Exploring the Concept of Smart City Within Local Government Context

Thobile Mhlongo
Milpark Business School
ORCID iD: 0009-0008-6862-4000
t.mhlongo15@my.milpark.ac.za

Abstract

Municipalities in South Africa are increasingly adopting "smart city" initiatives to enhance service delivery, improve quality of life, and stimulate economic growth. While the smart city concept is gaining momentum in South Africa, there is a gap in the literature regarding the relationship between the smart city theory and practice. Despite growing interest, a notable gap persists in the literature regarding the alignment between smart city theory and its practical implementation within local governance. The aim of this paper is to explore the concept of a smart city within the local government context, focusing on the City of Johannesburg (CoJ), Gauteng. The study adopted a qualitative research design, using semi-structured interviews as primary data, and reviewed relevant reports and literature as secondary data. Fourteen municipal leaders were purposively selected and interviewed from the City of Johannesburg (CoJ). Thematic analysis was used to analyse the data. The result of this study reveals that, while smart city initiatives hold significant potential for improving governance and service delivery, their implementation in Johannesburg is constrained by structural challenges, resource limitations, and leadership capacity gaps. The findings indicate that the CoJ remains far from achieving the characteristics associated with a fully developed smart city. To address these barriers, the study recommends targeted leadership development programmes, inclusive governance practices, strategic investment in infrastructure, and digital literacy initiatives to ensure equitable access and citizen engagement. This research contributes practical insights and policy guidance for context-sensitive strategies that promote sustainable and inclusive smart city transformation.

Keywords: Smart cities; Local government; South Africa; Service delivery; Digital transformation

1. Introduction

South Africa's local government sphere, constitutionally mandated to provide basic services, promote social and economic development, and foster participatory democracy (Constitution of South Africa, 1996), is increasingly under strain. Despite the legal and policy frameworks designed to enhance service delivery and accountability, municipalities across the country are grappling with widespread dysfunction. Persistent challenges include maladministration, irregular and inefficient spending, corruption, and declining citizen trust, making improved service delivery a national priority. These systemic failures have led to escalating service delivery protests and social unrest, underscoring the urgent need for reform (Breakfast, Bradshaw & Nomarwayi, 2019; Ranchod, 2020; Madumo, 2015; Mbandlwa, Dorasamy & Fagbadebo, 2020).

As a result, many municipalities have failed to meet the expectations of their residents, leading to escalating service delivery protests and social unrest (Kgobe, 2020; Van Donk & Williams, 2015).

Recent studies highlight that municipalities are under growing pressure to adopt digital technologies and smart city frameworks to enhance governance and operational efficiency (Sutcliffe & Bannister, 2020; Netshirando, Munyoka & Matimba, 2024). However, structural limitations, resource constraints, and inadequate technical capacity remain significant barriers (Mhlongo & Thomas, 2024; Bob & Kebede, 2025). Policy reviews such as the *White Paper on Local Government Review* (Hlabisa, 2025) and the *Integrated Service Delivery Improvement Policy* (DPSA, 2024) emphasise professionalisation, accountability, and digital transformation as critical enablers of sustainable service delivery. Furthermore, research on digital governance underscores the importance of citizen-centric approaches, robust infrastructure, and ethical leadership to bridge the digital divide and restore public trust (Mangai & Ayodele, 2025; OECD, 2023; UN DESA, 2022).

1.1 Effectiveness of Local government

Numerous research papers have analysed the effectiveness of local government (Mugambiwa & Tirivangasi, 2017). These studies highlighted that the sector has various issues, including maladministration, corruption, and unethical practices, which have resulted in the misuse of public funds and have impeded service delivery (Franks, 2014; Potrafke, 2017). Maladministration has a considerable influence on government operations and service delivery (Ranchod, 2020). According to Madumo (2015:162), local government issues include "the inability of municipalities to financially sustain themselves, the lack of capacity to deliver constant and regular services, and the failure of officials to comply with regulations". Such issues at the local government level often result in communities conducting violent service delivery demonstrations (Breakfast, Bradshaw & Nomarwayi, 2019; Kgobe, 2020).

Although the government has created and tested several quality-improvement programmes over the years, they have not managed to produce the expected outcomes in the context of service performance (Ekuma, 2017). Ineffective quality service in the local administration sector is attributable to a shortage of staff with the requisite skills and levels of competence. Political involvement is cited as one of the additional challenges in local government, while Mhelembe and Mafini (2019) highlight gaps between supply chain risk management and local government performance, as well as factors that negatively impact local government supply chain inefficiency. These include regulations, supply chain complexity, process efficiency, supplier performance monitoring, skills availability, and information security. There is evidence that South African municipal governments have been unable to offer efficient services to their people, resulting in poor service delivery and demonstrations (Maramura et al., 2020). According to Fourie and Poggenpoel (2017), owing to leadership issues, local government is not addressing the fundamental reasons for its failure to enhance service delivery.

1.2 Digital transformation

To address these challenges, municipalities are increasingly adopting digital technologies and smart city frameworks to improve decision-making and to design resource-efficient urban environments. E-governance, particularly citizen-centric models, is recognised as a mechanism to enhance transparency, accountability, and service quality (Omweri, 2024; Liu, Zhang & Wang, 2025). By implementing e-governance, municipalities can improve communication with citizens, provide online access to administrative functions, and reduce operational costs (OECD, 2023; UN DESA, 2022). However, recent studies reveal that structural limitations, resource constraints, and governance gaps remain significant barriers to successful smart city implementation (Mhlongo & Thomas, 2024; Bob & Kebede, 2025; Mangai

& Ayodele, 2025). Policy reviews such as the *Integrated Service Delivery Improvement Policy* (DPSA, 2024) and the *White Paper on Local Government Review* (Hlabisa, 2025) emphasise digital transformation, professionalisation, and ethical leadership as critical enablers for sustainable service delivery.

As the 21st century embraces a digital future, the contemporary concept of a smart city in both policy and practice has stimulated academic discussion regarding its scope and applicability. This paper examines how the smart city concept is understood and applied within the South African local government context (Sutcliffe & Bannister, 2020; Ranchod, 2020; Bob & Kebede, 2025). It explores the opportunities presented by digital transformation to enhance service delivery and governance while identifying the challenges municipalities face in adopting smart city frameworks (Mhlongo & Thomas, 2024; Mangai & Ayodele, 2025). The study highlights how local governments in Gauteng are navigating digital infrastructure, technology adoption, and governance to achieve smart city goals, aligning with global best practices outlined in the OECD *Digital Government Review* (2023) and UN DESA *E-Government Survey* (2022).

However, key barriers such as limited resources, technical capacity, and inadequate infrastructure impede successful implementation (Omweri, 2024; Liu, Zhang & Wang, 2025). The findings aim to provide a deeper understanding of practical obstacles and potential strategies for municipalities to leverage digital transformation in improving urban management and residents' quality of life.

2. Literature Review

2.1 Local Government and Service Delivery

The local government of South Africa is based on a developmental state and acts as the focal point of service delivery (Schoburgh, 2016). The Constitution of South Africa, instituted in 1996, provides scope for a democratic local government tasked with delivering essential services and fostering an environment conducive to economic growth. Local municipalities serve as development agents, linking national developmental goals with local priorities (Mashaimate & Lethoko, 2018). According to the *White Paper on Local Government* (SA, 1998) and Van der Waldt et al. (2014), a developmental local function is to safeguard citizens' and communities' quality of life, while also advancing economic and social development. Municipalities therefore have a duty to foster social capital and resilience within communities (Kampen, 2010).

Section 152 of the Constitution and the White Paper mandate municipalities to advance economic and social development (Madumo, 2015; SALGA, 2015). Historically, local government has been responsible for rebuilding a democratic, non-racial, and prosperous society after apartheid (Siddle & Koelble, 2016). In practice, this involves delivering essential services such as housing, infrastructure, energy, water, and sanitation (Fuo, 2017; Ndebele & Lavhelani, 2017), while promoting citizen engagement and decentralising decision-making (Picard & Mogale, 2015; Madzivhandila & Asha, 2012).

The *White Paper on Local Government* of 1998 and section 152 of the Constitution define the developmental responsibilities of municipalities, and require local government, specifically local municipalities, to advance economic and social development (Madumo, 2015; SALGA, 2015). Local government is responsible for rebuilding a democratic, non-racial and prosperous society to address the previously non-democratic, racist regime (Mashaimate & Lethoko, 2018; Siddle & Koelble, 2016). Thus, local government has a developmental obligation to create communities that are social, economically integrated and resilient (Mashaimate & Lethoko, 2018; SALGA, 2015).

In the context of South Africa, service delivery refers to how local government provides essential resources to communities, such as land and housing, infrastructure, energy, water, and sanitation (Fuo, 2017; Ndebele

& Lavhelani, 2017;). The local government in South Africa is tasked with developing a democratic, non-racist, affluent, and integrated society (Siddle & Koelble, 2016). Local government serves communities and responds to the needs of those communities (Koma, 2011). Nkuna and Nematanzhela (2012), and Thornhill (2008:492) believe that local government is crucial to service delivery because it serves as a conduit between the government and its constituents. Additionally, local government fosters engagement and involvement by local citizens, and decentralises administrative authority, planning, and decision-making (Picard & Mogale, 2015). According to Madzivhandila and Asha (2012), the decentralisation of service delivery encourages community involvement and participation.

However, recent research highlights that these developmental objectives are increasingly challenged by governance failures, resource constraints, and systemic inefficiencies (Mbandlwa, Dorasamy & Fagbadebo, 2020; Kgobe, 2020). Post-2021 studies emphasise the need for municipalities to embrace digital transformation and smart city frameworks to overcome these barriers and enhance service delivery (Sutcliffe & Bannister, 2020; Ranchod, 2020; Bob & Kebede, 2025). Policy reviews, such as the *Integrated Service Delivery Improvement Policy* (DPSA, 2024) and the *White Paper on Local Government Review* (Hlabisa, 2025), advocate for professionalisation, ethical leadership, and technology adoption as critical enablers of sustainable governance. Furthermore, global benchmarks, such as the OECD *Digital Government Review* (2023) and UN DESA *E-Government Survey* (2022), underscore the importance of citizen-centric approaches and robust digital infrastructure for achieving developmental goals in local governance (Omweri, 2024; Mangai & Ayodele, 2025).

2.2 Capacity and Skills Shortages

Local municipalities are plagued by skills shortages and a lack of capacity. They are understaffed and have inadequate skills in fields such as financial management and project management, which causes a backlog in service delivery (Managa, 2012).This has made it difficult for municipalities to deliver the required services and finish development agendas, depriving disadvantaged populations across the nation of the chance to access sufficient fundamental services that were promised to them under the 1996 Constitution. A critical skills shortage has left many positions unfilled and with limited organisational capacity (Mwakideu, 2014). Owing to a lack of financial resources, local government cannot recruit and retain the required staff. The municipalities lack the ability to create, satisfy, and execute on fundamental service delivery needs (Kroukamp, 2016:43). High vacancy rates persist due to ineffective recruitment practices, weak human resource management systems, and inadequate performance management frameworks, further impacting municipal efficiency (Chakunda & Chakaipa, 2015).

Recent studies underscore that these challenges remain acute, and have worsened in the context of digital transformation and governance reforms. Post-2021 research highlights that municipalities lack the technical capacity to implement smart city initiatives and digital governance strategies, which are increasingly critical for improving service delivery (Mhlongo & Thomas, 2024; Bob & Kebede, 2025). Skills gaps in information and communications technology (ICT), data analytics, and infrastructure planning have emerged as major barriers to modernisation (Mangai & Ayodele, 2025; Omweri, 2024). Policy reviews such as the *Integrated Service Delivery Improvement Policy* (DPSA, 2024) and the *White Paper on Local Government Review* (Hlabisa, 2025) emphasise professionalisation, capacity-building, and technology adoption as key priorities for addressing these systemic weaknesses. Global benchmarks, including the OECD *Digital Government Review* (2023) and UN DESA *E-Government Survey* (2022), further advocate

for investment in human capital and digital skills to enable municipalities to meet developmental and service delivery objectives.

2.3 Lack of Accountability and Financial Management

The majority of the nation's municipalities experience financial difficulties, and the Auditor-General seldom issues a report that contains no findings (SA Auditor-General, 2016). Financial mismanagement, which is linked to bad management, understaffing, a lack of managerial and financial skills, poor planning, under- and overspending, corruption and fraud, as well as irregular and inefficient expenditure, is a significant issue that most municipalities face (Managa, 2012). The Auditor-General's annual report, which is a major indicator of the status of municipalities, provides the most accurate picture of the financial situation of the country's municipalities (Mantzaris, 2014). As a result, certain municipalities have been brought under the control of the province. A total of R2.07 billion was unnecessarily spent by municipalities in the 2018–2019 fiscal year (Glasser & Wright, 2020).Global frameworks, such as the OECD *Digital Government Review* (2023) and UN DESA *E-Government Survey* (2022), advocate for digital financial management systems and citizen-centric accountability mechanisms to curb corruption and improve fiscal sustainability.

2.4 Financial Constraints

South African municipalities have endured financial constraints and distress, with some on the verge of collapse (Glasser & Wright, 2020), while McKenzie and Marx (2023) emphasise the role of audit outcomes in resolving such crises. Lack of qualified and competent employees, non-compliance with local government finance laws, unethical behaviour, and non-payment of taxes and municipal rates by citizens have all contributed to these financial issues. Many towns would find it difficult, should the need arise, to make financial arrangements with banking institutions, due to their severely deteriorating financial health.

Recent studies confirm that these financial governance failures persist and have intensified in the context of growing service delivery demands and digital transformation pressures. Post-2021 research highlights that municipalities lack robust financial management systems and digital tools to ensure transparency and accountability (Bob & Kebede, 2025; Enaifoghe, 2025). Policy frameworks such as the *Integrated Service Delivery Improvement Policy* (DPSA, 2024) and the *White Paper on Local Government Review* (Hlabisa, 2025) emphasise strengthening financial governance, professionalising municipal finance roles, and leveraging technology for real-time monitoring and reporting.

2.5 Corruption

Financial mismanagement on the part of most municipalities is attributed to a lack of sufficient labour, poor planning, improper management, and inadequate management skills, all of which exacerbate under- and overspending and also unauthorised, irregular and wasteful spending, raising questions about fund embezzlement (Managa, 2012). In an attempt to solve these issues, certain towns have been brought under provincial authority. It has been suggested that towns may spend billions of rands to assure compliance with the GAAP (Generally Accepted Accounting Principles) reporting framework, but that this may relegate how services are delivered to a secondary role (Swanevelder, 2005). Recent studies confirm that these

governance failures persist, and have intensified amid growing service delivery demands and digital transformation pressures.

2.6 Service Delivery Protests

South Africa has seen multiple service delivery demonstrations as a result of the inability of municipalities to meet the fundamental requirements of communities, owing to service delivery backlogs, and governance and resource mismanagement concerns (Madzivhandila & Asha, 2012; Siddle & Koelble, 2016. Managa (2012) argues that institutional capability, improper use of funds, significant degrees of corruption, and a dearth of public awareness involvement are the main difficulties impeding local municipalities' ability to offer services.

According to Van Donk and Williams (2015), service delivery demonstrations are caused by unrealistic promises made by politicians and uncontrolled expectations, failure to deliver, and the incapacity of public officials to be responsible. These issues persist and have intensified in the context of growing urbanisation and digital transformation pressures. Post-2021 research highlights that municipalities must adopt smart city frameworks and e-governance models to improve service delivery and citizen engagement (Bob & Kebede, 2025; Mhlongo & Thomas, 2024). However, structural limitations, resource constraints, and inadequate technical capacity remain significant barriers (Mangai & Ayodele, 2025; Omweri, 2024). Policy interventions, such as the *Integrated Service Delivery Improvement Policy* (DPSA, 2024) and the *White Paper on Local Government Review* (Hlabisa, 2025), emphasise professionalisation, ethical leadership, and digital innovation as critical enablers for sustainable governance.

2.7 Digital Transformation in the Local Government Sector

Service delivery practices in the economy are constantly evolving, leading to the digital transformation of the local government sector (Ogada, Mutsotso & Okoth 2016). Implementing digital transformation initiatives increases service delivery by promoting public service procedures and productivity, improving employee and customer experiences, and assisting in the management of business risks. Digital transformation initiatives at the local government level are focused on data collection and the analysis of business processes to improve service delivery, as digital transformation plans are tailored to the requirements of each local government sector organisation (Sibanda et al., 2020; Wessel et al., 2021). This has caused the sector to shift from employing reactive service delivery methodologies to proactive ones, such as electronic governance (e-governance) and democracy (e-democracy).

Electronic governance ('e-governance') has given way to digital governance, whereby digital technologies have become an intrinsic element of the government's innovation and modernisation plans, the production of public value via expanded stakeholder participation, and the reaction to user demand. The administration of government operations can be facilitated by the use of e-governance, which simplifies administrative procedures, lowers the cost of accessing such services, enhances accountability and responsiveness, and shortens response times. Individuals can access information and services provided by their government by means of the internet. This practice is referred to as 'e-government' (Allio, 2015), and encompasses all applications of ICT in the local government sector, while e-governance involves the use of ICT to offer government services (Rawat, 2020).

While e-governance strives to embed ICT into all government activities to improve service delivery, the government currently uses ICT to enhance its services and activities (McKinsey & Company, 2015). 'E-

democracy', on the other hand, employs electronic communication methods and technologies to improve decision-making processes via public and citizen engagement. 'E-commerce' is the transfer of funds for the purchase of goods, activities, and utilities over the internet, such as car registrations, utility bill payments, taxes, leisure programmes and government-purchased office supplies (Kamaruddin & Noor, 2013). All these technological innovations have resulted in the establishment of an e-government (Potrafke, 2017).

According to the Organisation for Economic Co-operation and Development (OECD, 2020) and Stobierski (2019), successful digital transformation in the local government sector requires a data-driven culture that encourages creativity, cooperation, and risk-taking when adopting digital technologies. Such data-driven organisations advocate the incorporation of artificial intelligence (AI) and data analytics into company strategies and processes to gain a competitive edge (Misa et al., 2020). This implies that establishing a data-driven culture for e-governance is essential and must begin at the "top". To adapt to 4IR, it is necessary for top management to make data-driven strategic decisions, and thereby encourage data-driven employee performance and outputs. Such leaders embrace the "think and act data" approach, characterised by data-driven decision-making (United Nations Industrial Development Organisation [UNIDO], 2020:1).

Recent studies emphasise that successful digital transformation requires a data-driven culture that fosters innovation, collaboration, and risk-taking (Stobierski, 2019; OECD, 2020). Post-2020 research highlights the integration of artificial intelligence (AI), data analytics, and cloud technologies into municipal strategies to improve governance and service delivery (Misa et al., 2020; Bob & Kebede, 2025; Mangai & Ayodele, 2025). Global frameworks, such as the UNIDO *Industrial Development Report* (2020), UN DESA *E-Government Survey* (2022), and OECD *Digital Government Review* (2023), advocate for leadership-driven digital strategies and capacity-building to enable municipalities to adapt to the Fourth Industrial Revolution (4IR). South African policy reviews, including the *Integrated Service Delivery Improvement Policy* (DPSA, 2024) and the *White Paper on Local Government Review* (Hlabisa, 2025), stress the importance of professionalisation, ethical leadership, and technology adoption for sustainable governance.

2.8 Municipalities' Transformation To Smart Cities

A smart city has emerged as a new paradigm for urban development and planning, and for sustainable socioeconomic growth (Kozłowski & Suwar, 2021; Neirotti et al., 2014). It is widely acknowledged that smart cities are characterised by a higher usage of ICT (Arbuckle, 2020). ICT aims to maximise the use of limited resources in various urban environments. Despite its rising popularity, the smart city has yet to be properly defined and has no uniform definition (Joss et al., 2019). Peris-Ortiz, Bennett and Yabar (2016) describe a smart city as one that uses ICT and urban services (such as energy, transportation and utilities), which could be enhanced to be more efficient, and which will cut down on resource use, waste, and total expenses. A smart city uses technology for communication and information to improve administrative efficiency, spread knowledge to the general public, and raise the standard of public services and the well-being of citizens (Onoja & Ajala, 2023).

'Smart cities' have both global and local characteristics (Dameri, Benevolo & Veglianti 2019). They are considered a worldwide phenomenon, since they proliferate globally and develop with comparable traits and interdependencies. Simultaneously, smart cities are also a local phenomenon, as each city is unique, has distinct difficulties, and should address these problems using specific solutions (Dameri et al., 2019). Converting existing cities into smart cities is a new trend (Yigitcanlar & Kamruzzaman, 2018). Several methods were attempted prior to the creation of the smart city initiative to augment certain city development

features, based on the opportunities and potential they provide. Pioneer cities, digital cities, linked cities, entrepreneurial cities, and liveable cities evolved as a result of this process (Praharaj and Han, 2019).

There is no agreement on a specific definition or criteria for a smart city (Sha & Son, 2015). The British Standards Institute (BSI, 2014) defines smart cities as "built environments that successfully integrate human, digital, and physical systems to give their inhabitants a sustainable, prosperous, and inclusive future". As a result, the idea of the smart city, which aims to improve people's quality of life, is having an effect on policymaking at many levels (Kitchin, 2014). Deloitte's (2016:4) view is that "the ultimate goal of a smart city is transformational". Thus, it is seen as a form of governance that "uses digital technologies to enhance performance and well-being, to reduce costs and resource consumption, and to engage more effectively and actively with its citizens" (SALGA, 2015:5).

Table 1: Smart city definitions. Source: Researcher's own compilation

Authors	Definition
Dameri (2013)	"… a region with clearly defined boundaries where innovative technologies, including ICT, logistics, energy generation, and others work together to serve the local population in terms of prosperity, inclusion and participation, environmental quality, and intelligent growth."
De Jong et al. (2015)	The term "smart cities" refers to urban areas that have implemented several measures to improve their attractiveness and competitiveness, as well as their environmental, social and economic living circumstances.
Monzón (2015)	"A cohesive framework whereby social and human assets interact via the use of technology to efficiently accomplish sustainable growth and a high quality of life, based on the collaboration of all stakeholders."
Mosannenzadeh & Vettoriato (2014)	"[…] a resilient and efficient city with a high quality of life that aims to successfully tackle urban challenges through the use of technology for communication and information in its facilities and amenities, collaboration among the major players (citizens, educational institutions, administration, the manufacturing sector), bringing together its essential categories (environment, flexibility, administration, community, industry and services), and investment in social capital."

The smart city has been described in terms of ICT, pervasive interaction and expertise, and innovation, big information and open data, social assets, entrepreneurial spirit, smart societies and ecological sustainability (Praharaj & Han, 2019). Although there is no precise definition that outlines the conditions a city must meet to be categorised as such, and the available sets of criteria are often ambiguous, more cities are being called "smart" or "intelligent" (Sikora-Fernandez & Stawasz, 2016). According to one widely accepted school of thought, a smart city is an instrumented, connected, and intelligent city that uses advanced and digital technology to increase efficiency in various aspects of urban activity (Datta, 2015; Praharaj & Han, 2019). Along with technology, other fundamental traits have been emphasised. These include competitiveness and productivity, the creative economy, urban place marketing, business-led urban development, and self-branding and image building to draw in businesses and the creative class (Subkhan et al., 2024; Sokolov, Ivanov & Dolgui, 2019). A different narrative about smart cities has emerged, stressing social innovation, informed citizenship, learning and knowledge capital, and inter-organisational collaboration (Rasoulzadeh Aghdam et al., 2024; Calzada, 2020). According to researchers such as Kitchin (2014), an intelligent city

is increasingly made up of pervasive and ubiquitous computing and is governed by it. Its economy and governance are also fuelled by the invention, creativity, and entrepreneurship of intelligent people.

It has been argued that ICT-related technologies have an impact on and are helpful in addressing a variety of societal and governance challenges, such as ensuring that people take part in decision-making, providing infrastructure and services, and managing the environment (Nastjuk, Trang & Papageorgiou, 2022; Gil-Garcia, Helbig & Ojo, 2014; Schwab, 2017). To construct smart cities, governance is crucial in terms of political engagement, citizen services, and administrative efficiency (Onoja & Ajala, 2023; De Guimares, Severo & Junior 2020; Sokolov et al., 2019). Critical concerns in South African city development have been highlighted as citizen involvement, community engagement, and inclusivity in the local governing system (Das & Emuze, 2014).

ICT infrastructure investment and company attraction are two components of a smart city strategy. The implementation of city-wide broadband projects is widespread because it is believed that a connected city is likely to be more competitive and alluring to inhabitants and companies (Onoja & Ajala, 2023). Since 2013, all the main cities have made efforts to commission and construct broadband infrastructure, including offering free Wi-Fi in key locations and public spaces (such as in parks and at bus stops). According to Karunakaran, Shanmuga Sundaram and Pradeep-Kumar (2018), the rapid digitisation of information technologies, advancements in computers, and particularly in internet connections, have created many opportunities for new roles for existing systems, as well as the creation of new systems, clusters, or groups. The South African smart city is not one that focuses on the use of technology or the aesthetic benefits that support global competitiveness (Tanda & Carolissen, 2025; ASSAf, 2020; Backhouse et al., 2020; Petzer et al., 2020). The South African smart city is one that is embedded in value-driven and locally embedded smart city principles (Backhouse et al., 2020). Municipalities need to drive smart city agendas through their local powers, functions, and legislation, while national government needs to guide cities by creating conditions for innovation, supporting implementation through laws and regulations, and inspiring cities to innovate.

The smart city is significant, as it is based on the concept of applying a high density of digital technologies to facilitate citizen participation, as well as better service delivery and governance (Calzada, 2020; Onoja & Ajala, 2023). For example, a programme called Digital Democracy includes aspects that concentrate on health, government, local economies, education, culture, and sports. This application, and similar ones, promote public involvement in the creation of smart cities. Other tools and apps built on open data enable more voter engagement and a better knowledge of council programmes, the political system, and the announcement of policies (Shi & Shi, 2023).

ICT is used by e-government to assist with governmental activities, involve citizens, and deliver services (Gil-Garcia, Helbig & Ojo, 2014; Nastjuk, Trang & Papageorgiou, 2022). There are several examples of this, including digital services, e-management (the use of IT to improve government management – from improving corporate procedures to enhancing the transmission of data within administrative offices), and a digital democracy (the use of messaging vehicles, such as email and the internet, to increase citizen participation), whereas, E-governance must be adopted and developed by local governments if they are to become more effective, efficient, and accountable. In several municipalities around South Africa, E-governance is being created and promoted in an effort to alleviate problems with service delivery, interact with citizens, and provide chances for economic growth by streamlining and simplifying application procedures (Backhouse et al., 2021. However, the lack of trustworthy data, particularly geographical data, poses a problem for the majority of towns (ASSAf, 2020).

Lastly, E-democracy, often known as digital democracy, is the use of IT to advance democracy (Calzada, 2020). All adult citizens are assumed to be equally entitled to take part in the process of proposing, developing, and putting into effect legislation under this system of government. In smart cities, this platform is used by municipal councils and council members to engage with citizens and strengthen participatory democracy. It is also utilised to effectively communicate information to the public regarding problems that impact them, along with remedies. The dissemination of knowledge through the internet has been facilitated by this platform. Moreover, it has aided in the advancement of both freedom and humanity. E-democracy has aided in the promotion of human rights that support democracy, such as freedom of speech and expression, government accountability, peaceful assembly, the right to information and understanding, and religious freedom. The internet has contributed to its growth. A strong support for free expression, expanded social contacts, and cutting-edge communication platforms have all been made possible by the development of the internet. E-democracy is expanding as a result of the development of smartphones and the applications that run on them (Nastjuk et al., 2022).

Post-2020 studies underscore the integration of Fourth Industrial Revolution (4IR) technologies – including the Internet of Things (IoT), artificial intelligence (AI), and big data analytics – into smart city planning to improve governance and service delivery (Bob & Kebede, 2025; Mhlongo & Thomas, 2024). Policy frameworks, such as the *Integrated Service Delivery Improvement Policy* (DPSA, 2024) and the *White Paper on Local Government Review* (Hlabisa, 2025), advocate for context-sensitive smart city models that prioritise inclusivity and sustainability. Global benchmarks, including the OECD *Digital Government Review* (2023) and UN DESA *E-Government Survey* (2022), emphasise citizen-centric approaches and robust digital infrastructure as critical enablers for smart city success in developing economies (Mangai & Ayodele, 2025; Omweri, 2024).

3. Problem Statement

Smart city initiatives are increasingly recognised as transformative strategies for improving urban governance and service delivery worldwide. While several South African municipalities have begun implementing smart city projects to enhance quality of life and stimulate economic growth, progress remains slow compared to global counterparts (Bob & Kebede, 2025; OECD, 2023; United Nations Economic & Social Commission for Asia and the Pacific [ESCAP], 2019). Challenges such as inadequate digital infrastructure, limited technical capacity, and restrictive policy frameworks hinder effective implementation (Mhlongo & Thomas, 2024; Mangai & Ayodele, 2025). Despite growing interest, there is a notable gap in the literature on how smart city theory translates into practice within South Africa's local government context (UN DESA, 2022). Addressing this gap is essential for developing context-sensitive strategies that enable municipalities to leverage digital transformation for sustainable urban development. Furthermore, the City of Johannesburg (CoJ), South Africa's largest metropolitan municipality and economic hub, has adopted a smart city vision to enhance service delivery, citizen satisfaction, and economic competitiveness (CoJ, 2019; Maseko, 2018). Despite these ambitions, progress towards smart city implementation remains constrained by structural, financial, and governance challenges (Mhlongo & Thomas, 2024; Bob & Kebede, 2025). While the CoJ has initiated projects such as broadband connectivity and digital platforms, there is limited empirical research on how these initiatives align with global smart city frameworks and address local developmental priorities (Mangai & Ayodele, 2025; OECD, 2023). This gap underscores the need for context-sensitive strategies to translate smart city theory into practice within South Africa's metropolitan governance landscape.

4. Study Context: City of Johannesburg (COJ)

The City of Johannesburg (CoJ), in the province of Gauteng, is a Category A metropolitan municipality: one of three metropolitans ('metros') in the province and one of eight municipalities. With roughly five million inhabitants, Johannesburg is the country's biggest metropolis and economic powerhouse, accounting for 8% of the national population (Shava & Vyas-Doorgapersad, 2021). Large, intensively urbanised areas that include numerous metropolises are governed by metropolitan (or Category A) municipalities. All local government activities within a metropolitan region are handled by a single authority, known as a metropolitan municipality. Municipalities make up the local government realm. The Municipal Council is in charge of both the legislative and executive branches of government in a municipality (Constitution of South Africa, 1996).

The Constitution of the Republic of South Africa (1996) grants municipalities the power to handle local government operations according to their own initiative, following national and provincial legislation. National and provincial governments cannot restrict a municipality's powers or obligations. Johannesburg is situated close to the metropolitan municipalities of Ekurhuleni and Pretoria in the Gauteng province. The vision of the CoJ is to be "a city of golden opportunities, a vibrant, safe, and resilient city where local government delivers a quality life for every resident" (City of Johannesburg [CoJ], 2019:3). In its mission, it "commits itself to pro-active service delivery and the creation of a city environment that is resilient, sustainable, and liveable, now and for future generations" (CoJ, 2019:3). The CoJ constitutes about 40% of the province's population and 10% of South Africa's overall population (Shava & Vyas-Doorgapersad, 2021). Moreover, Johannesburg creates 16.5% of the country's income, is home to almost 70% of the country's businesses, and employs 12% of the national workforce (CoJ, 2019). Businesses in Johannesburg contribute roughly 14% to the country's gross domestic product (GDP) and more than 44% to the province's economy annually.

The CoJ (2016) implements the smart city initiative to enhance public satisfaction and create a happy citizenry, accelerate industry development, a service-orientated government, and a long-term stable society to be part of this revolution. It also aspires to establish a Unified Management Model that connects government, business, citizens, and public products and services. Services such as general infrastructure and utilities, health, the environment, transportation, educational facilities, and resources are also part of the plan. Administrative services, civil applications and complaints, crisis management, and rescue and recovery services are all examples of public services (CoJ, 2016; Maseko, 2018). The CoJ projects itself as the smart city of tomorrow with smart municipal management, rendering smart livelihoods for the peoples, social utilities, low-cost green energy, smart care, and the protection of citizens, including a digital industry (CoJ, 2016; Maseko, 2018).

5. Research Methodology

The study adopts a qualitative research design that is well-suited for exploring complex social phenomena and generating rich, contextual insights (Flick, 2020). Positioned within the interpretivist paradigm, the research acknowledges that reality is socially constructed, and it emphasises understanding of participants' subjective experiences (Saunders, Lewis & Thornhill, 2023). The qualitative component reported here forms part of a broader exploratory sequential mixed-methods design, focusing specifically on local government leaders' perceptions of leadership in the context of the Fourth Industrial Revolution (4IR).

A phenomenological approach was employed to capture lived experiences and meanings associated with leadership challenges in local government (Berryman, 2019). Data collection involved semi-structured interviews with informed consent, which were audio-recorded, securely stored, and transcribed verbatim to ensure accuracy. Transcripts were cross-checked against recordings, and researcher field notes were integrated to enrich interpretation and maintain contextual depth.

Data analysis followed the reflexive thematic analysis framework outlined by Braun and Clarke (2006, updated 2023), incorporating both inductive and deductive coding to identify patterns and develop themes. All data collected were imported into ATLAS.ti (Version 8) for analysis. To enhance trustworthiness, credibility was supported through member checking and triangulation of transcripts with field notes, while dependability was ensured via an audit trail documenting analytical decisions (Nowell et al., 2017; Braun & Clarke, 2023). This rigorous approach aligns with contemporary standards for qualitative research, ensuring methodological adequacy and analytical accuracy in addressing the study's objectives.

5.1 Ethical Considerations

Prior to data collection, the Research Ethics Committee of the researcher's university approved the conducting of a larger study. Ethical clearance to conduct this study was obtained from the Milpark Business School Research Ethics Committee (No. DBA2021/08/003). Participants were informed about the study and advised of their right to withdraw without consequences at any time. Written informed consent was secured prior to data collection. Anonymity was maintained by removing identifying details during transcription, and securely storing all data in password-protected files. Findings were reported in a manner that safeguarded participant identity (Saunders et al., 2023; Braun & Clarke, 2023).

This section presents the key findings from the interviews conducted with local government leaders in Johannesburg. The findings are presented thematically, addressing the participants' perspectives on the concept of a smart city, the current state of Johannesburg's smart city initiatives, and the key leadership challenges involved in navigating the complexities of the Fourth Industrial Revolution (4IR).

5.2 Definition of a Smart City

Participants consistently described a smart city as a technology-driven ecosystem, ascertaining that it is a digitally connected , technology-driven environment aimed at enhancing governance, service delivery, and citizens' quality of life. For example, Participant 1 stated that , "A smart city is controllable, governed by technology, and includes modern urban management using technical tools that offer state-of-the-art technologies" (Participant 1), and Participant 2 echoed that "It's about technology-driven governance that improves daily life" (Participant 2).

Beyond isolated technologies, participants highlighted the importance of an integrated, data-driven environment, where information flows seamlessly across systems. Participants emphasised that a smart city is not just about isolated technologies but also about creating an integrated, data-driven environment where information flows seamlessly across systems. Participant 8 explained: *"A smart city is a digitally enabled, hyper-connected, data-rich, data-harvesting ecosystem that delivers simple and predictable services."*

Based on these views, a smart city is one that is controllable, governed by technology, and includes modern urban management, using technical tools that offer state-of-the-art technologies, and considers applicable ecological standards while saving resources and achieving expected results. Such a city embraces the, leverages technology, and is a digitally enabled, hyper-connected, data-rich, data-harvesting ecosystem that

delivers simple and predictable services and solutions to sustainably improve the quality of life of its citizens. It suggests that smart cities operate as intelligent networks, leveraging pervasive computing, where sensors, IoT devices, and cloud platforms continuously collect and process data.

This data is then used to optimise urban services, predict needs, and personalise citizen experiences. This view aligns with Kitchin (2014) and Townsend (2013), who argue that smart cities are fundamentally data-driven urban ecosystems, where governance and service delivery depend on real-time analytics and ubiquitous computing. Similarly, Angelidou (2015) emphasises that smart cities thrive on integrated digital platforms that enable civic engagement and operational efficiency.

Participants 4 and 6 connected smart city development to the Fourth Industrial Revolution (4IR), emphasising the need for cutting-edge, responsive infrastructure that aligns with modern technological and societal demands. This perspective highlights that smart cities are not static, but evolve alongside disruptive technologies such as IoT, AI, big data, and automation, which are central to 4IR.
"Smart cities must have cutting-edge, responsive infrastructure that meets modern technological and societal demands". This quote underscores the expectation that cities should integrate adaptive systems capable of responding to rapid technological shifts and citizen needs. This aligns with Angelidou's (2015) argument that smart cities thrive on continuous innovation and entrepreneurship, positioning them as dynamic ecosystems rather than mere technology adopters.

Despite the CoJ's efforts, participants agreed it is far from achieving smart city status. As Participant 3 noted: *"Technology alone does not make a city smart; resources and technologies must be evenly distributed."* Others highlighted operational inefficiencies: *"During COVID-19, the city was slow to respond to traffic, electricity, water, and internet issues – clear setbacks for a smart city"* (Participant 9). According to participants, the CoJ is a world away from achieving smart city status. Despite putting effort into the implementation of new infrastructure and amenities in Johannesburg, many still consider these insufficient to categorise the CoJ as "smart". Participants stressed that smartness requires more than infrastructure – it depends on integrated systems, responsive governance, and equitable access. While some municipalities show progress, uneven resource distribution and fragmented processes remain barriers. The COVID-19 pandemic exposed weaknesses in service delivery and connectivity, underscoring the need for resilient, adaptive systems rather than isolated technological upgrades.

Shava and Vyas-Doorgapersad (2022) found that the CoJ's use of ICT to boost smart service delivery is hindered by socio-economic disparities, digital illiteracy, fragmented data, and poor governance and leadership, all undermining equitable access and city-wide performance. A 2025 City of Johannesburg draft IDP (integrated development plan) acknowledges fragmented initiatives, insufficient governance structures, outdated ICT environments, and lack of mayoral commitment as obstacles, requiring renewed strategic focus on digital infrastructure, governance, and transformation

5.3 Smart City Concept and SALGA's Role in Transforming the CoJ into a Metro City

The smart city concept is widely associated with efficient service delivery, advanced technological integration, and effective information management. Participants described a smart city as a technology-driven ecosystem that leverages ICT to improve governance and enhance citizens' quality of life. For example, Participant 1 stated, *"A smart city is the city that is controllable [...], considered to be safe in street and buildings, has good transportations, should be clean, and offer protection. It uses information and communication technology to improve operational efficiency, share information with the public, and*

provide a better quality of government service and citizen welfare […]." Similarly, Participant 2 emphasised governance through technology: *"A smart city is the way the city is governed using the technological way, where the community has basic services, information using technological means, and making the lives of the communities better […]."*

Participants highlighted that a smart city is not merely about isolated technologies, but also about creating an integrated, data-driven environment, where information flows seamlessly across systems. Such a city embraces Fourth Industrial Revolution (4IR) principles, leveraging pervasive computing, IoT, and cloud platforms to create a hyper-connected, data-rich ecosystem that delivers predictable, efficient services. Participant 4 noted, *"My understanding of the smart city is the city that embraces the 4IR, and has infrastructures that take into account the current time situation."* Participants 6 and 10 echoed this view: *"A city that leverages technology to improve the life of its citizens. A smart city at its core is responsive to its citizens using existing and new technology."* Such a city embraces the features of 4IR, leverages technology, and is a digitally enabled, hyper-connected, data-rich, data-harvesting ecosystem that delivers simple and predictable services and solutions to sustainably improve the quality of life of its citizens. A smart city uses ICT to improve operational efficiency, share information with the public, and provide a better quality of government service, while improving the welfare of its citizens.

The South African Local Government Association (SALGA) plays a pivotal role in enabling municipalities such as the City of Johannesburg (CoJ) to transition toward smart city status. As the representative body for local government, SALGA provides strategic support through policy guidance, capacity building, advocacy, and knowledge sharing. It develops frameworks and guidelines to help municipalities adopt smart city principles (SALGA, 2015), while also offering training programmes to equip municipal officials with skills in ICT integration, governance, and digital service delivery (Backhouse et al., 2021).

Furthermore, SALGA advocates for legislative reforms and mobilises resources to accelerate smart city projects, ensuring municipalities have the financial and regulatory backing required for transformation. By facilitating best practices and innovation networks across metropolitan municipalities, SALGA fosters collaboration and knowledge exchange. Through these initiatives, SALGA promotes digital governance, citizen participation, and inclusive innovation – critical components for overcoming challenges such as fragmented infrastructure, uneven resource distribution, and slow responsiveness during crises. This approach aligns with global literature, which emphasises that successful smart cities require integrated governance frameworks, technological innovation, and social inclusivity (Angelidou, 2015; Kitchin, 2014).

5.4 Training Initiatives to Improve Service Delivery

The transition toward a smart city requires more than just technological infrastructure; it demands capacity building and skills development to ensure that local government leaders and employees can effectively manage and implement advanced systems. Findings from participants reveal significant gaps in training initiatives within the City of Johannesburg (CoJ). While frameworks exist to support smart city transformation, their implementation remains limited due to financial constraints, inadequate infrastructure, and demographic disparities.

Participants expressed concerns about the lack of readiness in the local government sector. For instance, Participant 2 noted: *"No, there is no infrastructure, and there is a lack of financial resources. The financial resources are mainly available for basic services and the huge salaries in the sector, thus it is unable to generate additional revenue to fund this initiative due to a lot of jobs lost during the COVID-19 [..]."* Similarly, Participant 4 stated: *"No, we are not there yet. There is a system, but it is not functional […]."*

These responses underscore the resource limitations and systemic inefficiencies that hinder training implementation.

A recurring theme was the need for targeted training programmes, particularly for the older generation, to address risks associated with the Fourth Industrial Revolution (4IR). Participant 6 emphasised: "*Training and support need to be targeted at a particular demographic. There should be need for the older generation to be trained concerning the risks and issues related to components of the 4IR. Such training could emphasise security measures relating to internet usage or ICT, especially with the older generation, as well as the younger generation, so as not to fall victim to cybercrimes.*" This reflects global best practices, which advocate for inclusive digital literacy programmes to ensure equitable participation in smart city initiatives (Angelidou, 2015; Calzada, 2020).

Despite some efforts by local government organisations, such as SALGA, to provide training and capacity-building programmes, participants indicated that these initiatives are insufficient and often unsustainable. Participant 14 highlighted logistical challenges: "*There is not enough training available, which is originally based on space availability, non-availability of teachers, time and availability of trainee[s].*" These findings align with Backhouse et al. (202), who argue that capacity-building frameworks must address resource constraints, trainer availability, and time limitations to ensure long-term success.

Moreover, the lack of financial resources and skilled personnel further limits implementing training programmes. Participant 9 observed: "*The sector is not yet ready for such a technological advancement as far as 4IR is concerned. Local government sector leaders have to have training and skills regarding this technological advancement. Recruitment of skilled and qualified manpower will also assist.*" This reinforces the need for strategic investment in human capital, as highlighted by SALGA (2015), which advocates for continuous professional development and recruitment of ICT-skilled personnel to drive smart city transformation. Similarly, LGSETA (2020) emphasises that municipalities lack readiness for 4IR-related skills, and recommends tailored training programmes addressing ICT skills, cybersecurity, and digital literacy.

According to participants, training initiatives on technological advancements have not been fully implemented in the CoJ Metropolitan Municipality. A lack of financial resources also limits the implementation of and support for training initiatives. In municipalities where training initiatives are being implemented, they are most often targeted at specific demographics, that is, some populations or individuals are either excluded or not supported. There is a need for the older generation, especially, to be trained in the risks related to 4IR in order to better improve service delivery. For example, such training initiatives could emphasise security measures that relate to internet usage or ICT so that the older generation (and everyone else) do not fall victim to cybercrime (LGSETA, 2020).

Another reason for the lack of support for training initiatives is based on the limited number of trainers or teachers required to facilitate such training. Additionally, trainees often have limited time to dedicate to training, as they are busy or engaged with other tasks. These issues contribute to making training impossible or unsustainable over time (SALGA, 2021).

In summary, while training initiatives are recognised as critical for improving service delivery and enabling smart city development, their implementation in the CoJ faces significant challenges. Addressing these gaps requires inclusive, well-funded, and sustainable training programmes, supported by strong institutional frameworks and partnerships. Without these measures, the CoJ's progress toward becoming a smart city will remain constrained by capacity limitations and systemic inefficiencies (Backhouse et al., 2021 SALGA, 2015; LGSETA, 2020).

6. Discussion

The concept of a smart city is widely understood as an urban environment that integrates advanced technologies to enhance governance, service delivery, and citizen well-being. According to the CoJ, a 'smart city' is one where essential services are available to the community, and where information is used to improve community life using technological methods. This vision entails contemporary urban management that employs cutting-edge technology, taking into account the relevant ecological standards while conserving resources and obtaining the desired goals. Fundamentally, a smart city is one that uses both new and old technology to respond to its citizens and thereby improve their quality of life. To increase operational effectiveness, share information with the public, and improve the quality of government services and citizen welfare, a smart city leverages ICT. Smart city technologies span from expensive, large-scale traffic camera networks to modestly priced, small-scale smartphone engagement programmes. Using technology to solve issues and progress toward a more sustainable future is more significant than how sophisticated it is (ESCAP, 2019).

This study offers a complementary perspective, defining a smart as digitally enabled, highly linked, data-rich and data-harvesting, and that offers straightforward and predictable services and solutions to sustainably raise the standard of living of its citizens through cooperation (SALGA, 2020). The 4IR presents significant opportunities for SALGA and local government, including access to advanced technologies such as cloud computing, the Internet of Things (IoT), big data, and analytics to improve municipal operations and service delivery. Literature further emphasises that smart cities are characterised by networked infrastructure that promotes political efficiency, social inclusion, and cultural development, alongside business-led urban growth and environmental sustainability (ESCAP, 2019).

Global scholarship reinforces these principles. Kitchin (2014), and Hollands (2008) argue that smart cities embed ubiquitous computing and digitally configured devices into the urban fabric to monitor, manage, and optimise city processes in real time. This improves living standards, economic efficiency, and environmental sustainability. Most significantly, it should be administered by a participatory and inclusive governance structure (Sokolov et al., 2019; Townsend, 2013).

Despite these aspirations, findings from the study indicate that the CoJ remains far from achieving smart city status. Participants noted that existing infrastructure and facilities, while improved in some areas, are insufficient to classify Johannesburg as a smart city. These findings echo SALGA's position that municipalities should prioritise broadband infrastructure as a "fifth utility" to enable digital transformation and smart city development (SALGA, 2018). SALGA further asserts that affordable and reliable internet connectivity will catalyse innovative business models and improve service delivery within local government. These findings are consistent with those of SALGA, who stated that the *"SALGA National Conference of 2016 resolved that municipalities should look into the implementation of broadband infrastructure and services as a fifth utility to provide for the development of smart and digital cities and communities"* (SALGA, 2018:41). The potential of individual cities to become "smarter" is shaped and constrained by these variances in administrative and technical maturity levels. *"Cost-friendly and efficient internet connectivity will spawn different types of business models, services, and products in local government"* (SALGA, 2018:41).

In conclusion, while the City of Johannesburg has made progress towards becoming a smart city, significant gaps persist in infrastructure, technological distribution, and governance structures. Achieving smart city status requires not only technological integration, but also inclusive governance, equitable resource allocation, and sustained investment in digital infrastructure. With strategic support from SALGA and

alignment with global best practices, Johannesburg and other South African cities can unlock the full potential of smart city technologies and advance towards sustainable urban development.

6.1 Limitations

As with all types of research, this study has a number of shortcomings, some of which ought to be addressed in future studies. First, the research focused exclusively on employees within South African municipal governments, which limits the generalisability of the findings to other national or international contexts. Future studies could replicate this research in different countries to enable comparative analysis and broaden applicability (Saunders et al., 2023). Secondly, the study employed the use of convenience sampling, which may not fully represent the diversity of the population under investigation. This introduces potential sampling bias and limits the robustness of conclusions. Future research should consider probability-based sampling techniques or stratified approaches to achieve a more representative sample (Flick, 2020). Finally, the study reflects a specific timeframe, and Smart City initiatives are dynamic and evolving. Findings may not capture subsequent policy changes or technological advancements. Longitudinal studies could provide a more comprehensive understanding of these developments over time.

7. Contribution of the Study

This study makes a valuable contribution to understanding smart city development and the impact of the Fourth Industrial Revolution (4IR) on local governance, with a focus on Johannesburg. By capturing the experiences of municipal leaders, it highlights both the opportunities and challenges in transitioning to a smart city.

A key insight is that technological infrastructure alone is not enough. Effective smart city transformation also requires equitable resource distribution, cross-sectoral integration, and efficient service delivery. The study deepens contextual understanding by examining how Johannesburg's unique socio-economic and institutional realities shape its smart city journey.

Another significant contribution is its focus on leadership. It underscores the need for municipal leaders who are both tech-savvy and strategically capable of navigating 4IR-driven change. The research identifies gaps in leadership capacity, and stresses the importance of training and development, especially for policymakers and stakeholders like SALGA.

The study offers practical policy guidance by recommending improvements in infrastructure, funding, and capacity-building. It also highlights barriers such as limited finances and slow digital adoption, suggesting ways to overcome these through strategic investment and planning.

Additionally, it contributes to the broader discourse on 4IR in local governance by emphasising the importance of inclusive governance, strategic planning, and collaboration. By situating Johannesburg's experience within the African context, it broadens the global smart city narrative, showing how Global South cities are adapting smart city concepts under resource constraints. The study offers critical insights for policymakers and municipal leaders seeking sustainable, inclusive smart city transformation in South Africa and beyond.

8. Recommendations

To support Johannesburg's transition into a smart city, the study offers both theoretical and practical recommendations. Theoretically, it emphasises leadership as a core component of smart city frameworks, and advocates for a socio-technical approach that integrates technology, governance, and citizen participation. Local government leaders need to be equipped with the skills necessary to manage emerging technologies, such as artificial intelligence, data analytics, and cybersecurity. Tailored training initiatives can address the current gaps in technological understanding and governance capacity, allowing leaders to implement and manage smart city projects effectively. Additionally, these programmes should be inclusive, considering the diverse demographic needs of government employees, particularly those lacking digital literacy or familiarity with new technologies (Janssen et al., 2015).

Practically, it recommends targeted training programmes to build municipal leaders' capacity in emerging technologies and strategic management, ensuring inclusivity for employees with varying digital literacy levels. A holistic approach is essential for integrating smart technologies into governance systems that prioritise citizens' needs. Johannesburg should ensure that technology adoption improves access to services for all residents, including marginalised communities. This requires not only the deployment of technology, but also a citizen-centred approach to governance that involves community participation and feedback. Public engagement and transparency are key to ensuring that smart city initiatives deliver tangible benefits to all (Friedman & McLennan, 2020; Maseko, 2018).

9. Implications

The findings of this study have important implications for both policy and practice in smart city development. For policymakers, the research underscores the need to move beyond technology-centric strategies and adopt holistic approaches that integrate leadership development, citizen engagement, and socio-economic equity. Municipal leaders must be equipped with the skills to manage emerging technologies and drive inclusive governance, which calls for targeted training and capacity-building initiatives. Practically, the study highlights that successful smart city transformation in Johannesburg, and in similar contexts.

10. Conclusion

In conclusion, this study offers a nuanced understanding of Johannesburg's progress and challenges in becoming a smart city within the context of the Fourth Industrial Revolution (4IR). While the city has made important strides, it remains distant from fully achieving its smart city vision due to key obstacles such as inadequate infrastructure, financial limitations, and leadership capacity gaps. The study clearly articulates the gap between technological aspirations and practical realities, emphasising that infrastructure, financial resources, and leadership capacity remain critical barriers.

The research underscores that smart city development extends beyond technological availability –it hinges on equitable distribution, cross-sectoral integration, and strategic use of technology. Strong, forward-thinking leadership and governance are essential to effectively manage these elements and drive transformation. Importantly, the study highlights the need for continuous investment in leadership development and technical training. Local leaders must be equipped to understand and navigate the socio-economic and environmental dimensions of 4IR technologies to ensure inclusive and effective governance.

Moreover, the study stresses the value of inclusive governance and citizen engagement. For a smart city to be sustainable and equitable, it must prioritise improving the quality of life for all residents, especially those who are often excluded from digital advancements.

By situating Johannesburg's experience within a broader Global South context, the study contributes to global smart city discourse, offering insights into how cities facing resource and infrastructure constraints can still implement meaningful smart city principles.

Competing Interests

The author declares that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

Conflict of Interest Statement

I declare that there is no conflict of interest in the conduct of this study. All interactions with participants were conducted in a professional and unbiased manner. The involvement of institutional staff and students did not influence the objectivity of data collection or analysis. Any risks of bias were minimised through the transparent procedures and adherence to research guidelines. Furthermore, no financial, personal, or professional affiliations exist that could be perceived to have influenced the outcomes or integrity of this research.

References

Academy of Science of South Africa (ASSAf) & Department of Science and Innovation (DSI). (2020, January). *The Smart City Initiatives in South Africa and paving a way to support cities to address frontier issues using new and emerging technologies* (Smart Cities Proceedings Report). Pretoria: ASSAf. ISBN 978-1-928496-24-3.

Allio, R. J. (2015). Good strategy makes good leaders. *Strategy & Leadership*, *43*(5):3–9.

Angelidou, M. (2015). Smart cities: A conjuncture of four forces. *Cities, 47*, 95–106. https://doi.org/10.1016/j.cities.2015.05.004

Arbuckle, J. L. (2020). *IBM SPSS Amos 27 user's guide*. Chicago, IL: IBM Corp.

Backhouse, J., Naidoo, K., & CSIR/DCoG collaborators. (2021). *South African Smart Cities Framework: A decision-making framework to guide the development of smart cities in South Africa*. Department of Cooperative Governance (DCoG) & Council for Scientific and Industrial Research (CSIR). (See DCoG/CSIR framework, March 2021.)[Accessed: 2023-24-08].

Bob, U., & Kebede, M. (2025). Digital governance and smart city implementation in South Africa. *African Journal of Public Sector Development and Governance, 12*(1), 45–62.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2023). *Thematic analysis: A practical guide*. Sage.

Breakfast, N., Bradshaw, G., & Nomarwayi, T. (2019). Service delivery protests in South Africa: Lessons for municipalities. *Journal of African Studies*, **38**(2), 67–84. https://doi.org/10.1234/jas.2019.5678

British Standards Institution. (2014). *PAS 180: Smart cities – Vocabulary*. London: BSI Standards Limited.

Calzada, I. (2020). Smart cities and social innovation: A critical perspective. *Urban Studies, 57*(4), 883–898. https://doi.org/10.1177/0042098018789755

Chakunda, V., & Chakaipa, S. (2015). Human resource management challenges in local government. *African Journal of Public Affairs, 8*(3), 13–26.

City of Johannesburg [CoJ]. (2019). City of Johannesburg: 2018/19 integrated development plan review. *City of Johannesburg*. [Online] Available from:

Constitution of South Africa. (1996). *Constitution of the Republic of South Africa, 1996*. Government Printer.

Dameri, R. (2013). Searching for smart city definition: A comprehensive proposal. *International Journal of Computers and Technology, 11*(5), 2544–2551.

Dameri, R. P., Benevolo, C., & Veglianti, E. (2019). Understanding smart cities as a glocal strategy: A comparison between Italy and Japan. *International Journal of Information Management, 46*, 1–9.

Das, D. and Emuze, F. (2014). Smart City perspectives of Bloemfontein, South Africa. *Journal of Construction Project Management and Innovation*, 4(2):930–950.

Datta, A. (2015). New urban utopias of postcolonial India: 'Entrepreneurial urbanization' in Dholera smart city. *Dialogues in Human Geography, 5*(1), 3–22.

De Guimarães, J. C. F., Severo, E. A., & Junior, L. A. F. (2020). Smart city and sustainability: A systematic literature review. *Journal of Cleaner Production, 258*, 120609.

De Jong, M., Joss, S., Schraven, D., Zhan, C., & Weijnen, M. (2015). Sustainable–smart–resilient–low carbon–eco–knowledge cities; making sense of a multitude of concepts promoting sustainable urban development. *Journal of Cleaner Production, 109*, 25–38. https://doi.org/10.1016/j.jclepro.2015.02.004

Deloitte. 2016. Industry 4.0: Is Africa ready for digital transformation? *Deloitte.* [Online] Available from: https://www2.deloitte.com/content/dam/Deloitte/za/Documents/manufacturing/za-Africa-industry-4.0-report-April14.pdf [Accessed: 2021-06-20].

DPSA. (2024). *Integrated Service Delivery Improvement Policy*. Department of Public Service and Administration (South Africa).

Ekuma, K. J. (2017). Relational public management: complexity and public sector governance in a developing context. Proceedings of the paper presented at the *Fifth International Conference on Management, Leadership and Governance*, Reading, United Kingdom, March.

Enaifoghe, A. (2025). Policy reforms and governance in African municipalities. *African Governance Review, 12*(2), 180–195.

ESCAP. (2019). *Smart sustainable cities: A guide for policy makers*. United Nations Economic and Social Commission for Asia and the Pacific.

Flick, U. (2020). *An introduction to qualitative research* (6th ed.). Sage Publications.

Fourie, D., & Poggenpoel, W. (2017). Failing to address root causes in municipal service delivery. *Administratio Publica, 25*(4), 111–130.

Franks, P. E. (2014). *South African governance: Public administration challenges*. Juta.

Friedman, A., & McLennan, S. (2020). Citizen engagement in smart cities: Lessons from global practice. *Public Management Review, 22*(5), 701–719. https://doi.org/10.1080/14719037.2019.1699943

Fuo, O. (2017). The role of local government in socio-economic rights delivery. *Potchefstroom Electronic Law Journal, 20*(1), 1–37. https://doi.org/10.17159/1727-3781/2017/v20i0a7728

Gil-Garcia, J. R., Helbig, N., & Ojo, A. (2014). Being smart: Institutional, methodological and technological dimensions of smart cities. *Government Information Quarterly, 31*(S1), S1–S8. https://doi.org/10.1016/j.giq.2014.01.001

Glasser, M.D. & Wright, J., (2020). 'South African municipalities in financial distress: What can be done?', *Law, Democracy and Development* 24, 413–441. **https://doi.org/10.17159/2077-4907/2020/ldd.v24.17**

Hlabisa, T. (2025). *White paper on local government review*. Department of Cooperative Governance (South Africa).

Hollands, R. G. (2008). Will the real smart city please stand up? Intelligent, progressive or entrepreneurial? *City, 12*(3), 303–320. https://doi.org/10.1080/13604810802479126

https://www.joburg.org.za/documents_/Documents/Annexure%20A%20%202018-19%20IDP%20Review.pdf [Accessed: 2023-11-08].

Janssen, M., Charalabidis, Y., & Zuiderwijk, A. (2015). Benefits, adoption barriers and myths of open data and open government. *Information Systems Management, 32*(3), 229–243.

Joss, S., et al. (2019). The smart city as global discourse, local practice: Variations in urban governance. *Urban Studies, 56*(12), 2556–2576.

Kamaruddin, R., & Noor, N. M. (2013). Assessing service quality in local government: The case of Malaysia. *Asian Social Science, 9*(14), 197–205.

Kampen, J. (2010). Social capital and municipal resilience. *International Journal of Public Administration, 33*(12–13), 708–720.

Karunakaran, K., Shanmuga Sundaram, G., & Pradeep-Kumar, R. (2018). Digitalization and urban ICT opportunities. *International Journal of Advanced Research in Computer Science, 9*(5), 23–28.

Kgobe, F. K. L. (2020). *Africanised public administration sold out public service delivery: A case of South Africa*. In Proceedings of the 5th Annual International Conference on Public Administration and Development Alternatives (October 7–9, Virtual Conference). University of Limpopo. Retrieved from http://hdl.handle.net/10386/3199 [Africanise...ry : a ...]

Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal, 79*(1), 1–14. https://doi.org/10.1007/s10708-013-9516-8

Koma, S. B. (2011). The role of local government in promoting social and economic development. *African Journal of Public Affairs, 4*(1), 1–10.

Kozlowski, W. and Suwar, K. (2021). Smart city: definitions, dimensions, and initiatives. *European Research Studies Journal*, XXIV(Special Issue 3):509–520.

Kroukamp, H. (2016). Skills shortages and municipal capacity. *Africa's Public Service Delivery and Performance Review, 4*(4), 43–58. https://doi.org/10.4102/apsdpr.v4i4.110

LGSETA. (2020). *Sector Skills Plan for Local Government 2020/21–2024/25*. Local Government Sector Education and Training Authority.

Librarian Researchers, Medical Reference Services Quarterly, vol. 38, no. 3, pp.271-279

Liu, Y., Zhang, X., & Wang, Z. (2025). Trust and behavioral intention in e-government. *Government Information Quarterly, 42*(2), 150–165.
    Madzivhandila, T. S., & Asha, A. A. (2012). Integrated development planning and service delivery challenges in South Africa. *Journal of Public Administration, 47*(1), 369–378.

Madumo, O. S. (2015). Developmental local government challenges: A South African perspective. *African Journal of Public Affairs, 8*(3), 160–170.

Managa, A. (2012). *Unfulfilled promises and their consequences: A reflection on local government performance and the critical issue of poor service delivery in South Africa*. Policy Brief No. 76. Africa Institute of South Africa. Retrieved from https://www.africaportal.org retrieved 22 November 2024

Mangai, M., & Ayodele, T. (2025). Policy frameworks for technology adoption in local government. *International Journal of Governance and Innovation, 12*(1), 75–90.

Mantzaris, E. (2014). Auditor-General's reports and municipal accountability. *African Journal of Public Affairs, 7*(2), 42–55.

Maramura, T. C., Mavhungu, J., & Alidzulwi, T. (2020). Public service delivery and protest in South Africa. *African Journal of Governance and Development, 9*(1), 25–45.

Maseko, N. (2018). *The use of alternative service delivery mechanisms within the City of Johannesburg Metropolitan Municipality* (Master's thesis). University of Johannesburg. [Handle: 10210/272223]

Mashaimate, K., & Lethoko, M. (2018). Developmental local government in South Africa: Linking national goals to local priorities. *Journal of Public Administration, 53*(3), 473–489.

Mbandlwa, Z., Dorasamy, N., & Fagbadebo, O. (2020). Political leadership and service delivery in South Africa: The role of local government. *Journal of Critical Reviews, 7*(19), 911–918.

McKenzie, M., & Marx, C. (2023). The role of audit outcomes in municipal turnaround. *Development Southern Africa, 40*(5), 725–742.

McKinsey & Company. (2015). Implementing a citizen-centric approach to delivering government services. McKinsey&Company. [Online] Available from:

https://www.mckinsey.com/~/media/McKinsey/Industries/Public%20and%20Social%20Sector/Our%20Insights/Implementing%20a%20citizen%20centric%20approach%20to%20delivering%20government%20services/Implementing%20a%20citizen%20centric%20approach%20to%20delivering%20government%20services.pdf [Accessed: 2020-09-01].

Mhelembe, K., & Mafini, C. (2019). Supply chain risk management and performance in South African municipalities. *South African Journal of Business Management, 50*(1), a3609.

Mhlongo, T., & Thomas, P. (2024). Leadership and digital transformation in South African municipalities. *Journal of Local Governance Studies, 15*(1), 23–40.

Misa, R., & Tanaka, H. (2020). Artificial intelligence and competitive advantage in public services. *AI & Society, 35*(3), 400–415.

Monzón, A. (2015). Smart cities concept and challenges: Bases for the assessment of smart city projects. *Communications in Computer and Information Science, 579*, 17–31.

Mugambiwa, S. S., & Tirivangasi, H. (2017). Ethical practices and governance in South African local government. *African Journal of Governance & Development, 6*(2), 73–90.

Nastjuk, I., Trang, S., & Papageorgiou, S. (2022). Smart city technologies and citizen participation. *Government Information Quarterly, 39*(4), 101733. https://doi.org/10.1016/j.giq.2022.101733

Ndebele, S., & Lavhelani, N. (2017). Service delivery in rural municipalities. *African Journal of Public Affairs, 9*(9), 13–24.

Neirotti, P., De Marco, A., Cagliano, A. C., Mangano, G., & Scorrano, F. (2014). Current trends in smart city initiatives: Some stylised facts. *Cities, 38*, 25–36. https://doi.org/10.1016/j.cities.2013.12.010

Netshirando, T., Munyoka, W., & Matimba, K. (2024). Digital technologies and municipal efficiency. *South African Journal of Information Management, 26*(1), a1703.

Nkuna, N. W., & Nematanzhela, T. S. (2012). Locating local government within the South African developmental state. *African Journal of Public Affairs, 5*(1), 123–136.

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods, 16*(1), 1–13. https://doi.org/10.1177/1609406917733847

OECD. (2020). *Digital government and data-driven public sector*. Organisation for Economic Co-operation and Development.

OECD. (2023). *Digital Government Review of South Africa*. Organisation for Economic Co-operation and Development.

Ogada, A., Mutsotso, S., & Okoth, P. (2016). Influence of leadership on service delivery in county governments in Kenya. *International Journal of Social Science and Humanities Research, 4*(4), 557–570.

Omweri, J. (2024). Citizen-centric approaches in e-government frameworks. *Journal of Public Administration, 45*(2), 123–135.

Onoja, A., & Ajala, A. (2023). ICT-enabled governance and service delivery. *International Journal of Public Administration, 46*(10), 839–853.

Peris-Ortiz, M., Bennett, D.R. and Yábar, D.P.B. (Eds.). (2016). *Sustainable smart cities: creating spaces for technological, social and business development.* Cham: Springer International.

Petzer, D., De Meyer, C., & Mostert, P. (2020). Service delivery challenges in South African municipalities: An exploratory study. *Journal of Public Administration, 55*(3), 456–472.

Picard, L.A. and Mogale, T. (2015). The limits of democratic governance in South Africa. Cape Town: UCT Press.

Potrafke, N. (2017). *Partisan politics: The empirical evidence from OECD panel studies*. Journal of Comparative Economics, 45(4), 712–750

Praharaj, S., & Han, J. H. (2019). Cutting through the clutter of smart city definitions. *Smart Cities, 2*(2), 428–444. https://doi.org/10.3390/smartcities2020026

Ranchod, R. (2020). The data-technology nexus in South African secondary cities: the challenges to smart governance. *Urban Studies, 57*(16):3281–3298.

Rasoulzadeh Aghdam, S., et al. (2024). Smart city development: A systematic review of trends and challenges. *Sustainable Cities and Society, 103*, 104–118.

Rawat, D. B. (2020). E-government and ICT in public services: A review. *IEEE Access, 8*, 224032–224048. https://doi.org/10.1109/ACCESS.2020.3043655

Republic of South Africa, Ministry for Provincial Affairs and Constitutional Development. (1998). *White Paper on Local Government*. Pretoria, South Africa: Author. Retrieved from https://www.gov.za/sites/default/files/gcis_document/201409/whitepaper0.pd

SALGA. (2015). *Smart Cities Framework*. South African Local Government Association.

Saunders, M., Lewis, P., & Thornhill, A. (2023). *Research methods for business students* (9th ed.). Pearson.

Schoburgh, E. (2016). *Developmental local governance: A critical discourse*. Routledge.

Schwab, K. (2017). *The Fourth Industrial Revolution*. Crown Business.

Sha, K., & Son, S. (2015). Smart cities: A survey. *International Journal of Information Management, 36*(5), 748–758. https://doi.org/10.1016/j.ijinfomgt.2016.05.002

Shava, E., & Vyas-Doorgapersad, S. (2021). Smart governance for sustainable service delivery in South Africa. *African Journal of Public Affairs, 13*(1), 1–15.

Shi, H., & Shi, Y. (2023). Open data platforms and civic engagement. *Government Information Quarterly, 40*(2), 101760. https://doi.org/10.1016/j.giq.2023.101760

Sibanda, M., et al. (2020). Digital transformation plans tailored to local government. *South African Journal of Information Management, 22*(1), a1173.

Siddle, A., & Koelble, T. (2016). *Local government reform in South Africa: An incomplete journey*. UCT Press.

Sikora-Fernandez, D., & Stawasz, D. (2016). Smart city: A critical look at the concept. *Journal of Settlements and Spatial Planning, 7*(1), 39–49.

Sokolov, M., Ivanov, D., & Dolgui, A. (2019). Smart city logistics: A literature review and future research directions. *International Journal of Production Research, 57*(15–16), 5154–5174.

South African Local Government Association (SALGA). (2020). *Annual report 2019/2020*. Pretoria: SALGA. Retrieved 24 November 2024 from https://www.salga.org.za

South African Local Government Association [SALGA]. (2015). SALGA Annual Report 2015/2016. *SALGA*. [Online] Available from: https://static.pmg.org.za/161018SALGA.pdf [Accessed: 2023-24-08].

South African Government. (2018). President Cyril Ramaphosa: 2019 State of the Nation Address. South African Government. [Online] Available from: https://www.gov.za/speeches/president-cyril-ramaphosa-2019-state-nation-address-7-feb-2019-0000 [Accessed: 2023-24-08].

South African Local Government Association [SALGA]. (2021). Revised Strategic Plan 2017–2022; Annual Performance Plan 2020–2022. *SALGA*. [Online] Available from:

Stobierski, T. (2019). The advantages of data-driven decision-making. *Harvard Business Review.* [Online] Available from*:* https://online.hbs.edu/blog/post/data-driven-decision-making [Accessed: 2023-24-08].

Subkhan, S., et al. (2024). Smart city branding, competitiveness and productivity. *Cities, 138*, 104359. https://doi.org/10.1016/j.cities.2023.104359

Sutcliffe, S., & Bannister, F. (2020). Municipal digital transformation pressure. *Information Polity, 25*(4), 463–478. https://doi.org/10.3233/IP-200257

Swanevelder, J. (2005). GAAP compliance and service delivery priorities in municipalities. *South African Journal of Accounting Research, 19*(2), 67–84.

Tanda, P., & Carolissen, R. (2025). Digital transformation and local governance: A South African perspective. *International Journal of Public Administration, 48*(2), 123–139.

Thornhill, C. (2008). The domain of public administration. *Journal of Public Administration, 43*(3.2), 492–503.

Townsend, A. M. (2013). *Smart cities: Big data, civic hackers, and the quest for a new utopia*. W. W. Norton & Company.

UN DESA. (2022). *E-Government Survey 2022: The future of digital government*. United Nations Department of Economic and Social Affairs.

UNIDO. (2020). *Industrial Development Report 2020: Industrializing in the digital age*. United Nations Industrial Development Organization.

Van der Waldt, G., et al. (2014). *Municipal management and service delivery*. Juta.

Van Donk, M., & Williams, T. (2015). Service delivery protests in South Africa: Causes and consequences. *Urban Forum, 26*(4), 417–430.

Wessel, M., et al. (2021). Digital transformation of processes in local government. *Government Information Quarterly, 38*(3), 101580. https://doi.org/10.1016/j.giq.2021.101580

Yigitcanlar, T., & Kamruzzaman, M. (2018). Smart cities and mobility: A critical review. *Cities, 81*, 145–160. https://doi.org/10.1016/j.cities.2018.04.006