which confront Ekurhuleni.

Historically, what is now Ekurhuleni was known as the East and or Far East Rand. Ekurhuleni is a Tsonga word meaning ‘place of peace’ and reflects the aspirations of its residents in light of the pre-1994 violence that engulfed parts of the municipality. Germiston is the Administrative Capital town of the City of Ekurhuleni (Machaka and Roberts 2004: 12).

One of the main objects of local government is to promote local economic development although many instruments for the promotion of economic development are under the control of national and provincial governments. The 2016 State of the Cities Report buttresses the central role of the contribution of the South African cities in the national economy and shows the 5 largest cities, Johannesburg, Cape Town, Tshwane, Ekurhuleni and eThekwini, playing a dominant role in the national economy. Furthermore, Ekurhuleni’s contribution to the national economy has increased from 8.2% in 1995 to 8.8% in 2016, overtaking eThekwini as the fourth largest city in the process (State of South African Cities Report 2016). It was further highlighted by the State of South African Cities Report (2016), that “between 1995 and 2013, four of the
cities increased their share of South Africa’s Gross Value Added (GVA). Johannesburg (11.7% to 13.9%), Cape Town (10.3% to 10.9%), Tshwane (8.9% to 9.2%) and Ekurhuleni (8.2% to 8.8%), but the shares of eThekwini and all the three smaller metros declined.

The structure of the City of Ekurhuleni’s economy is dominated by four sectors: manufacturing, finance and business services, community services and general government and, to a lesser extent, the trade and hospitality sector. Over the past 15 years, major structural shifts have occurred in the structure of the economy, principally involving the decline of the dominance of the manufacturing sector, which dropped from 30.3% in 2000 to 22.7% in 2015. A comparable increase of the contribution of the finance and business services sector, which increased its share from 14.8% in 2011 to 21.3% in 2015, is noted (CoE Integrated Development Plan (IDP) 2017/18). The Integrated Development Plan (ICoE IDP) 2017/18 in addition highlights that “the continuing decline of the manufacturing sector is a big challenge for the municipality and for that reason the revitalization of the manufacturing sector is a key strategic focus area for the municipality”.

With a GDP of R 301 billion in 2015 (up from R 128 billion in 2005), Ekurhuleni contributed 21.43% to the Gauteng Province GDP of R 1.41 trillion in 2015, increasing in the share of Gauteng Province from 22.18% in 2005. The City of Ekurhuleni contributes 7.51% to the GDP of South Africa which had a total GDP of R 4.01 trillion in 2015 (as measured in nominal or current prices). Its contribution to the national economy remains constant from 2005 when it contributed 7.5% to South Africa, but it is lower than the peak of 7.8% in 2005. The declining percentage contribution of Ekurhuleni to the national GDP is consistent with the decline in manufacturing that was highlighted above (CoE IDP 2018).

In 2015, Ekurhuleni achieved an annual growth rate of 0.34% which is a significantly lower GDP growth than the Gauteng Province’s 1.54%, and is lower than that of South Africa, where the 2015 GDP growth rate was 1.18%. Contrary to the short-term growth rate of 2015, the longer-term average growth rate for Ekurhuleni (2.70%) is very similar to that of South Africa (2.58%). The economic growth in Ekurhuleni peaked in 2006 at 7.12% (internet source: www.treasury.gov.za).
The City of Ekurhuleni has a total GDP of R 301 billion and in terms of total contribution towards the Gauteng Province, Ekurhuleni ranked third relative to all the regional economies to total Gauteng GDP. This ranking in terms of size compared to other regions of Ekurhuleni remained the same since 2005. In terms of its share, it was in 2015 (21.4%) slightly smaller compared to what it was in 2005 (22.2%). For the period 2005 to 2015, the average annual growth rate of 2.7% of Ekurhuleni was the fourth relative to its peers in terms of growth in constant 2010 prices (internet source: City of Ekurhuleni 2018). Additionally, the Ekurhuleni Integrated Annual Report (2015/16) states that “in 2020, Ekurhuleni’s GDP is forecasted at an estimate of R 251 billion (constant 2010 prices) or 21.2% of the total GDP of Gauteng. The ranking in terms of size of the City of Ekurhuleni will remain the same between 2015 and 2020, with a contribution to the Gauteng Province GDP of 21.2% in 2020, compared to the 21.3% in 2015. At a 1.74% average annual GDP growth rate between 2015 and 2020, Ekurhuleni ranked the third compared to the other regional economies”.

While the economy of Ekurhuleni outpaced that of Gauteng in 2005, 2006 and 2007, its economy has lagged that of the latter since 2008, with the exception of 2010 and 2014 as depicted in the figure above. The clear trend from the analysis is the slowing growth rate for all the three economies (national, provincial and local) depicted in the figure: the 11-year period from growth rates of over 5% in the first 3 years (2005, 2006, and 2007) to below 2% in 2015 is noted, with the Ekurhuleni economy taking the biggest strain. In addition, the catastrophic impact of the global financial crisis in 2008 can be seen in the negative growth rates in 2009 (City of Ekurhuleni 2018).

The City of Ekurhuleni’s Economically Active Population (EAP) was 1.64 million in 2015, which is 48.47% of its total population of 3.38 million, and roughly 25.32% of the total EAP of the Gauteng Province. From 2005 to 2015, the average annual increase in the EAP in Ekurhuleni was 2.33%, which is 0.464 percentage points lower than the growth in the EAP of Gauteng’s for the same period (Parilla and Trujillo 2016:20).
4.2.2 Ekurhuleni’s demographic analysis

According to the 2016 Community Survey (internet source: www.ekurhuleni.gov.za), the City of Ekurhuleni has an estimated population of 3 379 1042, up 200 634 people from 3 178 470 in the 2011 census. The population growth rate has slowed from as high as 4% in the period between 1996 and 2001 to 2.47% between 2001 and 2013. This represents over 6% of the population of South Africa. An important feature of the growth in the Ekurhuleni population is the net migration into the City as together with Tshwane and Johannesburg are the largest recipients of in migration in the country. As stated in the document entitled Ekurhuleni Community Survey (2016 Data), major shifts seem to have occurred in the population composition by broad age groups between 2011 and 2016, for example the promotion of the young, the 0-14-year age group increasing from 24% to 35% and that of elderly, with the 65+ population more than doubling from 4% to 9%.

4.3 ICT FOR SMART GOVERNANCE IN THE CITY OF Ekurhuleni

One of the objectives of the study is to determine different ICT mechanisms in the city of Ekurhuleni Metropolitan Municipality (EMM). The researcher can argue that computers and internet are mostly used in public libraries in the city. The high usage of computers and computers with internet could be attributed to the high demands and availability of information electronically in libraries today.

4.3.1 E-government in the City of Ekurhuleni

E-governance requires an institutional context within which it can flourish. Key components of an enabling context include public sector reform to improve service delivery, good governance and applying ICTs for development. Public sector reform was a major theme in the nineties literature on managing public institutions, from the reinventing government concepts in the United States to the computerisation of the public service in Malaysia (Ekurhuleni Annual Report 2017/18). These concepts were drawn from study and interpretation of the multiple changes taking place in public services around the world during the early period of globalisation through technology. The importance of public sector reform remains valid in South Africa today, still
operating under the weight of a rule-driven bureaucracy, rather than a flexible bureaucracy energised by management excellence (Ekurhuleni Annual Report 2017/18). Good governance addresses the responsibilities of the state, private sector and civil society to create an environment within which human endeavour can benefit society. It focuses on political, economic and administrative components of governance. Good governance ensures that political, social and economic priorities are based on broad consensus in society and that the voices of the poorest and the most vulnerable are heard in decision-making over the allocation of development resources (Ekurhuleni Annual Report 2017/18).

Information and communication technologies (ICTs) including telephony, computing and broadcasting, can contribute to sustainable human development and poverty eradication through making social communication easier and more affordable and by enabling speedy and secure economic transactions (Scupola 2008:20). As accelerator, driver, multiplier and innovator, ICTs are powerful if not indispensable tools in the massive scaling up and interlinkage of development interventions and outcomes in the 21st century. ICTs in the context of governance may also play a critical role in speeding up the flows of information and knowledge between government, citizens and business. According to the United Nations Development Programme (UNDP), the challenge for all countries is to develop a system of governance that promotes, supports and sustains human development. This, according to Ekurhuleni Annual Report (2017/18), assumes regular interaction and feedback, as envisaged in the community participation requirements for the municipal Integrated Development Plans. Governments in many parts of the world have made huge ICT investments aimed at improving governance processes.

E-governance is regarded as the application of ICT to governance processes and decision-making, in ways that provide opportunities for citizens and communities to regularly receive information about government activities and to participate in government decision-making at relatively low cost (internet source: WhatIts.com 2017). The expected benefits of such public sector reforms have been identified as, inter alia, increasing the efficiency of government operations (information and communications flows across institutions of government); strengthening democracy (through citizen participation in decision-making); enhancing transparency (by
publishing government information), and providing better services to citizens and businesses through virtual, but direct interaction (internet source: WhatIfs.com 2017).

The concept of e-governance moves utilisation of ICT beyond computerisation of administrative tasks to access information for citizens and businesses. It specifically includes the idea of using ICT to address development challenges. The global shift towards adoption of ICTs as a major resource for governments emerged in the mid-nineties, initially with governments designing their own large information systems and data repositories and later with government to government (G2G) communication fostered by the advent of email and the internet (Tiwana and Balasubramaniam 2001:18).

The Ekurhuleni Metropolitan Municipality has partnered with Bytes Technology Networks (BTN), in a project worth about R12 million, to upgrade and replace much of its existing networking infrastructure. The project is part of the Ekurhuleni vision to bring improved automated services to the people of its regions, which extend across all the nine towns mentioned in the preceding section of the chapter. One of the challenges facing local government is getting services to the people, especially those in outlying areas and those without transport. Government has taken a strategic decision to start reaching these people via the use of technology (internet source: www.ekurhuleni.gov.za).

As part of a phased project, BTN is working with the metro to redo its entire networking infrastructure in the area, starting with Benoni, Boksburg and Kempton Park. According to Pillay (internet source: http://www.engineeringnews.co.za/), “not only was the existing network old but it was already battling to handle the existing network traffic, without even the consideration of new services and applications being rolled out across the region. The goal is to create a first-class network that is able to scale to accommodate the provision of e-services to the citizens in our region”. Once the need to upgrade the infrastructure is identified, the decision to standardise on Cisco hardware for the job will then be taken. The third phase of which was to go out to tender and identify a services and installation partner to facilitate the roll-out - this is where BTN was selected added (internet source: http://www.engineeringnews.co.za/).
BTN was selected out of 30 other parties which tendered for the business which has been touted as the largest Cisco networking deal in 2004. The new networking infrastructure is to be a high speed, multi-service capable, state of the art voice and data, video technology infrastructure. Ekurhuleni Metropolitan Municipality received the Customer Innovation Award in the Digital Transformation category at Software AG's Innovation World 2013 event. Ekurhuleni Municipality won the award for using Software AG technology to increase and accelerate service delivery to South African citizens (internet source: www.ekurhuleni.gov.za). Ekurhuleni Metropolitan Municipality is providing free digital training to young people to help them become confident when using technology. The free online Microsoft Information Communication Technology (ICT) training programme will enable them to write and create mobile applications as well as create games and websites. The training programme, which started in mid-August, is open to young people in Ekurhuleni aged between seven and twenty-one. Through the programme, the youth will learn essential basic computer skills, digital literacy, creative coding, and app studio and touch development (internet source: www.ekurhuleni.gov.za).

The aim of the programme is to encourage an interest in ICT among young people. The city has free Wi-Fi in most of the townships; therefore, the investment will be used and maximised. The city has realised that young people are roaming the streets and are not participating in the digital world so the city wants to bring them on board and tap into their innovative and creative minds so that they can compete. It was important for both young and old people to start using technology and become computer literate so that they don’t miss out on opportunities (internet source: http://www.engineeringnews.co.za/).

4.3.2 Ekurhuleni Broadband Policy Framework

Broadband is generally defined as a high speed data transmission services to transmit data and multimedia content, usually from the internet. Broadband is defined by the International Telecommunication Union (ITU) Standardization Unit as a “transmission capacity that is faster than primary rate Integrated Services Digital Network (ISDN) at 1.5 or 2.0 Megabits per second” (ITU 2003: 20). Furthermore, the Organisation for Economic and Co-operation and Development (OECD) (internet source:
https://docplayer.net/) defines broadband as any Internet connection with a download speed of 256kbps. The researcher perceives the term ‘broadband’ as typically used to denote an Internet connection with download speeds faster than traditional dial-up connections (at 64kbps) minimum threshold for bitrates at 256 kbps.

The South African broadband policy defines broadband as always available, multimedia capable connection with a download speed of at least 256 kbps (Nyanda 2010 in Kekana 2013: 17). However, these are just technical definitions. The wide range of broadband indicators, the lack of homogeneity in broadband data transfer speeds and bandwidth, and a broad diversity of regulatory and geographic factors, do not facilitate an accurate global definition of broadband. Thus, it will therefore be desirable to refocus the definition beyond the traditional elements and involve high-speed networks, services, applications and users alongside policies regarding the promotion of investment, affordability, demand, availability and access (Budde, Burgess, Ponder and Lozanova 2011: 18). Kim, Kelly and Raja (2010: internet source), propose that broadband be defined beyond the traditional notion of a specific type of network connectivity or minimum transmission speed and rather, broadband be viewed as an ecosystem that includes its networks, the services that the networks carry, the applications they deliver, and users.

In terms of the Ekurhuleni Metropolitan Municipality, growth and development strategy 2025, as well as the integrated development plan 2012, the development of an ICT infrastructure and the lobbying for broadband infrastructure provisioning in selected priority high tech hubs such as the OR Tambo international airport and surrounds will work closely with the City of Tshwane and Johannesburg in promoting the smart province concept and attracting ICT development and investment to the region. The Ekurhuleni growth and development strategic documents has a missing aspect of development of broadband and how the development of the network infrastructure will be implemented; however, the Integrated development plan indicates under the ICT operational plans that there will be a percentage development of the fibre network for the Aerotropolis (Kekana 2013:23).

The Aerotropolis is defined as the airport city that contains the full set of commercial facilities that support airlines and aviation linked businesses, as well as millions of air
travellers who pass though the airport annually and offers businesses located on and near the airport with speedy connectivity to their suppliers, customers, and enterprise partners nationally and worldwide, modelling a gateway to international countries. According to Kekana (2013:240), fundamental to the success of the Aerotropolis concept is broadband infrastructure that support and enable business interactions thereby promoting economic growth. Therefore, it can be accepted that ICTs and broadband will be an integral part of the Aerotropolis if it is in support of the growth and developmental agenda of the Metro. ICTs and broadband infrastructure form a nerve centre that would enable the seamless business operations within the central business district or the airport driving economic growth of the Metro and its surrounding cities.

The City of Ekurhuleni has incorporated municipal broadband initiatives and plans with the broader municipal’s growth and development strategies. This is a clear demonstration of good governance and policy leadership on the part of the metro. The Ekurhuleni Metro’s GDS emphasizes collaborations with other metros and government entities in their build-up of the broadband infrastructure to support the Smart province concepts and markets (Kim, Kelly and Raja 2010: internet source). The intention as highlighted by markets (Kim et al. 2010: internet source) to collaborate with other stakeholders, in the build-up of broadband networks and reflect good governance and leadership that seeks to reduce duplication of effort and resources in implementing their broadband polices and strategies. The broadband infrastructure as an integral part of the envisioned Ekurhuleni’s Aerotropolis is also expected to promote economic growth in the region. The primary data confirms that ICT and broadband will form a greater part of the Aerotropolis, which is regarded as the gateway to international markets (Kim et al. 2010: internet source).

The current broadband infrastructure is already built and plans are underway to sell access capacity because there is a view that South Africa still has big a role to play to ensure a sufficiently competitive broadband market. There is a view that International Collaborative Network for Agricultural Systems Applications (ICASA) needs to address the problem of market failure, in support of the view that broadband has the potential for economic growth. There is, however, some concern about poor leadership in the policy development arena due to poor broadband performance in the country. The
primary data also indicates that the affordability of broadband is the subject of the completion commission rather than the regulator (Pan and Yang 2010:56). The data also indicates that Ekurhuleni does believe in the concept of active citizenry and has established a community broadband project named “Siyafunda”, which allocates free computers to schools around the Metro, and offers experiential training on ICT to community members as one of its community engagement processes (Polkonen and Vlachos 2006:30). Different types of broadband networks or tools will be conceptualised as follows:

- **Cable Modem**: A broadband technology that uses access lines for cable television (CATV). Although traditional CATV networks need to be upgraded with a separate voice line to provide interactive communication services like telephony and internet access, new networks use the same coaxial cable to provide simultaneous transmission of data, television and voice. Connection speeds range from 1 to 10 Mbps (Distaso, Lupi and Manenti 2006:90);

- **Fibre to the home (FTTH)**: A fibre optic technology similar to standard cable that allows for transmission speeds of up to 10 Gbps. Fibre optic cables are rolled out up to home of the consumer and can carry video, data, voice and interactive video-telephone services (Distaso et al. 2006:90);

- **Fixed Wireless Access (FWA)**: A technology, initially deployed as an alternative to the local copper loop, which uses radio links between a base station and a receiving antenna located in the customers’ premises. It allows for simultaneous transmission of voice and data and can reach speeds of over 2 Mbps (Distaso et al. 2006:90);

- **Satellite**: Satellite is a broadband technology that uses satellite TV equipment to carry data. At the moment, the majority of services based on satellite technology are one-way (they only allow for downstream transmission) and need a dial-up connection for the return channel. The downstream speed ranges between 300 Kbps and 2 Mbps. This technology is considered to be
particularly effective for servicing rural areas where other technologies are too expensive to be put in place (Distaso et al. 2006:90)

- 3G wireless: Third-generation wireless refers to current and future telecommunications innovations that mobilizes broadband access, with the ability to support several different cellular standards and provide multimedia services. The largest potential of this type of wireless technology is that it is not computer-centric, and that it presents the convergence of several 2nd generation (2G) wireless telecommunications systems. The major advantage lies in the possibility for high-speed Internet access through mobile devices. 3G wireless promises speeds at above 2Mbps; however, it remains to be seen how fast this technology will be fully developed and deployed in the market (Papacharissi and Zaks 2006:66).

4.3.3 City of Ekurhuleni Smart Growth Development Strategy (GDS)

The City has a long-term development strategy referred to as the Ekurhuleni Growth and Development Strategy 2055 (GDS 2055). The strategy systematically analyses Ekurhuleni’s history and its development challenges, and outlines the desired growth and development trajectory. It seeks to ensure that Ekurhuleni transitions from being a fragmented City to being a Delivering City from 2012 to 2020, a Capable City from 2020 – 2030 and lastly, a Sustainable City from 2030 to 2055 (CoE IDP 2018/19).

The GDS has identified five strategic themes to incrementally measure the success of the city. These long-term outcomes have been designed to incrementally measure the success of the city in achieving the objectives of the GDS 2055. It will: re-urbanise in order to achieve sustainable urban integration, re-industrialise in order to achieve job creating economic growth, and re-generate in order to achieve environmental well-being, re-mobilise in order to achieve social empowerment and re-govern in order to achieve effective cooperative governance (CoE IDP 2018/19). These five strategic themes influence one another in order to achieve the desired trajectory. To implement these GDS themes during the current term of Council, the following Strategic Objectives are proposed to be used as building blocks for the institutionalisation of the
GDS and the development of the IDP for the term and Service Delivery and Budget Implementation Plan (SDBIP) to (CoE IDP 2018/19):

- Promote integrated human settlements through massive infrastructure and services rollout;
- Build a Clean, Capable and Modernised Local State;
- Promote Safer, Healthy and Socially Empowered Communities;
- Protect the natural environment and promote resource sustainability, and
- Create an enabling environment for inclusive growth and job creation (CoE IDP 2018/19).

The GDS comprises four IDP Strategic Objectives which are outlined as follows. These IDP Strategic Objectives are aligned to the GDS themes and together they are recognised as anchors that will keep the GDS alive:

1. **Objective 1. To promote integrated human settlements through massive infrastructure and services rollout**: The city envisions a future with significantly improved human and social development, especially focussing on the electrification of all informal settlements; construction of 100 000 housing units; provision of 59 000 serviced stands and up-scaling of services at qualifying informal settlements to make them more habitable. Furthermore, it will promote preservation of water usage and continue investing in water infrastructure to ensure security of supply, making land available for development. The focus is also on the Ekurhuleni Power Station to broaden accessibility and ensure security of supply, Implementation of the IRPTN, Infrastructure investment and Accelerate Wi-Fi rollout (Ekurhuleni 2055 GDS).

2. **Objective 2. To achieve effective cooperative governance**: The city aims to take lead in the implementation of good governance. To achieve that the city has focus areas such as good governance and clean administration (sustain clean audit); and vetting of all senior managers and supply chain management staff. It will introduce public tendering processes; build capacity to minimise outsourcing of key municipal services and establish a commission to fight fraud and corruption. Furthermore, the city is also
fighting for improved organisational culture, relations between the staff and employer and revenue enhancement. Improving service delivery through visible and impactful programmes supported by capex spending is also a focus for the city. In addition, creation of a single city identity is one of the major focus areas for the city to achieve the implementation of good governance (Ekurhuleni 2055 GDS), as is the need to increase the number of local clinics piloting the 24-hour health care programme and amend the indigent policy. Moreover, it will create a signature mega arts and culture event for the city, and roll out pro-poor social package-free water and electricity as per its commitment. There are also plans for the developmental Arts, culture and sports programmes targeting youth, and promoting social cohesion; by-law enforcement and crime reduction programmes; increased emergency services and the establishment of an Ekurhuleni University and of a functional land invasion unit. Lastly, renewable energy, waste minimisation, urban management and upgrading of ideal standardised community parks, using the model of Spruitview Park, are proposed (Ekurhuleni 2055 GDS).

- **Objective 3. To achieve environmental wellbeing**: The establishment of sustainable infrastructure solutions and ensuring a liveable environment is the city’s most significant objective. For instance, housing, eco-mobility, water, energy sanitation, waste and information and communication technology, are in focus here (Ekurhuleni 2055 GDS).

- **Objective 4. To achieve job creating economic growth**: The city envisages a future where it will focus more on decreasing the unemployment rate, and improving the level of service delivery to an efficient, effective, economic, ethical and progressive service delivery level (Ekurhuleni 2055 GDS).

Figure 4.2 shows the Ekurhuleni Growth and Development Strategy-GDS 2055.
4.4 CITY OF EKURHULENI: ACHIEVEMENTS AND CHALLENGES TO BECOME A SMART CITY WITH SMART GOVERNANCE

The vision of becoming smart is the core of the vision of the City of Ekurhuleni. A city that strives to promote sustainability through the reduction of greenhouse gas emissions and the carbon footprint, provides adequate clean water to all its residents and monitor water wastage, is regarded as smart city (COJ Integrated Annual Report 2015/16 cited in Maseko 2017:81). The vision of the City of Ekurhuleni is to become “the Smart, Creative and Developmental City” (internet source: https://www.ekurhuleni.gov.za/).

The City of Ekurhuleni has a population of around 2.7 million people and contributes approximately 7% to the national production and between 6% and 7% per annum from 1999 to 2006. Five minutes from OR Tambo International airport, the Albertina Sisulu Corridor is a prime investment and development location. Straddling the R21 freeway which runs through Ekurhuleni, the corridor links Johannesburg OR Tambo International airport and Pretoria upliftment (Ekurhuleni Integrated Development Plan 2018/2019). This Corridor offers a myriad of investment opportunities in a wide range of sectors, including telecommunication and business outsourcing import and export,
manufacturing and processing transport related services, office and retail space and industries to agriculture, ecotourism and conservation. Furthermore, business activities in Ekurhuleni townships are diverse and ranges from retail, industrial activity to construction. The municipality has devised an urban development structure that creates investment opportunities for business while also contributing to social development and upliftment (Ekurhuleni Integrated Development Plan 2018/2019).

Roads, railways and airports service Ekurhuleni well, as it has a well developed network of infrastructure and strong telecommunications infrastructure and powerful electricity grids. A modern road network system reaches every part of the municipality and connects all major towns, offering convenience and a seamless travel experience. Roads are maintained and more than capable of handling the city’s increasing commercial traffic (Ekurhuleni Integrated Development Plan 2018/2019). The N3 road from Johannesburg to Durban, the N2 from Johannesburg to Witbank and the R21 highway, which joins OR Tambo International airport to the rest of the province, all meet at Gillooly’s Interchange right in the heart of Ekurhuleni. South Africa has more than a quarter of all railroad tracks in Africa, and the hub of the railway system is found in Ekerhuleni (Ekurhuleni Integrated Development Plan 2018/2019).

In terms of infrastructure, a network of roads, airports, rail lines, telephones, electricity grids and telecommunication are found in Ekurhuleni, that rivals that of Europe and America. Ekurhuleni can be regarded as the transportation hub of South Africa. The core vision of the city is the desire to build prosperity for the city and country based on job creation. The key focus is on using inter-modal connectivity as the true basis for penetrating economic development, particularly for time-sensitive, sunrise businesses such as perishable life sciences, advanced manufacturing, information and communication technology and research. The strategy proposes five over-arching principles, which are:

- Community: build strong neighbourhoods that allow people to realise their full potential;
- Collaborate: streamlined and effective governance that meets or surpasses global standards;
• Concentrate: sense transit orientated development that leverages and compliments existing communities;
• Connect: move goods, services and people efficiently and effectively, and
• Compete: identify and amplify the value chains which South Africa can dominate globally (Ekurhuleni Integrated Development Plan 2018/2019).

Ekurhuleni Metropolitan Municipality has probably most strongly articulated its vision of a digitally connected city, as one in which all citizens have access to affordable broadband services. ICT development is part of the economic transformation and development of the municipality (Ekurhuleni Growth and Development Strategy 2025). This strategic approach is set out in the Growth and Development Strategy 2025, the Integrated Development Plan, the EMM Digital City Blueprint and the Business Plan for the Implementation of Customer Care Centres. Furthermore, the city recognises the contribution that a vibrant ICT sector will make to its manufacturing-oriented economy, which has been lagging in global terms (Ekurhuleni Growth and Development Strategy 2025).

The City also accepts that its role is to facilitate this process as it creates opportunities for the private sector to step in and provide the infrastructure and services. In terms of e-administration, Ekurhuleni has made great strides as it had to build a wireless network that connected nine administrative centres. It is now focusing on improving individual administrative processes (business process mapping) and aims to create a single view of its customers (Ekurhuleni Metro Integrated Development Plan, Budget & Service Delivery Budget Implementation Plan 2007/8 – 2009/10). While the municipality has no e-services, apart from a website that is weak in terms of social and local economic development information, it has a major project to build customer care centres throughout Ekurhuleni as a primary vehicle for e-services. The CoE Digital City Blueprint illustrates extensive knowledge of and insight into the characteristics and future requirements of the local economy, local realities and inequalities, and aims to address the identified needs, including digital inclusion and e-governance. While an e-governance strategy is embedded in the Digital City Strategy, it could be more explicitly stated (Ekurhuleni Metro Integrated Development Plan, Budget & Service Delivery Budget Implementation Plan 2007/8 – 2009/10).
The strategy sees the interconnectedness between social development and local economic development. The GDS 2025 agenda requires the application of ICT with the intended outcome of ‘world-class ICT infrastructure’ to support economic growth in Ekurhuleni. This perspective includes requirements for broadband infrastructure especially in ‘high-tech hubs’ such as the vicinity of the OR Tambo International Airport, South Africa’s international business and tourist gateway (Abrahams and Bhyat 2007). The implementation of this ICT for development agenda will take place through the annual IDPs. The main weakness in the IDP document reviewed, was that ICT development is discussed in relation to Infrastructure and Services, but e-governance (or e-government) is not discussed in relation to projects designed to enhance social or local economic development (Abrahams and Bhyat 2007).

While noting the need for private sector partnerships, the CoE envisages the achievement of the digital city through what is known as the Full Public Control Model, which means that CoE would have direct involvement in all aspects of the project including the passive infrastructure, the active infrastructure and services. Ekurhuleni plans to create customer care areas and customer care centres as a mechanism to provide integrated services and information to communities; however, the ideas are general rather than specific (Ekurhuleni Metro Integrated Development Plan, Budget & Service Delivery Budget Implementation Plan 2007/8 – 2009/10).

The strategic vision of municipalities to offer broadband services to citizens provides a great opportunity for improving ICT penetration in South Africa and therefore the effective provision of e-services. Local government in Gauteng is taking on the role of facilitator in promoting ICT access, as it considers the benefits both in terms of improving the rate and quality of service delivery, and with regard to the connectivity necessary for continued business development. The main challenge is the design of an e-governance policy framework that applies to provincial and local governments collectively, detailing, inter alia, the actions required from each sphere of government (Abrahams and Bhyat 2007:140).
Despite of smart city and smart governance initiatives, the City of Ekurhuleni is experiencing service delivery challenges. The municipality has been “facing challenges in its finances; infrastructure and planning as well as outstanding investigation. It has also lagged behind in providing key services and dealing with outstanding disputes” (internet source: https://www.sanews.gov.za/), hence the demand for improvements in services with smart infrastructure development. The City of Johannesburg therefore is tasked to provide support to the City of Ekurhuleni to “basic institutional arrangements, governance, systems, processes and procedures are in place and support the objectives of the council” (internet source: https://www.sanews.gov.za/), In the City of Ekurhuleni, “the capacity for analysis and the potential for investigating alternative and innovative ways of delivering services is lacking. The province is, therefore, also requested to support the municipality by deploying resources and specialists who can develop a bold turnaround plan” (internet source: https://www.sanews.gov.za/). These challenges are complemented with challenges regarding the implementation levels of smart city and smart governance initiatives, discussed in Chapter Five.

4.5 SUMMARY

The main focus of this chapter was a discussion of the City of the Ekurhuleni Metropolitan in terms of geography, the statistical overview of the population of the city, and the broadband policy of the city, highlighting the smart governance initiatives in the City. It appears that the City of Ekurhuleni’s smart city initiative with smart governance is not far from being achieved, with the ICT programmes put in place to develop and improve the skills of the people. However, the city needs to focus on the assessment of the ICT and smart city challenges on a regular basis. The scientific methodologies applicable to the will be discussed in the next chapter.
CHAPTER FIVE
DATA ANALYSIS AND DISCUSSION OF FINDINGS

5.1 INTRODUCTION

The study sought to explore the improvement of local governance through ICT and smart governance. This has been undertaken through various topical issues spreading across five chapters. Data in this study was collected through questionnaires and interviews, together with a study of existing secondary literature documents. The preceding chapter of the study has conceptualised the general overview of the city of Ekurhuleni, including the history, geography and the economy of the city. In the process of deducing the meaning of raw data, an analysis should be undertaken. Therefore, the core aim of this current chapter is to analyse data and discuss the findings. A triangulated approach to data analysis is used, which mean that both a quantitative and qualitative data analysis methods are used on data gathered from municipal officials and community members of the study area, which was the Ekurhuleni Metropolitan Municipality. This data is analysed graphically presented and interpreted using the scientific methods as discussed in the respective sections of this chapter. It is a significant point for the study to consider the views of the people in the city, since they are the ones who are positively and negatively affected by the utilisation of ICT for smart governance initiative.

The chapter aims to realise the research objective, such as, “Discuss the research methodology; to analyse and interpret the responses to gain insight regarding the status of ICT for smart governance in the City of Ekurhuleni Metropolitan Municipality” (see Chapter One, section 1.4.2).

The research methodology aspect is discussed in Chapter One (refer sections 1.5-1.8). This chapter therefore briefly explains the research and research methodology and expands on the explanation regarding the data collection process and the data analysis procedures utilised in the study. The researcher submitted a letter of request for conducting research at the Ekurhuleni Metropolitan Municipality, which was signed by the relevant official at the municipal headquarters and submitted back to the
5.2 RESEARCH METHODOLOGY

The researcher utilised a mixed method study that is a “systematic integration, or ‘mixing’, of quantitative and qualitative data as part of a single investigation or programme of inquiry. The basic premise of this type of methodology is that the integration of data permits a more complete and synergistic utilization of data than do separate quantitative and qualitative data collection and analysis” (Wisdom and Creswell 2013: 2).

Qualitative research is used to find solutions to problem statements, and produces described data based on the written and spoken words of people. Qualitative research methods are rooted in human or social science and are different to research methodologies used in natural sciences (Creswell 2003:181). Qualitative research concerns itself with an assessment of a situation expressed in the participant’s own words. The purpose of qualitative research is to examine human behaviour and the social, cultural, and political contexts in which it occurs (Salkind 2009:307). Quantitative research uses only two techniques, the experimental and quasi-experimental research design. Experimental designs are used most often in laboratory studies of animal and human behaviour. Quasi-experimental research designs are used mostly in social sciences (Auriacombe 2017:50).

This research is qualitative (exploratory) and quantitative (descriptive), serving the purpose of providing exploration and description of concepts and the intended impact that was highlighted in the study. The main reason for undertaking research is to discover knowledge and to gain a broader understanding of a phenomenon. As for the purposes of research, there are two aspects that are closely interactive: to investigate and then to describe and discuss. This enables the researcher to be predictive and arrive at the desired outcomes of the research objectives formulated at the outset. Descriptive research “does not fit neatly into the definition of either quantitative or qualitative research methodologies, but instead it can utilize elements of both, often within the same study” (The Association for Educational Communications and Technology 2016: 1).
This study utilised the case study approach. The “case study is a design of inquiry found in many fields, especially evaluation, in which the researcher develops an in-depth analysis of a case, often a programme, event, activity, process or one or more individuals. Cases are bounded by time and activity and the researcher collect detailed information using a variety of data collection procedures over a sustained period of time” (Yin 2009, 2012:14).

The goal of using a case study here is to get an in-depth understanding of the role that ICT plays in a smart governance initiative. Although case studies have often been considered part of qualitative research and methodology, they may also be quantitative or contain a combination of qualitative and quantitative approaches. Qualitative research is characterised by an interpretative paradigm, which emphasises subjective experiences and the meanings they have for an individual. Therefore, the subjective views of a researcher in a particular situation play a vital part in the study results. Another characteristic of qualitative research is its idiographic approach (Vogrinc 2008 cited in Starman 2013: 30), which emphasises “an individual’s perspective on the investigative situation, process, relations, etc.” In this study, both qualitative and quantitative methods (mixed-method) approaches are utilised to explore ICT for improved smart governance in local governance. The City of Ehuruleni Metropolitan Municipality is used as a case study.

The research techniques used are literature review and documentary review, interviews and a questionnaire survey, discussed in Chapter One (refer sections 1.7.2 and 1.7.3). The data obtained from the interviews and questionnaires was recorded manually, later collated, analysed and presented in tables together with a written report (refer to section 5.4). The aspects of validity, reliability and research ethics are discussed in Chapter One (refer Sections 1.6.3 and 1.9).

5.3 INTERPRETATION AND ANALYSIS OF DATA

The researcher spent one day in the municipal office to discuss his research and fulfil the obligations regarding research ethics, for example, filling the municipal office forms. The researcher thereafter visited the IT unit to conduct interviews.
researcher, due to his professional obligations, managed to get a half day for two days in a month. Due to the nature of his work, he does not have an annual leave provision, hence tried to minimise taking unpaid leave to reduce financial loss. The interview process was therefore carried out in the IT unit of the City of Ekurhuleni Metropolitan situated at Cnr. Trichardts and Commissioner Street, Boksburg Civic Centre, 7th Floor. Within the timeframe of three hours a day, the researcher managed to conduct interviews with 16 employees (eight employees a day) from the IT Unit of the City of Ekurhuleni Metropolitan Municipality. The aim was to gain more understanding of the challenges that come with the smart city initiative.

A questionnaire was also distributed to 123 residents of the City of Ekurhuleni. The researcher spent four days in the City of Ekurhuleni’s Civic Centre, which is based in Boksburg and at the Benoni Customer Care Centre. These centres were considered as appropriate places to engage with the community members because it is where the IT and HR departments are situated. The IT department is situated at the Civic Centre and the HR department is situated at the Benoni Centre. These are the places where people with IT-related complaints are found. The researcher approached 123 residents who visited these centres for IT-related issues and electricity-related issues such as power cuts and prepayment meters. The researcher decided to spend three hours a day for four days from Monday to Thursday as he did not have annual leave provision, and hence took a four half days off from work with unpaid leave.

The researcher approached the community members in the time-frame of three hours a day. Time spent was approximately 6 minutes per respondent to gather information for the study. The researcher was able to gather information from 30 respondents in one day. In total, three hours were spent until the researcher reached the total number of 30 respondents in one day, hence a total of 60 community members were contacted in a two-day timeframe at the Civic Centre. Thereafter, on the third and fourth day, the researcher went to Benoni Customer Care Centre, where the residents of the area can make queries with regards to municipal services. The researcher managed to get 63 responses in the same time-frame of 3 hours a day for two days (31 responses on the third day and 32 responses on the fourth day). These community members were in fact queuing to consult the Human Resources managers (HR) regarding IT-related HR matters.
5.3.1 Quantitative data analysis

Quantitative data analysis is the process of turning words into numbers. In simple terms, it is the statistical and mathematical analysis of numeric data (Bernard and Ryan 2010:4). The study uses quantitative data analysis to expand the study scope and focus. Another reason for the study to use quantitative data analysis is that it opens up the possibility of applying statistical techniques to material that is quantifiable. The researcher’s decision to use quantitative data analysis was influenced by quote from Miles and Herrmann (1994) quoted in Hesse-Biber (2010:81): “quantification of data is not the end up point but rather a means of making available techniques which add power and sensitivity to individual judgement, when one attempt to detect and describe patterning in a set of observations”. The researcher used the quantitative approach in unpacking and analysing the raw data collected from 123 respondents on how the people of Ekurhuleni perceive the utilisation of ICT, and the role that ICT can play in making Ekurhuleni as a smart city with smart governance. The data analysed in this section was derived from research instruments which had ‘yes’ or ‘no’ or other affirmative and non-affirmative choices for the respondents to select. A respondent also had space for providing discussion and explanations to their choice of answer. Quantitative data analysis and presentation was undertaken using the Microsoft Excel programme of data analysis and presentation. Accompanying interpretations are based on the researcher knowledge of the issues at hand, surveyed literature and respondents’ input. The following is the quantitative analysis and interpretation of empirical data.

5.3.1.1 Knowledge of Information and Communication Technology

The study asked the questionnaire participants questions pertaining to their knowledge of ICT in relation to public service delivery and municipal governance. This data is analysed and presented in Figure 5.1.
The study established that there is a relatively high knowledge of ICT in the Ekurhuleni Metropolitan Municipality, as shown in Figure 5.1. Out of the 123 surveyed participants, 61% of respondents indicated that they had knowledge of ICT in relation to smart governance. On the other hand, 39% of respondents stated that they did not have any knowledge of ICT. The researcher attributes this distribution to the varying levels of ICT penetration in the municipality, with respondents based in townships having less knowledge of smart governance as compared to their counterparts living in urbanised conurbations. Scholars Mitchell and Odendaal (2015:140) construe that people living in townships have less access to internet and technology due to prevailing poverty.

5.3.1.2 Opinions on the availability training programmes for service consumers

Opinions of the participants about the availability of ICT training programmes in the city in relation to effective service delivery were asked. The data is analysed and presented on the following in Figure 5.2.
Training programmes targeting community members on the issues and use of smart solutions to service delivery were explored in the study. The figure above shows that 63% of the respondents were not aware of the training programmes provided by the city in ensuring that the citizens can use ICT effectively in smart city initiatives. Only 37% of the respondents proved to be aware of the availability of the programmes. Despite the lower percentage of people aware of the availability of programmes, the researcher can conclude that this is due to ignorance and negligence from the citizens, because if 37% of respondents are aware, it shows that the training programmes are provided by the city. The preceding situation is substantiated by Van Schalkwyk (2012:93), who argues that public service delivery is sometimes affected by the ignorance of residents of the municipal developmental programmes.

5.3.1.3 Readiness of the municipality to become a smart city

The adoption, implementation and sustaining of smart governance is solely dependent on the ability or willingness of that particular city to take the smart governance path. The researcher decided to ask the people who belong to the city about the readiness of the municipality to become smart, as they are the ones who are directly affected by the changes that take place within the city. Figure 5.3 shows the distribution of respondents by their opinions on the readiness of the Ekurhuleni Metropolitan Municipality to become a smart city.
Figure 5.3 shows that the highest percentage of the distribution according to readiness of the municipality to become smart is the majority of 60% of respondents believed the city is ready and 40% of respondents believed the city is not ready to become smart. The low level of percentage can be due to insufficient service delivery, which is subject to the fact that the city consists of heterogeneous societies comprising people with different needs and demands, to which the government can only render services according to the majority at some point. Despite the low level of the people who feel the city is not ready, if 60% of respondents believe the city is ready, it means the city is on the right direction of becoming smart. The high level of people on the positive side can be due to the sufficient and effective service delivery they get from their government. The study argues that perceptions on the readiness of the City of Ekurhuleni to become a smart city with smart governance is a sure sign of the enthusiasm that residents and community members have for 21st century ICT solutions to the challenges that they face.

5.3.1.4 Willingness of the municipality to institute smart governance

For a city to become smart, there must be a willingness first before the adoption and implementation of the smart governance initiatives. Respondents were questioned about the willingness of the city to become smart, in relation to service delivery improvement. A graphic presentation of the distribution of the willingness of the municipality to institute smart governance is given below in Figure 5.4.
The responses reflect that 59% of the respondents agreed that the city is making progress to this goal, while 41% of respondents doubted the aspirations of the City of Ekurhuleni in relation to the willingness to transform into a smart city. Findings are based on the numbers provided above which favours the willingness of the city to improve smart governance. This simply means that the public officials of the City of Ekurhuleni should be given credit on that department since the numbers shows that they are doing things the right way. From the perspectives of this category of respondents, the willingness was said to be measured by the effort that has been made towards smart solutions. According to responses from the respondents, these include the Ekurhuleni App, which residents and visitors can use to report road hazards like potholes, to the municipal authorities. Nonetheless, some respondents who took part in the questionnaire survey were sceptical and registered their displeasure at the rate at which those holding the levers of power are embracing and implementing ICTs; most lambasted the slow pace used by their municipality to rollout smart governance.

5.3.1.5 Existence of challenges inhibiting transformation into a smart city

Similar to any public service delivery initiatives, smart governance is not immune to challenges. Challenges that are hindering the City of Ekurhuleni from becoming smart were explored and respondents were also questioned about their awareness of these
challenges. Figure 5.5 indicates the distribution for the existence of challenges to transformation into smart governance and 21st century smart city by Ekurhuleni metro.

**FIGURE 5.5: DISTRIBUTION FOR EXISTENCE OF CHALLENGES TO TRANSFORMATION**

Figure 5.5 indicates that 69% of respondents witness the existence of challenges in transforming the City of Ekurhuleni into a smart city. On the other hand, 31% of the respondents appear to be unaware of the existence of challenges to transforming the city. Findings indicate a challenge, because if 69% of respondents agreed to the existence of challenges, it means the challenges do exist. The City of Ekurhuleni has adopted and is implementing a smart city strategy and has a roadmap with the objective to enhance the city’s ability to provide services that are easy to access and use, while simultaneously being efficient and responsive in a transparent way. The City is focusing on key smart city programmes as part of implementing a smart city transformation. The shown distribution therefore indicates that the need to transform municipal governance into modern smart city phenomena will not be easy for the municipality; hence, there is need for a robust approach to such a change.

**5.3.1.6 Ability of the municipality to resolve technology related obstacles**

Success of smart solutions in smart governance in municipalities is dependent on the ability of those tasked with being gatekeepers of this technology to timely resolve problems as they arise across various platforms. Some of the complaints the IT unit in the City of Ekurhuleni receives are related to the instability of the e-services website and the instability of the broadband network, as well as to setting up infrastructure to
enable e-government. This process is expensive and requires dedicated capital and an operational budget. In places where the City of Ekurhuleni has managed to set up the service, it is constantly being challenged by things such as bandwidth, local and wide area networking. Furthermore, some complaints are usually related to the slowness of the network and security certificates that have expired, thus making the site untrustworthy. Respondents were asked about the ability of the municipality to resolve the problems or obstacles stated above.

The reason why the research explored this part of the smart governance issue is because as technical as it is, ICT requires well-oil apparatus and quick resolution of problems. That will ensure that no time is lost to downtime when networks are down. In the same vein, a responsive ICT unit is advantageous to the municipality since it keeps residents and visitors satisfied. In terms of an efficient and effectively running ICT system, municipalities can make sure that complaints, feedback and input from service consumers reach the authorities in record time, allowing for a swift resolution of infrastructure glitches. This is in line with the Batho Pele principles of people-centred public service delivery. A graphic presentation of the scale is given in Figure 5.6 which follows.

**FIGURE 5.6: DISTRIBUTION FOR ABILITY TO RESOLVE TECHNOLOGY OBSTACLES**

![Pie chart showing 55% yes and 45% no]

Figure 5.6 indicates that 55% of the respondents were happy with the ability of the municipality to resolve technology related obstacles, and 45% of them were clearly not happy at all about the service they get in relation to resolving technology related
obstacles. Findings indicates that this is due to the high population in the city and fewer staff members who are employed to focus on the particular field in the municipality. For instance, collected data showed that in most cases it appears that there are five ICT staff people and yet the municipality receives more than 300 complaints a day. Hence it becomes difficult to attend to those complaints and solve them thoroughly if the municipality is short of staff. Respondents in the study stated that, another reason for that could be the skills shortage, where the municipality is overloaded with people who do not have the necessary kills for the job; some are employed based on political influence not on merits, which results in poor service delivery.

A qualitative data analysis follows in the next section of the study.

5.3.2 Qualitative data analysis

The researcher interviewed 16 participants and qualitative data analysis was used when analysing the data collected. Qualitative data can be understood as transcripts of individual interviews and focus groups or field notes, copies of documents, audio and video recordings from observation of certain activities. Qualitative data is related to concepts, opinions, attitudes, values and behaviours of people in a social context where the data is not quantified (internet source: www.socialresearchmethods.net). On another note, Qualitative Data Analysis (QDA) is the range of processes and procedures whereby the researcher gathers from the qualitative data collected, some form of explanation, understanding or interpretation of the people and situations being researched. QDA is usually based on an interpretative philosophy of the researcher. The idea is to examine the meaningful and symbolic content of qualitative data (Bernard and Ryan 2010:4). Qualitative data analysis is the classification and interpretation of linguistic (or visual) material to make statements about implicit and explicit dimensions and structures of meaning making in the material and what is represented in it. Meaning making can refer to subjective or social meanings. Qualitative data analysis has been used in this study to discover and describe issues in the field or structures and processes in routines and practices. Often, qualitative data analysis combines approaches of a rough analysis of the material (overviews, condensation, summaries), with approaches of a detailed analysis (elaboration of categories, hermeneutic interpretations or identified structures). The final aim is often
to arrive at generalisable statements by comparing various materials or various texts or several cases of phenomena under a given scope of social investigation (Bernard and Ryan 2010:5).

In this study, qualitative data analysis covers responses from semi-structured interview sections, which the researcher had with twelve respondents. The researcher uses a thematic data analysis aimed at developing a greater understanding of the perceptions, attitudes and feelings of respondents on the subject of the role that ICT can play in making the City of Ekurhuleni a smart city with smart governance. The following is a thematic analysis of the data. The researcher coded the data sets into various themes which are in line with the study’s over-arching aim of exploring the impact of ICT into instituting smart governance in the City of Ekurhuleni in South Africa. The researcher uses qualitative interpretation to “enhance or clarify findings derived from the quantitative analysis (for example data, collected sequentially and the findings from one analysis type are used to inform data collected using qualitative analysis” (Onwuegbuzie and Combs 2011:2). Above all, qualitative data analysis enables the researcher to have an insider’s perspective into the phenomena under study. Thus, this section enables the study to have a closer look into understanding the dynamics surrounding smart governance and its impact on improving public service delivery in the City of Ekurhuleni. The following section covers the seven themes under which the qualitative analysis of empirical data is undertaken. The responses are language edited to present the opinions in a scholarly manner.

5.3.2.1 Expectations from smart city initiatives in the municipality

Respondents had high expectations on the issue of smart city initiatives. The general perception was that ICT can be a useful tool for resolving all pressing service delivery, community participation, communication, leadership and efficiency challenges that the municipality currently faces. Respondents 1 and 5 voiced their opinions by saying that they expected ICT to ensure that there is more transparent, accountability and responsive governance in the municipality. Additionally, the study quotes one of the interviewees as follows:
I expect the smart city system to be more effective in terms of service delivery and promotion of communication structures between the local citizen and their government. In short, the system will result in good governance giving effect to quicker public service delivery for community development and less service delivery protests (Respondent 2, 2018).

In addition to the preceding excerpt, the study also gathered data which showed that respondents expected ICT to be a driving force behind infrastructural development. Thus, smart city initiatives can improve on current level of infrastructural development in the municipality, especially the provision of roads and social amenities in some areas. This is seen in the quote from one of the interview participants shown below.

I expect fibre network or base towers as the back-borne infrastructure, seamless services from municipal platforms, declaration of municipal key points and remote observation of such facilities and crime reduction within the central business districts and community settlements. Smart governance should bring us good healthcare for improving living standards, especially in the township areas (Respondent 6, 2018).

The study infers that respondents expected that ICT can bring the kind of community transformation that they want. Furthermore, participants hoped that ICT in their municipality would improve service quality; create employment; bridge the current communication gaps between the municipality and its residents; improve community safety (through CCTV cameras) and community education initiatives; gain more access to public service; improve community participation and involvement; improve feedback generation and information exchange, and improve technology penetration amongst local residents.

The researcher argues that smart governance can indeed be the tool to attain the above expectations. Different scholars such as Batty (2008:5), Portland (2011:20) and Paris (2009:5) argue that smart governance provides opportunities to use ICTs for promoting greater accountability of the government, increase efficiency and cost-effectiveness and create a greater constituency participation. The smart governance approach will also assist in achieving larger economic objectives such as cost savings and technological growth and innovation, for e-government and business. It is well
known that the South African government faces several challenges in this regard, and in particular with service delivery. As argued in the literature section of the study, smart governance comes with smart solutions for the city that is beneficial for the citizens.

5.3.2.2 Perceived levels of improvement through smart governance

Respondents’ perceptions on the levels of improvement through smart governance indicated a high degree of perceived benefits of ICT. This is credited to the fact that technology has numerous advantages linked to improved service delivery efficiency. The researcher deduces that the data ICTs have a cross-cutting effect in the local sphere of government in a number of ways. As seen from the collected data, ICTs can transform municipal governance on a macro levels due to the ability of technologies to improve solution to billing systems, problem diagnosis, elimination of queues, improved interface between officials and the communities. The study quotes one of the respondents as follows:

*I expect a high level of transformation because there will be detailed information regarding what informs increase of rates, detailed information regarding other services that are available for the community to opt for, detailed information about the budget of the municipality, detailed information about project holders and details regarding the development they will bring to the community. Transformation comes also because more avenues for communities to report theft, vandalism of broken pieces of infrastructure* (Respondent, 8, 2018).

ICTs were seen to have a huge potential of transforming Ekurhuleni in the sense that vital pieces of communication can be disseminated more quickly and with greater convenience. Respondents 9 and 11 indicated to the researcher that issues such as impending load shedding, disease outbreaks like Listeriosis or Swine flu, disruption on railway lines, or weather hazards, can help save lives since there will be early warning systems and prompt announcements. Furthermore, ICTs can be the conduit through which community perceptions about their government will be improved thereby leading to close, harmonious working relations between the officials and their residents. This was echoed by an interviewee, as quoted in the following extract:
Usually the relations between residents and their municipality are based on attitudes and perceptions of the effectiveness of the municipality, so having a caring and compassionate municipality can be key to advancing community development. I say this because ICT will bring us closer to the municipal officials. For example, if I can contact my municipal councillor or council via a cellphone application since I am staying here in Oliphantsfontein some 44 kilometres from Germiston, the Ekurhuleni head office, I can send queries or complaints electronically and minimise travel distance. Now that is a 21st century smart governance initiative that will make me perceive my municipality as being modern and people-centred (Respondent, 10, 2018).

From the preceding arguments and excerpts, the study deduces that there is a greater chance of socio-economic transformation, if the Ekurhuleni Metropolitan Municipality embraces 21st century ICTs towards smart governance. That can be one strategy to cope with current demanding citizens’ and service delivery efficiency. As mentioned on section 4.4 of the preceding chapter, while the economy of Ekurhuleni outpaced that of Gauteng in 2005, 2006 and 2007, its economy has lagged behind that of the latter since 2008, with the exception of 2010 and 2014. The clear trend from the analysis is the slowing growth rate for all the three economies (national, provincial and Ekurhuleni) depicted in figures of the 11 year period, from growth rates of over 5% in the first 3 years (2005, 2006 and 2007) to below 2% in 2015, with the Ekurhuleni economy taking the biggest strain. In addition, the catastrophic impact of the global financial crisis in 2008 can also be seen in the negative growth rates in 2009 (City of Ekurhuleni 2018). Therefore, smart solutions can improve the manner of service delivery, minimise the cost of providing those services and generate gainful employment for local residents.

5.3.2.3 Training programmes available for ICT personnel

The study explored the issue of training and development of ICT staff as a move to entrench smart governance in the City of Ekurhuleni. Similar to any other organisation that values human capital development, the study established that the municipality has working training programmes although there were questions on the attitude of the ICT personnel towards training. Furthermore, Respondents 7 and 14 indicated that while
training and development is in the municipality’s plans and programmes, the dedication of top management to effectively utilise training and development to achieve rapid changes in service delivery was questionable. Furthermore, the commitment in terms of finances for ICT personal training has not been forthcoming, showing that smart governance appears not to be prioritised by those managers tasked with transforming the city. On this matter, the study quotes one interview participant in the following excerpt: (Respondent 15, 2018).

The researcher deduces from the respondents that the municipality is fully committed to ICT staff training. However, based on the current pace at which the municipality is embracing and using smart governance, the study argues that the mentioned training programmes might be on paper, but practically being underutilised by both staff and management. Furthermore, the study argues that training programmes are not so efficient due to poor employee attitudes towards training. In spite of the insufficient or poor attitudes towards training due to the reason mentioned above, Respondent 12 indicated that there are benefits in the training programmes they provide in the City of Ekurhuleni Metropolitan Municipality, and was quoted as follows:

*I choose what new skills my workforce gains, targeting skills to meet the needs of my operation for now and in the future, training staff result in better customer service, better work safety practices and productivity improvements, you demonstrate to your workforce that you value them enough to invest in them, improving loyalty and staff retention. These are ICT related skills especially considering that we are in a digitalised 21st century world. In turn, retention of skilled personnel is a saving to the municipality. Employees of the municipality who enrol for available programmes acquire new skills, increasing their contribution to the organisation and building the employees self-esteem, the training they do takes them into other positions within the organisation positions with better prospects and/or better pay, they are up-skilled to do new and different tasks, which keeps them motivated and fresh, because they are being trained on time, they see that the organisation value them enough to invest in them* (Respondent 13, 2018).

From the preceding quote, it can be understood that training programmes are provided to the people but that the issues of ignorance and willingness, which is the poor attitude from the employees, cannot be overlooked. Training programmes are very helpful in
terms of equipping employees and helping new employees to settle in the organisation. It is a complicated field in the organisation as each department within the municipality is dependent on the ICT unit for daily operations. In addition, the Ekurhuleni Metropolitan Municipality has committed enough resources to ensuring that it organises seminars and marathon training sessions for their employees to always stay abreast of emerging trends in technology, as echoed by Respondent 16 in the study. Another dimension of training is explored in the next theme.

5.3.2.4 Availability of training initiatives for residents and service consumers

The study explored the issue of the municipality to ensure that its tailor-made services are user-friendly or that service users have the knowledge on how to get the best out of available smart governance initiatives. Respondents’ perceptions on the measures in place for the ICT unit to provide training to the consumers to use technology through smart governance indicated a high degree of perceived benefits of ICT. This is credited to the expectations of the people within the city on ICT in transforming the city into a smart city. As Respondent 4 indicated to the researcher, the people of Ekurhuleni are happy with the Ekurhuleni app, Business Process Mapping, free Wi-Fi in places, electricity larger power user metering, displayed and the web vehicle tracking. All these are simple but technical ICT tools that, for a service consumer who falls into a category of beings less-literature, using becomes an immense challenge. Thus, there is the need for awareness programmes to train and ensure a smooth tool-user interface.

Despite the claim that comes from the cited respondent, that the people of Ekurhuleni are happy with the service they get, Respondents 13 and 15 indicated to the researcher that some people are unhappy with the communication infrastructure such as Wi-Fi, and cellular phone applications such as My Ekurhuleni for core of communication within the local communities. The respondents suggested that they need to help each and every department to do everything from old systems and budget tools for the departments, and sensitising the end-user of those ICT initiatives on how best to interact with such systems. Improving transportation to commuters and free access of the Ekurhuleni application through digital training is necessary. One of the respondents was then quoted as follows:
The City of Ekurhuleni Metropolitan Municipality has put measures in place for the IT unit to train service consumers to use technology. The City has Business Process Mapping, Strategies to enable the smart city cat connected levels, roll-out of infrastructure, Fiber castle, installing biometric in the building, education to its customers and internal capacity strengthen. We value the ability of our service consumers (residents) and visitors to be able to interact with us through technology, for example, for a resident to be able to freely and swiftly report a road damage within our municipality, we offer training on how to best use our ICT offering. What is the purpose of having an ICT solution that is not user-friendly? (Respondent 6, 2018).

From the above argument, the study infers that the City of Ekurhuleni has clear goals and objectives of becoming a smart city and they are working towards achieving their goal of becoming smart. The researcher commends these initiatives and their customer focus since the goal of public service delivery is to ensure that the public service consumers are satisfied. To augment these arguments, the study cites Respondent 1 as follows:

_I work in the ICT Department of the Ekurhuleni Metropolitan Municipality as a developer of Apps. One of our goals is to make sure that we develop simplified, secure and effective smart solution for our service consumers. Every day, we are working on how to ensure that we come-up with working solutions and continuously improve our current scope of apps for our consumers. We also provide easy-to-understand manual and instructions on how best our consumers can interact with us through our apps. Mind you, we are a 21st century city, which is also competing for service excellence with such fast-growing cities such the Tshwane Metropolitan in Pretoria_ (Respondent 1, 2018).

The role of ICT is to make sure that the smart city and technology through smart digital is easily accessible to the people, the City of Ekurhuleni has taken measures to ensure that proper equipment is available. For instance, feedback generation is being done through mobile devices which are always connected to the smart apps to ensure that the link between the people and their government stays alive and lively. In this regard, the study argues that the success of smart governance and smart initiatives is not only
dependent on the availing of infrastructure supporting them, but also on the user-friendliness of such programmes. As a result, the study found that the City of Ekurhuleni is on the right path as far as consumer training and support is concerned.

5.3.2.5 Willingness of the municipality to become a smart city

The study probed the political or leaderships will to embrace smart governance. In this section, the perceptions of respondents on the willingness of the municipality to become a smart city indicated a positive desire on the smart city initiative are analysed. Overall, the study established that there is a great deal of political will towards smart governance in the Ekurhuleni Metropolitan Municipality. This is because public entity has realised the benefits that comes with a smart city initiative, as argued in the second chapter of the study. The leadership within the City of Ekurhuleni has realised the important role played by the introduction of ICT to promote smart governance. The study quotes one of the respondents as follows:

*Firstly, with the smart city initiative, the city of Ekurhuleni will have centralised systems that are efficient and sufficient. ICT will ensure that the smart city and technology through digital is accessible easer for the people to use. Secondly, the city will be in the forefront of technology before any department within the municipality request that service. ICT aid to provide infrastructure, applications and hardware platforms that the city can use. It enables systems, enabling access to vital skills and to maintain the systems, enabling and reporting activities as systems. All this enables fast, efficient, effective and responsive kinds of public service delivery* (Respondent 9, 2018).

From the above excerpt, the researcher can conclude that the city’s leadership is actually willing to become smart and this is concluded based on the measures that the city is currently taking in terms of improving services in the city as a whole. Respondent 1 indicated that customers are satisfied that queues can be captured via the Ekurhuleni app. Business Process Mapping has a huge advantage in revenue management for electricity supply and distribution which has shown a revenue or consumption figure of R8 billion in the 2018/2019 fiscal year for the municipality (Respondent 9, 2018). Furthermore, in the municipality, vehicles can be tracked electronically, therefore
ensuring there is ample ease of doing business, living lives and sustainable community
development for all. All these advantages are linked to the political dedication and
willingness of the leadership in Ekurhuleni Metropolitan Municipality to embrace and
utilise modern day smart governance approaches. On the other hand, there were
dissenting opinions on the issue of whether the municipal leadership was fully
committed to making Ekurhuleni a smart city, as seen in the quote from one participant
that follows:

There is no way that the city of Ekurhuleni Metropolitan municipality can become
a smart city, as long as the political mandate is still not given enough attention as
it should, as ICT has unused monitors lying the offices for decoration and money
was spent on buying the equipment resources. There is too much obsession here
in our municipalities on the use of ancient public sector practices while ignoring
the fact that globalisation and inventions have given us smart solutions for
improving how we provide services. Maybe the question should be how willing are
those who deploy or appoint our political leadership to embrace and bring about
smart solutions and make us a smart city (Respondent 8, 2018).

From the above argument the researcher can argue that having a good political will
can help departments within the municipality to enjoy great political support in the
management of ICT infrastructure, and there are some areas where this support is
lacking. As respondent 7 was quoted as saying, “the municipality has to make sure
that political mandate of the fallen heroes is implemented within the city of Ekurhuleni
Metropolitan municipality”. Furthermore, professionals such as administrators who are
trained and hired to execute solutions for our people will not have much say on how
deep and wide can the municipality embrace ICTs that solely rests in the hands of the
mayors and other appointees. So often, when there are protests, the first thing that
communities vent their anger and frustrations on are the municipal infrastructure
problems, followed later by complaints that there is no library, clinic or multi-purpose
centre for their communities. It all should begin on the political will, if these protests
and grumbles are to be addressed amicably and sustainably.

This is also an indication of doubt on whether politicians have a good understanding
of their important role in infrastructure management, specifically the ICT infrastructure
as the most important infrastructure to make life easier for their communities. The study deduces that there is need for municipalities to appoint or deploy tech-savvy politicians who would further the smart governance initiatives for the betterment of service delivery in their communities. These are the kinds of leaders who would go to great lengths to pool and allocate resources for entrenching smart solutions in a city that is Smart Governance-conscious, like Ekurhuleni.

5.3.2.6 Technology related challenges affecting transformation into smart city

The respondents indicated a high level of technology related challenges that the city keeps on experiencing on a daily basis. From the data, it appears that the problems are more experienced in public libraries where people would want to use the internet and cannot or not have the required skills to operate the machine. Sometimes people would want to uses the internet for academic purposes or for job application or job searching and sometimes may put down a complaint on the municipality’s database. The researcher’s perception of this is that the situation may be caused by the shortage of librarians to assist the public citizens who need help, or the lack of skills from the staff members who are assigned to assist the people. A quote from some of the interview participants is as follows:

*We need the skilled municipal employees to serve and promote smart solutions to our problems. The city of Ekurhuleni Metropolitan Municipality is actually struggling when it comes to skills to design Business Process Mapping (BPM) on paper, skills to design and implement BPM electronically, skills to renew or tweak original designs of BPM, to a small extent, funding. Business intelligence software is required, for instance to link vehicle movement to calls logged, job cards, time management and material management. Now that’s a smart city in my view, but are we anywhere near reaching that point* (Respondent 3, 2018).

From the preceding argument by the participant, the study concludes that the city still has a lot of work to do when it comes to transforming into a smart city. Other challenges that the study established include unethical behaviour affecting smooth adoption and support of smart governance programmes, corruption and nepotism that is affecting the appointment of the right competent staff into key positions which drive ICT adoption
and implementation. Respondent 4 (2018) bemoaned the lack of compliance in various aspects including procurement and supply chain management, which have affected the ability of the municipality to accrue and utilise state of the art technologies. In substantiation, the study quotes Respondent 11 was quoted as follows:

Corruption, maladministration, poor oversight, flouting of procedures, poor governance administration and disregard of rules and regulation are rampant in this municipality. The city is also lacking people with ideology in making sure that the people and the city understands the purpose of digital city. The deficiency of proper planning, lack of ICT usage between the departments and between the city and the community. There is also a challenge with the old, dilapidated form of some of our infrastructure such as sewerage and water supply lines has affected the allocation of resources to smart governance initiatives (Respondent 11, 2018).

There are several challenges of affecting smart governance in the municipality and those challenges are discussed by different scholars in the ensuing paragraph. As respondents in the study indicated, there are numerous challenges affecting smart governance within the City of Ekurhuleni. Additional obstacles are summarised as including the lack of collaboration among agencies; poor intergovernmental cooperation on smart governance; delays in smart service delivery systems (for instance district web portal are not updated); inclusion of traditional payments system instead of smart solution; lack of awareness by citizens of smart governance; lack of information or data on service standards and benchmarks as well as a lack of transparency in service delivery.

The preceding discussion can be supported by literature from various scholars as follows. Bwalya (2009) faced some challenges on smart governance like low level internet penetration, lack of budget, lack of citizen awareness, limited ICT skill and training. Athmay (2012) listed some restraining forces of smart governance readiness like lack of institutional readiness, lack of political will and lack of participation. Hossan stated that the most critical factors contributing to the failure of some smart governance programmes or their implementation in the local sphere of government, are the lack of internal political desire, inadequate technological infrastructure, lack of overall vision or strategy and dominance of politics or self-interest. Scholar Jaeger (2003) described
several broad areas in which smart governance faces obstacles. These included security, privacy, homeland security, digital divide, economic disparities, education, accessibility, prioritization, citizen awareness and confidence. Srivastava and Sharma (2010) identified geographical, social and economic disparities among citizens as the biggest barriers for smart governance, illiteracy, lack of infrastructure, security and privacy of personal and financial data as other constraints that hamper smart governance efforts.

5.3.2.7 Possible solutions to current smart governance challenges

Respondents had the chance of providing advice to the study on how the various smart governance challenges can be resolved. Respondents had a high degree level of expectation from the City of Ekurhuleni’s smart city initiative. The perception is that even though there are some positive outcomes that come with the smart city initiative, they feel that there is still gap. The city needs to have a critical eye on these going forward. Some respondents voiced their concerns: they expect ICT to come with new ways of dealing with public issues and they believe that ICT has come with new ways. However, the issue of lack of skilled or well-equipped employees within the municipality remains as the major challenge of the municipality, in relation to the smart city transformation. Some participants’ recommendations on how the city can resolve the smart governance challenges they encounter in the process of being smart, were given by the respondents. One respondent is quoted as follows:

The Ekurhuleni municipality needs to sustainably manage its processes and programmes, for example, prevent overspending through a sustainable management of expenditure and budget through smart systems. In addition, smart solutions are needed in energy, vehicle movement, job cards, time management and material management have massive positive implications. Upgrade the ICT department and provide funding for awareness programmes and training. Buy proper equipment and avoid having proper equipment only for decoration purposes. Improve communication to the customers and budget availability to deploy and implement such systems (Respondent 7, 2018).
From the preceding quote, the study deduces that there is greater chance of improvement in the City of Ekurhuleni. The research emphasises the point of training and development is a key pillar to building a sustainable ICT infrastructure and practice. Nonetheless, the study adds that ethical and professional conduct should reign in on unscrupulous practices such as corruption and nepotism. The city is not far from becoming a smart city as it can be considered to be one of the richest cities in the country. Respondent 12 was quoted as saying:

*For the city to be smart, they need to provide good quality ICT infrastructure that can be used to shape public policy. There is also a need for sustainability within the ICT unit in the city of Ekurhuleni Metropolitan Municipality. The municipality need to enforce the utilisation of ICT equipment as well as improve on budget allocation for the accrual of smart equipment for real transformation* (Respondent 12, 2018).

From the above quotation, the study infers there is a lack of leadership within the officials of the City of Ekurhuleni. Thus, the respondent feels the need to enforce the utilisation of ICT equipment. This means equipment is available but it remains unused; this can be due to lack of skills from the staff members or from the managers. Other respondents in the study argue that the following can be strategies that can be used to re-route the City of Ekurhuleni back on the path of transformation into a smart city with smart governance. The said strategies include meritorious deployment of political officers of the municipality and enforcement of a profession code of conduct for municipal employees. Further strategies encompass training of both developers and users of smart solutions; strict adherence to statutes and polices that guide local government procurement and finance management; use of public-private partnerships for improved service delivery and above all, the utilisation a multi-stakeholder approach to adopting and implementing smart governance.

### 5.4 SUMMARY

Data analysis focussed on the status quo in the Ekurhuleni Metropolitan Municipality in its quest to transform its local governance through smart solutions that are ICT-based. Through both quantitative and qualitative data analyses, the study established
that huge potential exists for the transformation of local governance through smart governance despite the current slow pace at which the municipality is adopting and implementing these initiatives. Considering the perceptions of the public or the citizens of the City of Ekurhuleni about the impact of ICT in relation to the transformation into smart governance, was vital for this study. This is because whatever happens in the WHAT? does affect the people within the city directly and indirectly. Overall, the duty and responsibility of the municipality remains the same: it should find sustainable ways of improving the living standards of its residents through all means. The study values the critical role that ICTs can play in that regard. The following chapter will focus on the synthesis, findings and recommendations of the study.
CHAPTER SIX
FINDINGS AND RECOMMENDATIONS

6.1 INTRODUCTION

The previous chapter presented the findings of this study in detail. Chapter Seven now provides an overview of the study explaining the realisation of research objectives formulated in Chapter One, as well as the findings drawn from this research. It then concludes by offering significant recommendations to enhance and expand the use of ICT in the City of Ekurhuleni for improved smart governance. The chapter aims to realise the research objective, such as, “Provide possible recommendations for South African municipalities to implement the information and communication technology successfully for smart governance, with particular reference to the City of Ekurhuleni Metropolitan Municipality” (see Chapter One, section 1.4.2).

6.2 REALISATION OF RESEARCH OBJECTIVES

In Chapter One, the rationale of utilising information and communication technologies was raised and emphasis placed on smart governance for improved delivery of services. This study aims to provide a conceptual framework gained from the literature in an effort to explain the issues, concerns, challenges and solutions on the achievement of a smart city with smart governance in municipalities. Furthermore, it explored the critical interface between ICT, smart cities and smart governance in order to enhance the understanding of the phenomenon. The chapter therefore formulated research questions and objectives and described the appropriate methodology selected to achieve the established research objectives.

The answer to the research question, “What does the information and communication technology (ICT) entails?” posed in Chapter One, lies in the conceptual exposition of the ICT in Chapter Two. In Chapter Two, the definition of the concept was defined comprehensively (refer to Chapter Two, section 2.2). Critical in this chapter was the explanation of the statutory, regulatory and policy frameworks, and theoretical approaches that guide ICT in South African context (refer to sections 2.4 and 2.5), that led to the utilisation of ICT mechanisms. Through these descriptions, Chapter Two was
able to answer the following research questions:

- What does information and communication technology (ICT) entail?
- What are the statutory, regulatory and policy frameworks guiding ICT in South Africa?
- What are the theoretical approaches of ICT that can be considered applicable in South Africa?

In Chapter Two, it became clear that with the implementation of e-Government sharing of information with the public and across government departments has never been easier. Nonetheless, it is imperative that all public departments are aware of the requirements of the statutory, regulatory and policy frameworks in existence.

Chapter Three explained the concept ‘ICT’ for smart governance in detail. The chapter also explored the nexus between information and communication technologies, smart cities and smart governance for improved service delivery (refer section 3.6). The chapter was able to answer the following research questions:

- What does the concept ‘smart city’ entail?
- What does the concept ‘smart governance’ entail?
- What is the role of ICT in a smart city initiative to improve smart governance?
- What are the service delivery challenges experienced in South African municipalities that demand their transformation into smart cities for smart governance?
- Which South African municipalities have implemented ICT for improved smart governance?

In Chapter Three, it became clear that ICT is significant to improve services and efficiency through smart governance (sections 3.5 and 3.6.1-3.6.10), and hence contributes to public management and governance reforms. The incorporation of ICT
initiatives in municipal governance has assisted municipalities to become smart cities that demand smart governance.

Chapter Four provided a comprehensive discussion on the use of ICT to improve smart governance in the City of Ekurhuleni as a case-study. The chapter realised the following research objective:

- To explore the challenges experienced in the South African municipalities that demand the establishment of smart cities, with particular reference to the City of Ekurhuleni Metropolitan Municipality.

Chapter Five explained the research methodology, methods and techniques utilised to gather data for interpretation and analysis. The chapter explained the mixed methods approach (qualitative and quantitative) utilised in the study (refer to Chapter five, section 5.2). The chapter also discussed the case study approach and then analysed and interpreted the data (refer to section 5.3). Triangulation was utilised to strengthen validity and reliability in the research process. Through triangulation, qualitative and quantitative data was collected to corroborate findings.

Chapter Six discussed the realisation of research objectives and the main findings. Thereby it achieved the following research objective:

- To provide possible recommendations for South African municipalities to implement the information and communication technology successfully for smart governance, with particular reference to the City of Ekurhuleni Metropolitan Municipality.

Chapter Six also discussed the limitations experienced and left scope for further research in the area of ICT for improved smart governance in South African municipalities.
6.3 FINDINGS AND RECOMMENDATIONS

The main findings of the study has indicated that there is a huge gap between policies written on paper and what is being done or implemented in terms of policy execution. This is due to the low level of professionalism where everyone does what is good on their own side, forgetting the rules and regulations of how things should be done. Most importantly, the study has found that a lack of appreciation of the many advantages of smart governance by municipal officials, is affecting the ability of the City of Ekurhuleni to plunge into being a fully-fledged smart city. Also, corruption is a causal factor in terms of poor service delivery. It is the duty of government to ensure that service is rendered effectively, efficiently, economically and ethically. However, there are people who are still not granted access to effective services by, *inter alia*, the continued use of manual and cumbersome public service delivery solutions.

Moreover, the study has found that the problems affecting the city from becoming smart are not due to lack of policies, but rather due to the misinterpretation of policies from the officials, which results in poor service delivery from the government. It appears that the implementation process is also an issue for the city; for instance, they have training programmes drafted on paper but taking action is problem. This is due to the lack of skills, and people being scared to train others about something they are not good at. The study also indicates that the top management level of the municipality is afraid of dealing with change since people are resistance to change, and they are failing to develop leaders. Likewise, engaging in both developer and user training is also a problem. Delivering consistent training skills application and improving learning effectiveness is a struggle within the municipality.

Another finding is that the *Batho Pele* (people first) principles are only applicable when it favours the management of the municipality. For instance, the level of accountability, transparency and service standards, to mention a few, are only considered occasionally. Communication channels are as effective as they should be. The absence of collaboration among agencies is major issue affecting the city from progressing in the objectives of reaching the intended goal of the municipality. Overall, the study views the current dedication and implementation of smart governance in the City of Ekurhuleni to be deficient, something that has led to a haphazard and partial
adoption of smart governance. While various challenges remain, it is the willingness of leadership and the relative importance that those holding the levers of power in the municipality attach to ICTs, which determine how deep and far they will drive the municipality towards this goal. In the end, there is a need for modern-day municipalities to adopt 21st century, compliant, smart solutions which not only improve on the effectiveness of public service delivery, but also transform the economic and efficient aspects of the delivery of services to consumers or citizens.

After the analysis of data on the prospects of the City of Ekurhuleni to transform into a smart city through smart governance, the study proposes the following as the recommendations that the municipality should take into consideration towards attaining the required transformation:

6.3.1 Balancing policy prescripts and implementation or practice

The City of Ekurhuleni needs to make sure that it closes the disjuncture between policy stipulations and practice in order to realise its smart city goal. During the study, the researcher discovered that those tasked with undertaking various crucial tasks in ICT expansion and sustenance did not do as prescribed, thus ending up with a huge gap between what is required and what is actually being done. For instance, the CCTV monitors at the municipal head offices in Germiston are left unattended, hence losing vital data on what will be going on at a particular time. The study therefore suggests that the municipality has operational manuals, codes of conduct, monitoring tools and leadership oversight to ensure that all its ICT programmes and infrastructure are going according to plan. Robust strategy can markedly improve the path towards smart governance and smart city targets by the City of Ekurhuleni.

6.3.2 Prioritising ICT in planning and budgeting

The contemporary era of 21st century ICT dominance and expansion require municipalities to rethink their planning and resource allocation activities, especially given the influence of the 4th industrial revolution. In a bid to achieve its smart city and smart governance targets, the City of Ekurhuleni should consider ranking ICT plans
and programmes higher when it plans and budgets for its service delivery components. The influence of technologies cannot go unappreciated and there is need to move away from the conventional ways of delivering services. Such a move will begin with the municipalities placing equal and deserved priority to ICT so that all ensuing initiatives run smoothly without any resource-glitch. Oftentimes, the City of Ekurhuleni Municipality has been castigated for looking at ICT and smart governance on a small scale. Thus, expanding the budget and significance of this much-needed resource can be the stepping-stone into the 21st century league of smart cities.

6.3.3 Improve community involvement and engagement

Public service delivery in modern-day society has moved away from being top-bottom to being people-centred. Therefore, there is a great need to ensure that ICT initiatives and programmes of the City of Ekurhuleni are built and tailor-made to suit the preferences of local communities. The study recommends an improved and intensified community engagement and participation as a conduit to smart governance in a smart city. Although the Ekurhuleni Municipality has committed to making sure that the ICT solutions that it delivers are as simplified as possible, there is a need to emphasise the need to make sure that these are user-friendly and generate useful user feedback. Such a use of feedback can mean continuous ICT products and services in the municipality. The study values the saying that there should be ‘nothing for the people, without the people’ and all the various aspects of service delivery should include both an input and feedback form local communities because they are the target and end-users of public services.

6.3.4 Ethical and professional leadership practices

In order to have a successful smart city initiative, the municipal leadership must act in an ethical and professional manner, which will eliminate human misconduct. This can enable such leadership to enforce ethics and professionalism on their subordinates. Smart governance is dependent upon a compliance to rules and procedures, which is impossible in a scenario where things are done haphazardly and offenders flout municipal rules and regulations with impunity. Although the City of Ekurhuleni has put measures in place to ensure professionalism with the city, people need to be always
reminded of what it means to be professional and to practise ethical behaviour. People need to be trained on how to become a good leader, because good leadership is key to achieving the smart city with smart governance goals within the municipality. Model leadership of the municipality has an effect of making sure that initiatives that bring tremendous community developments like ICT, are taken seriously and there are no challenges to the political willingness of such leadership. In addition, the leadership should stand firm in the middle of rising misconduct, even if it means having to take decisive actions such as firing those who derail municipal community development projects.

6.3.5 Meritorious and competency-based appointments

Smart governance is dependent on having productive people in the right positions. That would mean carefully reviewing political deployments into municipalities. The City of Ekurhuleni Municipality needs to ensure that merit goes ahead of political affiliation when filling crucial posts. The issue of cadre appointment is the result of poor leadership and inconsistency in effective service delivery. Merit-based appointments can further ensure that key positions which are vital for the realisation of smart governance, are occupied by competent staff who can establish and drive good governance within a smart city. For a city to be considered as smart, the municipality must demonstrate good governance. The Batho Pele principles of good governance would play a major role in ensuring smart governance within the city. For instance, accountability and transparency would eliminate or minimise the level of corruption within the City of Ekurhuleni, like nepotism, where people are hired because they know each other or are related.

6.3.6 Intensified investment in ICT infrastructure

One of the findings of this study was that the City of Ekurhuleni has not implemented ICT programmes on a large scale. This is something that affects especially those residents who are staying in outlying areas of the municipality, due to shortages of ICT infrastructure such as fibre optic cables, libraries and readily accessible technicians for technical support. In this regard, the study suggests that the municipality invests more in unveiling, maintaining and monitoring its ICT infrastructure. Furthermore, the
municipality has to look at ICT from a macro perspective to ensure that it is treated as a major need for local communities and not be regarded as a luxury. This all begins with how the municipality allocates a higher ranked priority to investment in ICT infrastructure based on the unique and general needs of the communities that it serves. The study observes that a massive ICT infrastructure drive in the City of Ekurhuleni Municipality will bring economies of scale in the delivery of all other municipal services through smart solutions like increased CCTV for community safety.

6.3.7 Moulding municipal service delivery on smart governance

A full utilisation of smart governance initiatives is required if the City of Ekurhuleni Municipality has to improve its governance. The study established issues related to under-utilised ICT gadgets and systems in the municipality. Some ICT tools were being left idle without fully being utilised. As a recommendation, the study suggests the building of service delivery programmes around ICT. That is, it should look at how smart solutions can improve both the effectiveness and efficiency of delivery a service. In the era of the 4th industrial revolution, cities should turn to technology and smart solutions. The City of Ekurhuleni can learn from such successful smart city initiatives like those in the City of Singapore, where all service delivery components of a municipality are informed by how technology can make the process better. Therefore, smart governance becomes the reference point for municipal service delivery and all existing systems and programmes are aligned to such a new system of municipal governance and service delivery.

6.3.8 Staff training, retention and development

Smart cities are also dependent on keeping their well-trained employees on a regular basis and avoid losing them to the private sector. Trends in the public sector have shown that the public sector suffers from a persistent brain-drain where valuable human capital is lost to private sector organisations. This can be done through giving employees good incentives or paying employees according to the market value of their qualifications. The City of Ekurhuleni Metropolitan Municipality needs to ensure proper training programmes and rewards for employees. The researcher observes that the public sector usually provides training to their employees and fails to maintain them
and in that way, they lose well-trained staff to the private sector. The city cannot achieve its goal of becoming smart if it fails to keep employees who are willing to give their best for the organisation, happy. This can be done through demonstrating good leadership and management skills and making sure that the environment allows the employees to be creative and innovative. The study argues that employee motivation and retention is critical since many resources are being invested in training public servants. Therefore, there is a need to demystify the ‘private sector attractiveness myth’ by way of utilising attractive human resources practices anchored on training, development and retention.

6.3.9 City to city partnerships

Internal and international relations between and among cities have become one vital strategy for improving smart governance and transforming into smart cities. The concept and practice of smart governance has evolved over the years, and there are some cities globally and locally which have mastered how to undertake smart governance. An example is the City of Johannesburg and the cities of Singapore and Tokyo, from where the City of Ekurhuleni Municipality can learn lessons and derive some best practices for smart governance. Workshops or knowledge exchange programmes can be organised so that the officials from the cities can share their experiences to ensure that the emerging smart cities are on the right track. In addition, the City of Ekurhuleni has the legal right to forge developmental partnerships with cities outside the borders of South Africa towards its smart city expedition. However, the sharing of experiences and best practices with neighbouring municipalities like that of the City of Johannesburg is a good starting point, which can help diagnose challenges and map out a good path to smart governance.

6.3.10 State-led smart governance initiative and programmes

Municipal officials would benefit greatly from state-led smart governance initiatives and programmes, especially the ICT unit of the Ekurhuleni Metropolitan Municipality. Having associations that are managed by government or the state, where all the officials from the three different spheres of government would help the ICT staff members in terms of decision-making, analysing policies and coming up with solutions
in that way the cities within the country would easily achieve the core goal of becoming smart, would be an invaluable investment. The exchange of ideas and tools amongst the officials would speed up the process of growth in the field of ICT. Additionally, the national government has to ensure that it structures and implements a smart governance programmes across all the nine provinces. Such a programme would require all municipalities, national and provincial government entities to digitalise and transform into smart cities and governments. In this programme of action toward nation-wide smart governance, the state should ensure that there is ample investment and technical support for all those involved to avoid current haphazard and individualistic ICT policy implementation.

It is significant for all municipalities (in the general context) and the City of Ekurhuleni (the specific context), to conduct continuous monitoring of ICT initiatives to identify weaknesses and find solutions for improvement.

6.4 Limitations of the Study

The study was conducted and concluded in a dissertation format. The sampling therefore incorporated only the IT personnel of the City of Ekurhuleni Metropolitan Municipality. The researcher also wanted to conduct interviews with the strategic heads in the City of Ekurhuleni to obtain their strategic understanding regarding the policy aspects of ICT, smart cities and smart governance. However, the strategic personnel were most of the time busy with institutional and strategic planning. After visiting the CoE three times in one month, the researcher could not get appointments with all the heads. The information regarding the policy aspects of ICT, smart cities and smart governance, is therefore obtained through secondary sources by consulting the official documents of the CoE. Then too, in order to obtain the opinions of residents on the impact of ICT for smart governance, only 123 community members were consulted as the sample frame. This sampling frame, however, cannot generalise the viewpoints of community members at large, or residents of municipal areas in, for example, urban and rural areas alike. Future research needs to set a far wider sampling frame to increase scope, enhance objectivity and remove bias.
6.5 Scope for Future Research

The study could possibly be extended to embrace a detailed investigation in which the following area could be explored:

- The significance of city to city partnerships in improving smart governance in South African municipalities.

This nature of advanced research would result in a better impact assessment of the use of ICT for improved smart governance at municipal level.

6.6 Summary

This chapter explored the main findings of the study, and offered significant recommendations for the City of Ekurhuleni Metropolitan Municipality, that can be considered by other South African municipalities that are aiming to become smart cities. Not only will these findings and recommendation with improved smart governance by the effective implementation of ICT initiatives, but also, ultimately, with improved public service delivery.
REFERENCES


City of Ekurhuleni. 2018. Integrated Development Plan (IDP). Germiston: CoE.


Dash, N.K. 2005. Module: Selection of the Research Paradigm and Methodology. Available at:


**Web sources:**


https://hal.archives-ouvertes.fr/hal-00495968/document.


https://socialresearchmethods.net/.


APPENDIXES

Letter of Ethics: UJ

Letter of Ethics: CoE

Letter of Informed Consent

Interview and Survey Questionnaire
<table>
<thead>
<tr>
<th>RESEARCH COMPLIES WITH:</th>
<th>COMPLIANCE</th>
<th>NON-COMPLIANCE (tagged issues that need closer scrutiny)</th>
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</thead>
<tbody>
<tr>
<td>Participants' right to privacy, confidentiality and anonymity</td>
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</tr>
<tr>
<td>Participants' right to equality, justice, human dignity, life and protection against harm</td>
<td>01</td>
<td></td>
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<tr>
<td>Participants' right to freedom of choice, expression and access to information</td>
<td>01</td>
<td></td>
</tr>
<tr>
<td>Participants' right to be informed, consent/letters of request</td>
<td>01</td>
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<tr>
<td>Rights of the community and the scientific community</td>
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<td></td>
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<tr>
<td>The responsibility of presenting data that is accessible, truthful and not tampered with</td>
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<td></td>
</tr>
<tr>
<td>The responsibility of acknowledging ownership of ideas, theories, contributions or concepts</td>
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**OVERALL RATING**

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**CODE 91** - Approved
**CODE 92** - Suggested with re-submission
**CODE 93** - Approved with suggestions without re-submission
**CODE 94** - Not approved, re-application required

**FACULTY ETHICS CODE:** 2018
**STUDENT NAME:**
**SUPERVISOR NAME:** Prof S Vyas-Dooresiparad
**SIGNATURE:**
**CO-SUPERVISOR NAME:**
**SIGNATURE:**
**PF* CHAIR SIGNATURE:**
**DATE:** 2018/06/14
**HOD SIGNATURE:**
**DATE:** 2018/06/14
**FHDC CHAIR:**
**DATE:**
**FORM** - To be signed and submitted to FHDC with title registration
OFFICE OF THE HEAD OF DEPARTMENT
HUMAN RESOURCES

To: Ms Naledi Modibedi
HoD: Human Resources
Mr. Tumelo Kganane
Chief Information Officer

From: Ms. Omphile Sebitloane
Divisional Head: Workforce Capability Management

Enquiries: Ms. Omphile Sebitloane
Divisional Head: Workforce Capability Management

Date: 25 May 2018

Subject: ACCEPTANCE FOR PERMISSION TO CONDUCT RESEARCH IN THE CITY OF EKURHULENI BY MR MNCEDISI NCAMPHALALA

Reference is made to the appended request from Mr. Mncedisi Ncamphalala, to conduct research at the Information Communication Technology Department (ICT) of the City of Ekurhuleni.

The research topic is entitled “The role of Information and Communication Technology to institute smart governance in municipal governance” which is part of Mr. M Ncamphalala’s Masters within the School of Public Management, Governance and Public Policy at the University of Johannesburg.

The Human Resource Department supports the request by Mr. Mncedisi Ncamphalala to conduct the requested research in the City of Ekurhuleni, on the basis that the research will provide insights that can contribute to the efficient and effective implementation of management of ICT smart governance in the City of Ekurhuleni.

The research to conduct research is accepted, subject to the following conditions:

- That the research will not be prejudicial to the reputation of the organization;
- That the research be guided by the fundamentals of ethical consideration and ensure that participants will not be harmed, neither will they suffer adverse consequences from research activities;
- That extra care be taken to ensure that participants confidentiality will not be broken; no one will be deceived and that results or findings will not be misrepresented;
- That there will not be any irregularities in the course of conducting the research.
- That the research is an independent academic research;
- That the research is sponsored by an institution that is accredited in South Africa;
- That the HOD: Human Resources/ the delegated official provides continued general oversight;
- That an Indemnity Form be completed and signed by the applicant covering the entire period of the research within the City of Ekurhuleni;
- That the intention of the research must be to produce new knowledge with regards to effective management of role of ICT to institute smart governance in the City of Ekurhuleni.
The following information is attached hereto for ease of reference:

Annexure A: Request to conduct research in the City of Ekurhuleni
Annexure B: Request for Permission Letter
Annexure C: Certificate of Registration with University
Annexure D: Curriculum Vitae
Annexure E: Participants Consent Form
Annexure F: Research Scope/Methodology & Questionnaire
Annexure G: Signed Indemnity Form

In light of the above it is recommended as follows:

1) That the HOD Human Resources APPROVES the request by Mr. Mncedisi Ndamphalala to conduct research in the City of Ekurhuleni.

2) That the Information Communication Technology Department GRANT Mr. Mncedisi Ndamphalala access to the information he requires respecting the scope of his research.

Omphile Sekitoane
Divisional Head: Workforce Capability Management
Recommended / Not Recommended

Mr. Thulani Kanyane
HoD: Chief Information Officer
Supported / Not Supported

Ms. Ndidi Modiba
HoD: Human Resources
Approved / Not Approved
LETTER OF INFORMED CONSENT- INTERVIEW AND SURVEY QUESTIONNAIRE

Research: MA dissertation
Name: Mr Mncedisi Ncamphalala
Student number: 201406651
Telephone number: 078 592 7319
Supervisor: Prof S Vyas-Doorgapersad
Title of the research: The role of ICT to promote smart governance in municipal governments

Dear Respondent
I am a postgraduate (MA) candidate in Public Management and Governance at the University of Johannesburg. It would be appreciated if permission would be granted in order to conduct research on the matter through signing the consent form. The nature of research is academic (education and research). The data you provide would be reported anonymously. There will be no reference to individual responses. Aggregated perceptions will be reported in the research dissertation.

PARTICIPANT INVOLVEMENT:
CONSENT: I hereby confirm the following:
*I agree to participate in this research project.
*I have read this consent form and the information it contains had the opportunity to ask questions about them.
*I agree to my responses being used for education and research on condition my privacy is respected, subject to the following:
  - I understand that my personal details may not be included in the research/will be used in aggregate form only, so that I will not be personally identifiable
*I understand that I am under no obligation to take part in this project.
*I understand I have the right to withdraw from this project at any stage.

Name of the participant:
Signature:
Date:
SURVEY (QUESTIONNAIRE): COMMUNITY MEMBERS

Please provide the following information for demographic purpose:

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<thead>
<tr>
<th>Gender</th>
<th>Race</th>
<th>Age</th>
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Click on the appropriate box:

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<tr>
<th>Questions</th>
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<tbody>
<tr>
<td>Are you aware of information and communication technology-based services within the municipality?</td>
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<td>Are there training programmes to understand the utilization of information and communication technology-based services within the municipality?</td>
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<tr>
<td>Is the municipality ready to become a smart city?</td>
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<tr>
<td>Is the municipality ready to institute smart governance?</td>
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<tr>
<td>What are the service delivery challenges experienced in the municipality that demand the transformation into smart city for smart governance?</td>
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<tr>
<td>Are challenges related to the information and communication technology-based services corrected in a timely manner by the municipality?</td>
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</table>

Answer the following questions:

<table>
<thead>
<tr>
<th>Questions</th>
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<tbody>
<tr>
<td>What is the nature of service delivery complaints you log into the website regarding information and communication technology-based services in the municipality?</td>
</tr>
<tr>
<td>What do you expect from a smart city initiative within the municipality?</td>
</tr>
<tr>
<td>What level of improvements do your expect from the municipality through the institution of smart governance?</td>
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<tr>
<td>What do you expected from the municipality to implement the information and communication technology-based services successfully for improved service delivery?</td>
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THANK YOU!!!
INTERVIEW: IT UNIT

Please provide the following information for demographic purpose:

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<td>Gender</td>
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<td>Designation</td>
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<td>Department/Unit</td>
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<td>Years of working experience at local government level</td>
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<td>Years of working experience in the Ekurhuleni Metropolitan Municipality</td>
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Answer the following questions:

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>What are the ICT initiatives assisting the Ekurhuleni Metropolitan Municipality to transform into a smart city?</td>
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<tr>
<td>What are the improvements witnessed in the Ekurhuleni Metropolitan Municipality since implementing ICT initiatives?</td>
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<tr>
<td>What are the challenges regarding implementation of ICT initiatives for improved service delivery within the Ekurhuleni Metropolitan Municipality?</td>
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</tr>
<tr>
<td>What are the challenges restricting the Ekurhuleni Metropolitan Municipality in its transformation into a smart city?</td>
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<tr>
<td>What measures are implemented in the Ekurhuleni Metropolitan Municipality to promote smart governance?</td>
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<tr>
<td>What is the role of ICT in the Ekurhuleni Metropolitan Municipality to promote smart governance?</td>
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</tr>
<tr>
<td>What recommendations can be offered to the Ekurhuleni Metropolitan Municipality to promote smart governance?</td>
<td></td>
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THANK YOU!!!