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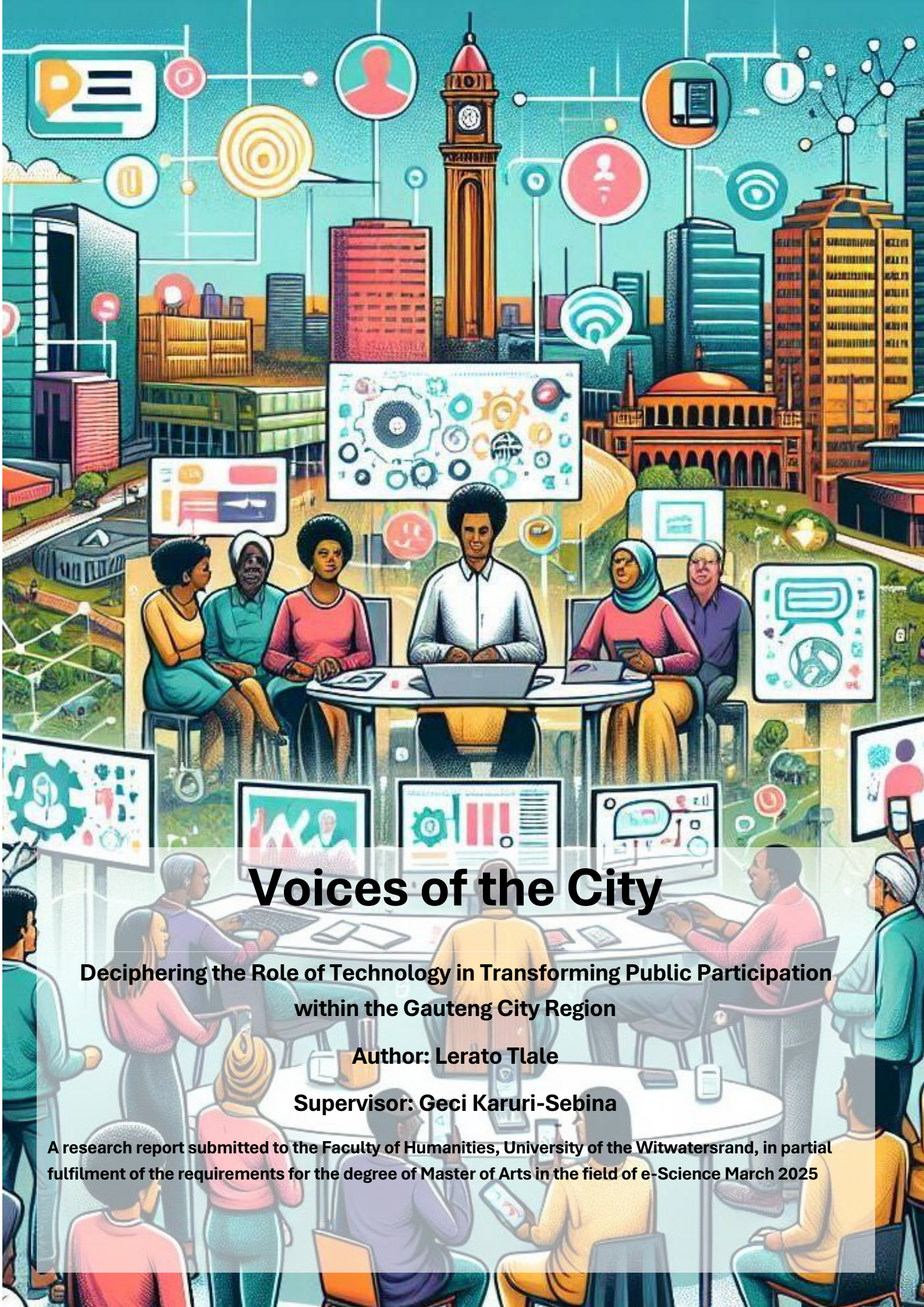
Voices of the City: Deciphering the Role of Technology in Transforming Public Participation within the Gauteng City Region

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Voices of the City

Deciphering the Role of Technology in Transforming Public Participation within the Gauteng City Region

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A research report submitted to the Faculty of Humanities, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Arts in the field of e-Science March 2025

Abstract

The advent of digital technologies has introduced new dynamics into the participatory landscape, offering novel avenues for political engagement and mobilisation. This study investigates the role of technology in shaping public participation within the Gauteng City Region, aiming to complement the traditionally qualitative domain of urban planning with robust empirical evidence. Anchored by a conceptual framework that foregrounds the interplay between digital access, socio-political attitudes, and spatial governance, the research positions public participation as contingent on both technological and contextual variables.

Adopting a quantitative approach, the study draws on data from the Gauteng City-Region Observatory's Quality of Life Survey 2023–2024 (Round 7). Linear regression models are employed to examine the relationship between access to information technologies and levels of public participation, with socio-economic status, government satisfaction, and municipal location modelled as moderating variables.

The analysis reveals a statistically significant yet modest positive association between digital access and participation. However, this relationship is not uniform; interaction effects differ across municipalities, underscoring the importance of localised governance contexts. Higher levels of government satisfaction are consistently associated with greater participation, suggesting the pivotal role of institutional trust. Conversely, socio-economic status is negatively correlated with participation, indicating greater engagement among those with fewer economic resources.

These findings reinforce the need for targeted strategies that account for both socio-economic and spatial disparities. The study urges policymakers to invest in inclusive digital infrastructure, strengthen institutional legitimacy, and support context-specific participatory frameworks. For practitioners, the findings underscore the value of designing participatory processes that respond to the varied conditions of urban communities.

By integrating empirical analysis with a theoretically grounded framework, this study offers new insights into the dynamics of digital inclusion and public participation, contributing to broader debates on equitable urban governance in the digital age.

Declaration

I, Lerato Tlale, declare that this report is my own, unaided work. It is being submitted for the degree of Master of Arts in the field of e-Science at the University of the Witwatersrand, Johannesburg. It has not been submitted for any degree or examination at any other university.

X

Lerato Tlale

Acknowledgements

2 Bakorinthe 4:8-9

"Re petetsoe ka mahlakoreng 'ohle, empa ha re hatelloe; re ferekane, empa ha re tsielehe; re hlorisoa, empa ha re lahloe; re akhotsoa fatše, empa ha re timetsoe."

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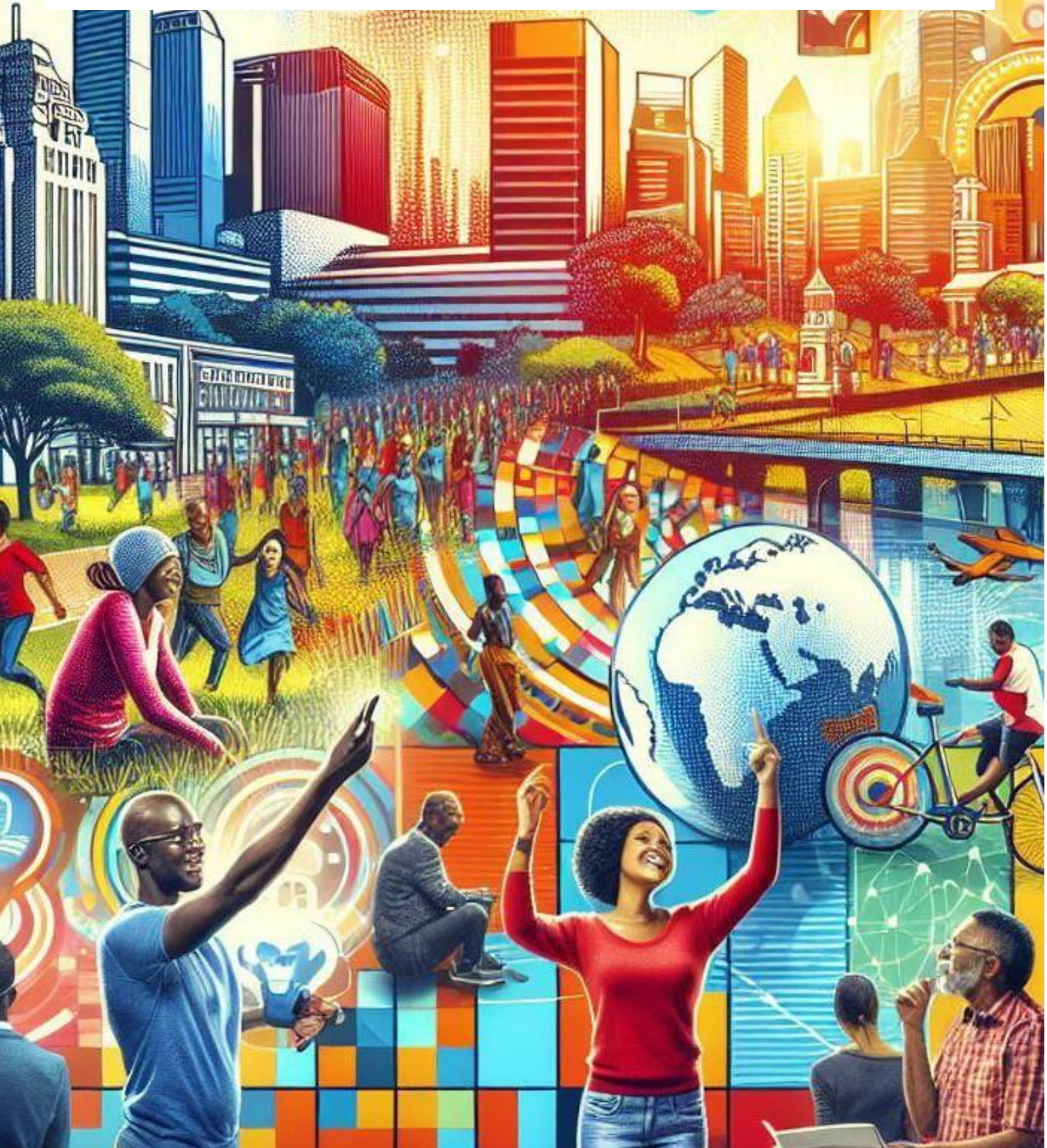
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Chapter One

Plugging Into Participation: Navigating Collaboration in the Age of Technology



1.1. Introduction

"The evolving technology is bound to be used somehow, for good or ill, and can be used to damage democratic values and the democratic process or promote them."(Mathe, 2022; 7).

Public participation has a long history in urban planning and is an essential part of the planning process (Foroughi et al., 2023; Echendu, 2023). In the realm of urban planning, citizens have an incentive to actively participate in these processes, as these actions wield a direct impact on their daily livelihoods (Hovik *et al.*, 2022). Therefore, residents are not merely participants in the planning process; their engagement extends to and acts as a catalyst for fostering innovation, creating cultural value, and cultivating a shared identity (Foroughi *et al*., 2023).

Described as the basic principle of our democracy (Papa, 2016); historically, the effectiveness of public participation is influenced by factors such as socio-economic status, education level, political efficacy, institutional trust, and power imbalances. (Senior *et al*., 2023). There is a range of perspectives on the concept of participation and the methods to achieve it across various disciplines. Participation, according to Lucky (2016), then encompasses a rich notion which varies in definition as well as application.

The advent of information and communications and digital technologies has introduced new dynamics into the participatory landscape, offering novel avenues for political engagement and mobilization. Digital platforms designed to support participation often replicate traditional methods and seldom utilise the opportunities provided by technology, typically offering only one-way information. (Wilson *et al*., 2019).

Echendu (2023) states that public participation can only be grasped, measured or gauged within the distinct decision-making environment it is observed in. Thus, as the quantification of public participation is inherently context-specific, this research aims to delve into this process within the South African context. In South Africa, public participation is woven into the fabric of various policies and legislation, forming a dynamic landscape where community engagement is not only encouraged but mandated[1].

This study adopts an eScience approach, employing statistical methods to delve into data-driven research across the social sciences, urban planning, and governance

[1] Tshooe (2015) highlights the obligation by referencing Chapter 7 of the Constitution of the Republic of South Africa, 1996, which outlines local government's mandate to promote community engagement and participation (Section 152(1)(e)). This commitment is further detailed in the Local Government: Municipal Systems Act, 32 of 2000, which requires municipalities to foster a culture of community participation and establish suitable mechanisms, processes, and procedures to support it.

domains. Examining the impact of information technologies on public participation in the Gauteng City Region contributes to the interdisciplinary field of data science. Through this exploration, the study aims to explore the dynamics of citizen engagement, offering insights into the association between technology and participatory practices.

1.2. Problem Statement

In South Africa, despite the legal prescripts[2] mandating public participation in processes of decision-making, there is a gap between intentions and implementation realities. This gap presents an opportunity to address longstanding challenges such as access to information, unequal power dynamics and lack of representation. The present predicament is such that social and political dynamics can either support or impede innovation in participatory practices (Mathe, 2022). Applicable factors in the South African context can include but do not exclusively include trust in political and social institutions, civic duty, political interest and technological privileges or access (Human Sciences Research Council, 2021).

While social theorists such as Castells (2006) point out that technology alone cannot ensure the transformation of political systems and democratic processes, it is crucial to note that positive social and political will is critical in determining the success of technology for democratic goals. For example, according to Mathe (2022), philosophers of the technological construction of society are of the belief that socio-political constraints hinder the effective use of technology for promoting sustainable democracy.

Thus, this research proposal holds that it is critical to investigate the potential and impacts that technology can have on participation practices, while taking into account the aspects that influence their efficacy. Through such innovative approaches to citizen participation, there is the potential to explore the transformative potential of information technologies in advancing democratic values, promoting social inclusion, and shaping more equitable urban futures.

[2] Since 2006, courts have examined the right to participate in legislative processes. In Doctors for Life International v Speaker of the National Assembly, the Constitutional Court provided historical and international context for this right. It traced its development from the Magna Carta to recent constitutions in Tanzania, Portugal, and Colombia. The Court also referenced various international and regional human rights instruments, concluding that the right to political participation includes the duty to facilitate public involvement. In South Africa, "involvement" and "participation" are used interchangeably, as indicated in sections 59(1)(a) and 72(1)(a) of the Constitution, which refer to the "facilitation of involvement" in legislative processes.

1.3. Developing an Inquiry

To assist in uncovering the interplay between information technologies, social and political dynamics, and public participation in the Gauteng City Region, with the goal of increasing awareness around opportunities to foster more inclusive and equitable democratic processes the following research question and sub-questions are proposed:

In what ways do access to information technologies influence public participation in the Gauteng City Region?

Sub-questions:

- How do social, political, demographic, and geographical factors shape the influence of information technologies on public participation in the Gauteng City Region?
- What is the statistical relationship between access to information technologies and levels of public participation in the Gauteng City Region?

1.4. Aim and Rationale

The aim of this study is to explore the ways in which information technologies influence public participation in the Gauteng City Region. While recognising the complexities of this multifaceted issue, this research study aims to provide insights that aid in comprehending the dynamics between technology, social as well as political factors, as well as public participation. By addressing the research question and sub-questions, this study seeks to examine the interaction between public participation as well as information technology, along with the existing social and political dynamics.

This study is motivated by the need to bridge the gap in quantitative research within the field of urban planning, which has traditionally been dominated by qualitative studies. By adopting a quantitative approach, this paper seeks to complement existing knowledge in a new context. Furthermore, as technological innovations continue to reshape our societies, there is a pressing need to better understand how traditional practices, such as public participation, are influenced by these changes. By shedding light on the interplay between information technologies, social and political factors, and public participation, this study hopes to help inform more effective and responsive urban planning practices amidst evolving challenges and opportunities.

1.5. Plotting the Course: A Chapter-by-Chapter Breakdown

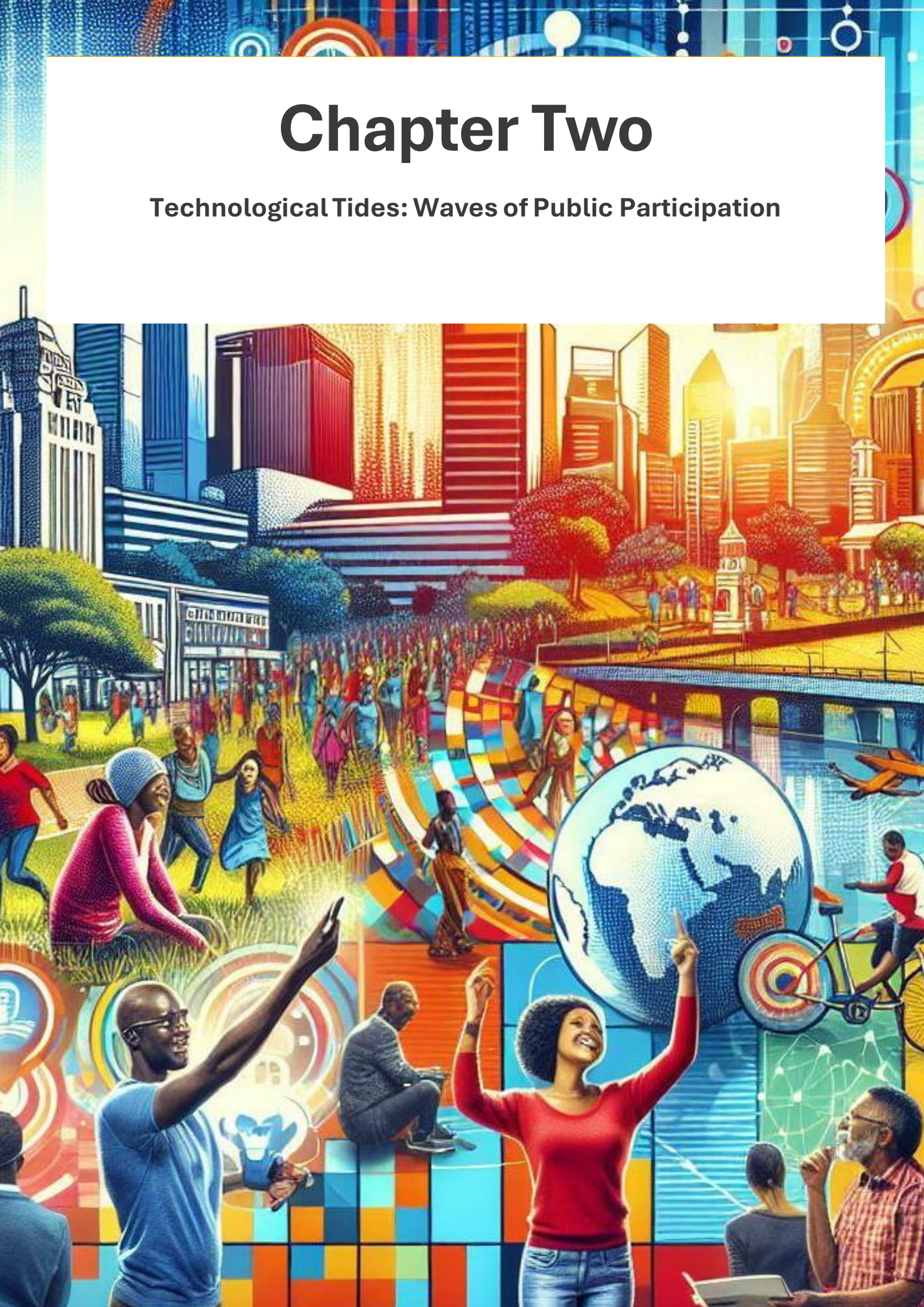
This research report is structured into five chapters, each building on the next to investigate the role of technology in shaping public participation in South African municipalities. Chapter Two, *Technological Tides: Waves of Public Participation*, reviews literature surrounding public participation, with a focus on its development in South Africa. The chapter reflects on current technological trends shaping participation in Gauteng and explores theoretical perspectives that frame this digital evolution. Chapter Three, *Unveiling the Dynamics: Methodological Approaches to Understanding Technology's Role in Public Participation*, outlines the research design and methodology. It introduces the dataset, details the process of data preparation, and explains the variables selected for quantitative analysis. Chapter Four, *Connecting the Dots – The Link Between Access and Action*, presents the key findings from the statistical analysis. It interprets these results in relation to the research questions and offers a discussion that highlights patterns and their potential implications. Chapter Five, *The Final Click – Wrapping Up the Digital Dialogue*, concludes the report by revisiting the main questions, reflecting on the study's contributions, and considering the implications for policy, planning practice, and future research.

1.6. Conclusion

In conclusion, this study seeks to unpack the complex and evolving relationship between information technologies and public participation in the Gauteng City Region context. By examining the interplay of technological access, social and political factors, and participatory practices, the study aims to address gaps in both knowledge and practice. The potential for information technologies to foster more inclusive, transparent, and democratic processes in urban planning remains immense, yet it requires careful consideration of the socio-political dynamics that shape their effectiveness. As this study investigates the statistical relationship between technology access as well as public participation, it aims not only to contribute to the body of knowledge in urban planning but also to offer practical insights for policymakers and practitioners in South Africa and beyond. Through a data-driven approach, this research endeavours to provide further understanding of how technology can be leveraged to create more equitable urban futures, ultimately promoting social inclusion, democratic engagement, and the advancement of sustainable urban development.

Chapter Two

Technological Tides: Waves of Public Participation



2.1. Introduction

Public participation has increasingly become a cornerstone of democratic governance and developmental policymaking worldwide. The integration of participatory mechanisms into decision-making processes aims not only to enhance service delivery but also to empower historically marginalised voices. Its importance lies in the ability to narrow the divide between governments and the communities they serve, creating spaces for dialogue, collaboration, and accountability. In South Africa, public participation carries weight due to the country's unique socio-political history and ongoing struggles to foster inclusive governance. The integration of participatory mechanisms into decision-making processes aims not only to enhance service delivery but also to empower historically marginalised voices.

This chapter explores the nature of public participation, its theoretical underpinnings, and its practical application in South Africa. It delves into the barriers that hinder citizen engagement, from socio-economic disparities to digital divides, while also examining the transformative potential of digital tools in fostering inclusive participation. By drawing on critical and networked governance theories, the analysis situates public participation within broader democratic projects, emphasising its role in addressing systemic inequalities and strengthening trust in government institutions.

Through a synthesis of empirical evidence and theoretical insights, the discussion highlights the potential of participation mechanisms - both traditional and digital - to either reinforce or dismantle power dynamics. The chapter ultimately seeks to provide further knowledge of public participation, pivotal to achieving responsive and equitable governance.

2.2. The Magnitude of Public Participation: Why the Fuss?

2.2.1. Defining Public Participation: What, Why, and How?

Public participation has emerged as a central tool in developmental processes, reflecting its widely accepted role in fostering more inclusive governance (Andani, 2017). Piper and Von Lieres (2008) emphasise that involving the public yields enhanced outcomes, not only by fostering informed and high-quality deliberation but also by securing stronger support through shared ownership of projects. Furthermore, Harrison *et al*. (2008) and Winkler (2011) argue that participation retains a long-standing significance as an institutional directive and as an essential instrument for achieving the aims of developmental local governance. Echoing these sentiments, recognises public

participation as an essential means for citizens to ensure the political system reflects their shared intent.

Defining public participation, however, presents challenges due to its complex, multifaceted nature (Khoza, 2023; Maphazi *et al.,* 2013). The lack of a single, definitive outline is evident in the varying interpretations of the concept. According to Arnstein (1969), through public participation, civil society can actively participate in and influence decision-making. Defining public participation in this way places an emphasis on the power interactions among citizens as well as the government, as well as how civil society are empowered and have their interests taken into consideration. Armitage (1988) describes public participation as the process where civil society takes responsibility for community changes, responds to concerns, and expresses opinions on decisions affecting their livelihoods. Public participation addresses the traditional powerlessness felt by civil society in influencing government decisions (Papa, 2016).

Meyer and Theron (2000) define public participation as including community involvement in decision-making, program implementation, and evaluation. Creighton (2005) describes it as the process of integrating public concerns, needs, and values into governmental and corporate decisions. Similarly, Nsingo and Kuye (2005) describe public participation as a method for communities to engage in the economic and political activities of their regions, thus contributing to decision-making processes. Ababio (2004) expands this definition, stating that participation involves collaboration among community members, government entities, local businesses, community-based organisations, and NGOs to influence decisions affecting community development and local governance outcomes.

Nonetheless as Roefs and Liebenberg (1999) caution, the inclination to participate does not always translate into action due to various barriers. Their analysis suggests that participation is more likely among individuals who trust the government, a relationship supported by current research on South African public engagement. A 2015 study by the South African Local Government Association (SALGA) acknowledged that fifty-one percent of respondents desired stronger public participation mechanisms at the municipal level. Similarly, the 2015 South African Social Attitudes Survey (SASAS) showed that nearly half (49.2 percent) of South Africans harboured distrust toward their local government, highlighting a scepticism that continues to hinder public engagement. The Institute for Public Policy Research (IPPR) underscores this connection, asserting that political trust is foundational to effective governance, as it fosters cohesion and smoothens policy-making processes.

The erosion of trust in government, as demonstrated by declining political engagement rates (Masiya *et al.*, 2019), reaffirms Roefs and Liebenberg's observations on the significance of trust in facilitating participation. Despite the passage of time, these insights remain highly relevant, particularly in South Africa’s socio-political landscape.

Contemporary political scientists, including Devine (2024), further emphasise the pivotal role of political trust, linking it to essential outcomes such as voter turnout and policy compliance. For instance, a 2015 study by the market research firm Institut de Publique Sondage d'Opinion Secteur (IPSOS) found that only fourty-percent of South Africans trust the state with providing public services (IPSOS, 2016). Thus, while Roefs and Liebenberg's observations date back to the 1990s, their applicability endures, shedding light on the persistent challenges of promoting public participation in South Africa.

2.2.2. From the Ground up: Public Participation in South Africa

The White Paper on Local Government (1998) states that South African municipalities, being the closest level of government to communities (Public Service Commission, 2009), should play a developmental role by collaborating with citizens and community groups to find sustainable solutions for their social, economic, and material needs, thereby improving their quality of life. Development planning is expected to involve close cooperation between municipal councils and community representatives to address concerns and take appropriate actions. However, Ouwencamp and van der Waldt (2024) argue that the reality in South African local municipalities falls short of this ideal. The prevalence of self-mobilisation and negative audit reports suggests that communities feel disconnected from local development planning processes and that municipal councils are not sufficiently responsive to their needs and concerns (Ouwencamp and van der Waldt, 2024).

Roefs and Liebenberg (1999) state that the perception that public participation, particularly in political realms, tends to skew towards the engagement of affluent segments of society, reflecting an elitist bias. Van Donk (2014) asserts that impoverished South Africans have minimal influence in local development processes that directly affect them. This highlights the need to explore ways to enhance public participation as a means to promote citizen-focused service delivery. Pandeya (2015), who argues that a theoretical perspective on public participation is that it serves as a vital avenue for amplifying the voices of marginalised communities, enabling them to assert influence and advocate for their interests within broader institutional frameworks. Bobbio (2019) expands on this perspective, highlighting various social biases that shape participatory dynamics, including disparities based on socio-economic status, educational attainment, and time availability. Additionally, findings from Phillip and Abdillahi's (2003) study suggest a correlation between household income levels and the extent of community participation, with higher income households exhibiting a greater propensity for engagement. Consequently, Papa (2016) argues that poverty and its associated constraints can act as formidable barriers to effective public participation, inhibiting the involvement of economically disadvantaged individuals in developmental initiatives.

Thus, it becomes evident that socio-economic factors exert a profound influence on the nature and extent of public participation, with lower income levels often serving as a

deterrent to active engagement in community affairs. Madumo (2014) contends that public participation encounters structural challenges, specifically concerning the mechanisms that could be employed to enhance it. The propensity for participation is also contingent upon citizens' familiarity with government policies and legislation, as well as a citizen's inclination to have a strong affiliation to a particular political party (Roefs and Liebenberg, 1999). Montja (2023) adds that remaining aware of who to hold accountable results in increased transparency by the government. The same can be said for increased knowledge corresponding to greater willingness among respondents to engage in participatory efforts. Consequently, as posited by Roefs and Liebenberg (1999), the correlation between participation and knowledge can be interpreted in dual ways: firstly, knowledge serves as a facilitator and motivator for participation, and secondly, participation contributes to individuals' understanding of policy-making processes and institutional frameworks.

2.3. Measuring Participation in the Digital Era

2.3.1. Click, Connect, and Contribute: The Digital Evolution of Public Participation

Public participation is a dynamic concept that varies across contexts, reflecting the diversity of engagement mechanisms and their adaptability to specific needs (Li et al., 2020). Recent technological advancements have profoundly reshaped participation channels, expanding opportunities for citizen engagement through digital platforms (Steinbach et al., 2019). This shift is particularly relevant in Gauteng, South Africa, where digital transformation is emerging as a critical tool to address longstanding gaps in public participation processes.

The South African Constitutional Court has repeatedly highlighted deficiencies in the legislative sector's ability to fulfil its constitutional mandate for public engagement. Recent seminars have called for accelerated adoption of digital tools to enhance participatory governance (Molepo, 2023). Despite this, barriers persist, including limited internet access and digital literacy, with only thirty-seven percent of South African households reporting consistent online connectivity via mobile phones or computers (Molepo, 2023). These disparities highlight the urgent need for inclusive digital strategies to ensure equitable access to participation platforms, particularly for marginalised groups.

Globally, local governments are embracing digital transformation to provide 24/7 public services more efficiently (Scupola & Mergel, 2022; Ahn & Chen, 2022). For South Africa, this transformation extends beyond service delivery to include bridging the gap between citizens' expectations and actual governmental performance (Alkraiji & Ameen, 2022).

This requires integrating digital participation tools into governance to address discrepancies and foster more transparent and responsive systems (Sanina et al., 2023).

The use of digital tools to enhance public participation is increasingly supported by empirical evidence. Crowdsourcing, for example, has proven effective in urban planning initiatives in South Africa, such as in Mangaung, where community members actively contributed to policymaking (Sinxadi, 2020). Similarly, international studies show that crowdsourcing has facilitated citizen engagement in fields like urban development, medicine, and journalism, underscoring its versatility and potential for participatory governance (Nguyen *et al.*, 2016).

While crowdsourcing offers innovative participation opportunities, its success hinges on technical and conceptual conditions. Brabham (2013) argues that digital platforms enable creative and interactive spaces, fostering collaboration between citizens and planners. However, Mokhele and De Beer (2007) caution that these tools must be inclusively implemented to empower citizens and ensure meaningful engagement. When effectively utilised, digital participation can enhance the standard of living in marginalised communities by fostering social innovation and access to information.

2.3.2. Comparative Analysis: E-Participation Versus Traditional Methods

The comparison between digital and traditional participation methods reveals distinct advantages and limitations. Traditional approaches, such as public hearings and citizen panels, often face criticism for their resource-intensive nature and restricted accessibility due to fixed schedules and locations (Kolsaker & Lee-Kelley, 2006). In contrast, digital tools, including ICT and social media, offer greater flexibility and reach, enabling real-time interaction between citizens and decision-makers (Hopkins, 2011).

Digital platforms, however, remain underutilised in South Africa, with adoption rates for higher-order tasks such as content generation and online transactions lagging behind global trends (Ramirez-Madrid et al., 2024). This suggests a need for further studies to understand citizens' intentions to adopt e-government systems, particularly at the municipal level (Abdurahman & Kabanda, 2024; Galushi & Malatji, 2022). Despite these challenges, e-participation holds promise for fostering inclusive governance by bridging the gap between policy frameworks and citizen expectations.

As digital transformation continues to reshape public participation in Gauteng, its potential to foster more inclusive and effective governance becomes increasingly apparent. By addressing barriers such as digital literacy and access, and integrating empirical insights from successful case studies, policymakers can leverage technology to enhance citizen engagement. The challenge remains to situate new forms of participation within broader democratic projects, ensuring that digital tools complement

traditional methods while expanding their reach and impact (Netshirando et al., 2024). Figure 1, adapted from Li et al. (2020), illustrates how public participation in urban planning is influenced by various factors, including the scale, stage, and scope of the planning process, the characteristics of available ICT platforms, and the level of online engagement. The diagram conveys that, while there is always an intention to facilitate public participation in urban planning, social demographics remain a constant determinant in shaping this process. Specifically, social demographics influence, first, the scale of the required urban planning intervention and the level of social engagement needed. Secondly, although municipalities may seek to involve all citizens through e-participation, the extent to which individuals can engage is contingent upon their access to the necessary digital technologies.

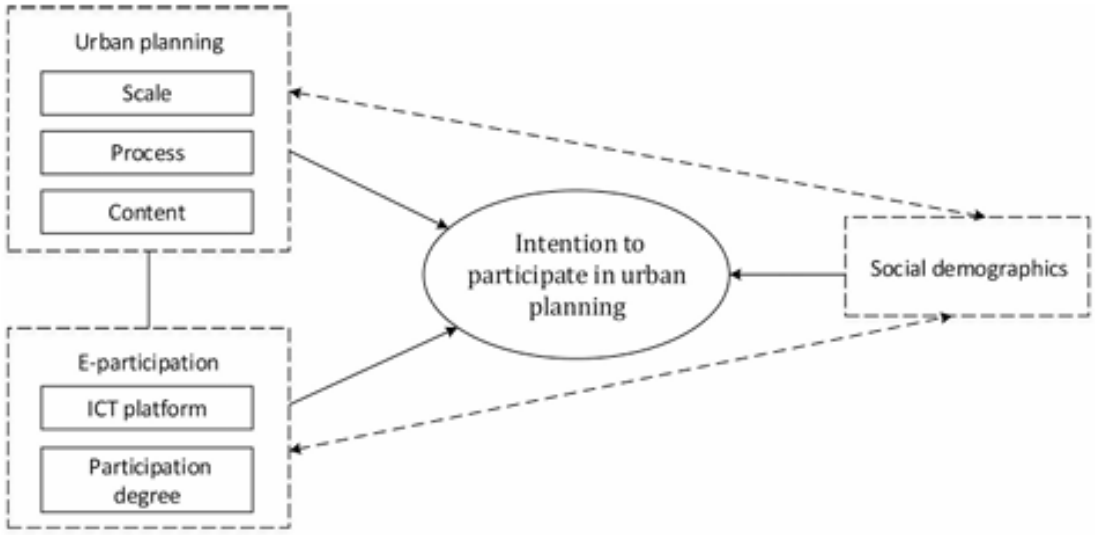


Figure 1:Conceptual Framework by Li et al. (2020): Factors Influencing Public Participation, including Urban Planning Scale, Stage, Content, ICT Platform Characteristics, and Online Engagement Levels.

2.4. Theoretical Framework: Interpreting the Interface

2.4.1. Critical Theory and Information Technologies

Critical theory, rooted in the work of Marx and later developed by Horkheimer and the Frankfurt School, serves as a vital lens for analysing power structures and systemic injustices within societal frameworks (Nickerson, 2023). It engages with the emancipatory aspirations of social and political movements, exploring the intersection of ethics, history, and political philosophy (Celikates & Flynn, 2023). In the context of municipal governance, critical theory highlights how authorities often act as gatekeepers, restricting resource flow and decision-making processes rather than empowering communities (Tshoose, 2015). This analytical framework becomes especially relevant when applied to information technologies, which serve as both tools of empowerment and mechanisms for perpetuating power imbalances.

Information technologies, in alignment with the aims of critical theory, hold the potential to democratise access to information and amplify marginalised voices, challenging dominant narratives and fostering more inclusive political discourse (Feenberg, 2008). However, the efficacy of these technologies in achieving inclusiveness and deliberation depends on their implementation within participatory frameworks. Digital tools can perpetuate traditional power dynamics unless carefully managed to ensure inclusivity and citizen empowerment (Ellison & Hardey, 2014; Lidén, 2016).

2.4.2. Networked Governance Theory

In the realm of governance, the theory of networked governance underscores the significance of collaboration and interconnectivity among diverse stakeholders, including governmental bodies, civil society organizations, and private sector entities, in tackling societal issues (Mashiteng et al., 2021). Within the context of this study, this theoretical framework offers a lens through which to examine how information technologies facilitate the exchange of information, coordinate efforts, and co-produce public services, thereby shaping patterns of public participation and political decision-making.

Central to this discussion is the creation of participatory spaces, designed to empower ordinary citizens to engage with government and have their voices heard (Tshoose, 2015). These spaces, when effectively constructed, not only strengthen the relationship between government and citizens but also enhance accountability among all stakeholders, including government representatives, civil society, and citizens (Tshoose, 2015). However, the construction of participatory spaces is not without its complexities. It is acknowledged that the creation of such spaces inherently involves power dynamics (Kerfoot, 2011; Steyn, 2011). These spaces can either serve as platforms for meaningful citizen engagement in shaping public policy debates or merely act as superficial tools through which authorities legitimise preconceived decisions (Kerfoot, 2011; Steyn, 2011). The critical concern then arises regarding the shaping of these participatory spaces and who holds the power to influence their structure and functioning (Escobar, 2011). Such debates intersect with broader discussions about the distribution of critical social, political, and economic power within society (Escobar, 2011).

Therefore, the linkage between theory and practice becomes evident. Networked governance theory provides a conceptual framework for understanding the dynamics of collaborative governance, while the practical implementation of participatory spaces embodies the principles of this theory. However, power and control over these spaces underscore the importance of critical analysis and ongoing examination of their effectiveness in fostering genuine citizen engagement and democratic decision-making processes.

2.4.3. Analysing Public Participation via Digital Tools

Public participation, as framed by critical theory, involves interrogating the breadth, type, and impact of citizen involvement (Fung, 2006, 2015; Newig et al., 2018). Hovik and Giannoumis (2022) outline three dimensions of participation: the extent to which diverse citizen groups are involved, the nature of communication (one-way or two-way), and the influence of citizen input on policy decisions. These dimensions provide a basis for assessing whether digital participation fosters inclusiveness, deliberation, and popular control, aligning with critical theory's goal of dismantling systemic inequalities.

Digital tools for e-participation, while promising, often reflect the limitations of conventional participation methods, such as excluding politically marginalised groups and limiting the influence of citizen input on decision-making (Kneuer, 2016; Loader et al., 2014). As the United Nations (2020) distinguishes, e-consultation facilitates citizen contributions to policy discussions without granting decision-making authority, whereas e-decision-making incorporates citizens into policymaking processes. The disparity between these models underscores the challenges of realising the democratic potential of digital technologies.

Institutional factors, such as public administration styles and cultural norms, influence the uptake and effectiveness of e-participation practices (Hovik & Giannoumis, 2022). Citizens often prefer participation channels they control, highlighting the need for flexible and citizen-driven digital platforms (Loader et al., 2014). Without such considerations, the risk remains that digital tools will serve as mere instruments of tokenism rather than catalysts for genuine engagement (Sundberg & Gidlund, 2022).

2.4.4. Information Technologies in Municipal Governance

Empirical evidence demonstrates the dual potential of information technologies in municipal governance to mitigate or exacerbate power imbalances. For instance, e-participation has shown promise in enhancing communication between governments and citizens, contributing to broader goals of digital democracy (Shihab et al., 2021; Choi & Song, 2020). However, it remains susceptible to the same weaknesses as traditional participation methods, such as limited inclusion of marginalised voices and superficial engagement (Ellison & Hardey, 2014).

Sundberg and Gidlund (2022) found that many participatory activities facilitated by digital tools tend towards tokenism, with forms of citizen engagement conspicuously absent. Similarly, the structural characteristics of political systems influence whether these technologies empower citizens or reinforce existing hierarchies (Hovik & Giannoumis, 2022). Figure 2 is a diagram developed to illustrate that, while each city has distinct systemic characteristics, these traits influence the extent to which stakeholders participate in urban processes. However, these systems may never be entirely sufficient and must continuously evolve to accommodate the diverse needs and requirements of

all stakeholders. By examining these dynamics through a critical theory lens, it becomes evident that information technologies must be intentionally designed to promote genuine dialogue and equitable decision-making.

Despite these challenges, case studies highlight the transformative potential of digital tools when used effectively. For example, participatory platforms that allow citizens to co-produce policies and services can disrupt traditional power structures and facilitate democratic outcomes (United Nations, 2020). The extent to which these tools enable two-way communication and impactful citizen input ultimately determines their role in either mitigating or exacerbating societal inequities.

The intersection of critical theory and information technologies provides a compelling framework for understanding public participation in municipal governance. While digital tools offer potential for fostering inclusiveness and amplifying marginalised voices, their efficacy depends on addressing systemic barriers and ensuring meaningful citizen involvement. By integrating critical theory into the analysis of digital participation, policymakers and scholars can better navigate the complexities of power dynamics and strive towards more equitable governance structures.

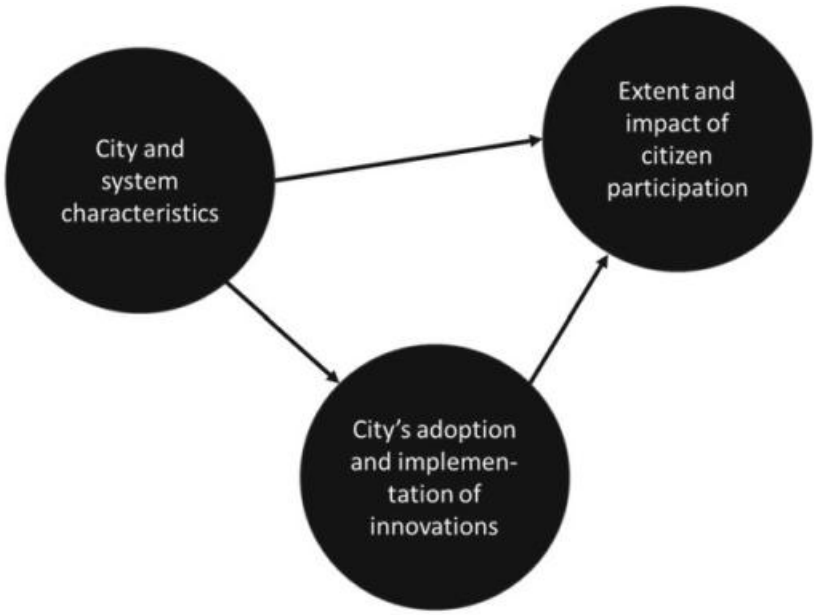


Figure 2: Key Concepts and Relationships in Citizen Participation: Hovik & Giannoumis' (2022) Model.

2.5. Conclusion

In conclusion, this literature review has shed light on the evolving discourse surrounding public participation in South Africa, tracing its roots in communicative and collaborative planning theories to its current manifestation in efforts to institutionalize mechanisms for citizen engagement within local governance structures. Through the lens of critical

theory and networked governance theory, this study has elucidated the complexities inherent in the pursuit of inclusive and democratic forms of urban governance. The conceptual framework developed herein highlights the interplay between theoretical constructs and practical realities (figure 3). This theoretical framework, coupled with analyses of information technologies and municipal governance, provides a potent tool for understanding and addressing societal inequalities. The framework aims to highlight the various issues that are fundamental to public participation. As discussed throughout the literature review, social and geographical demographics, along with citizens' trust in political and governance processes, are crucial factors that determine individuals' ability to participate and have their voices heard. However, the increasing reliance on technology and its adoption by municipalities to facilitate public participation forums, intended to enable universal engagement, is inherently flawed. Many individuals, if not the majority, lack access to the necessary technology. Therefore, the conceptual framework seeks to demonstrate that, while participatory processes are central to society and governance, the use of technology to enhance these processes remains limited due to disparities in access.

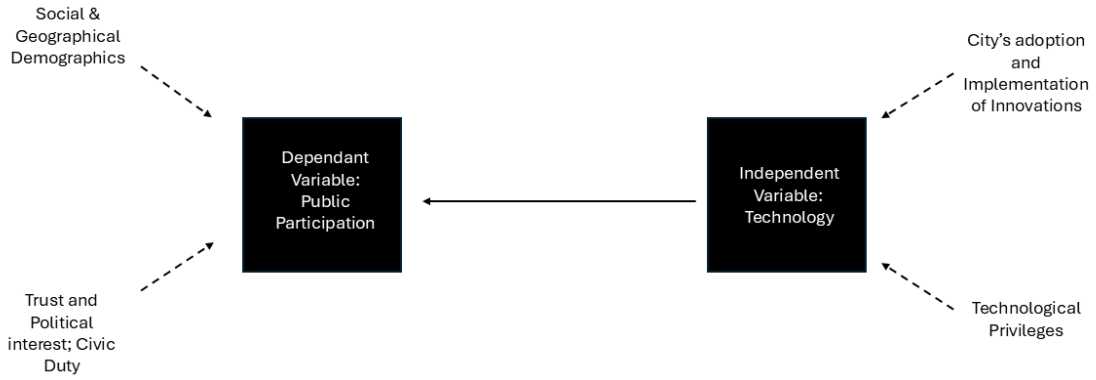
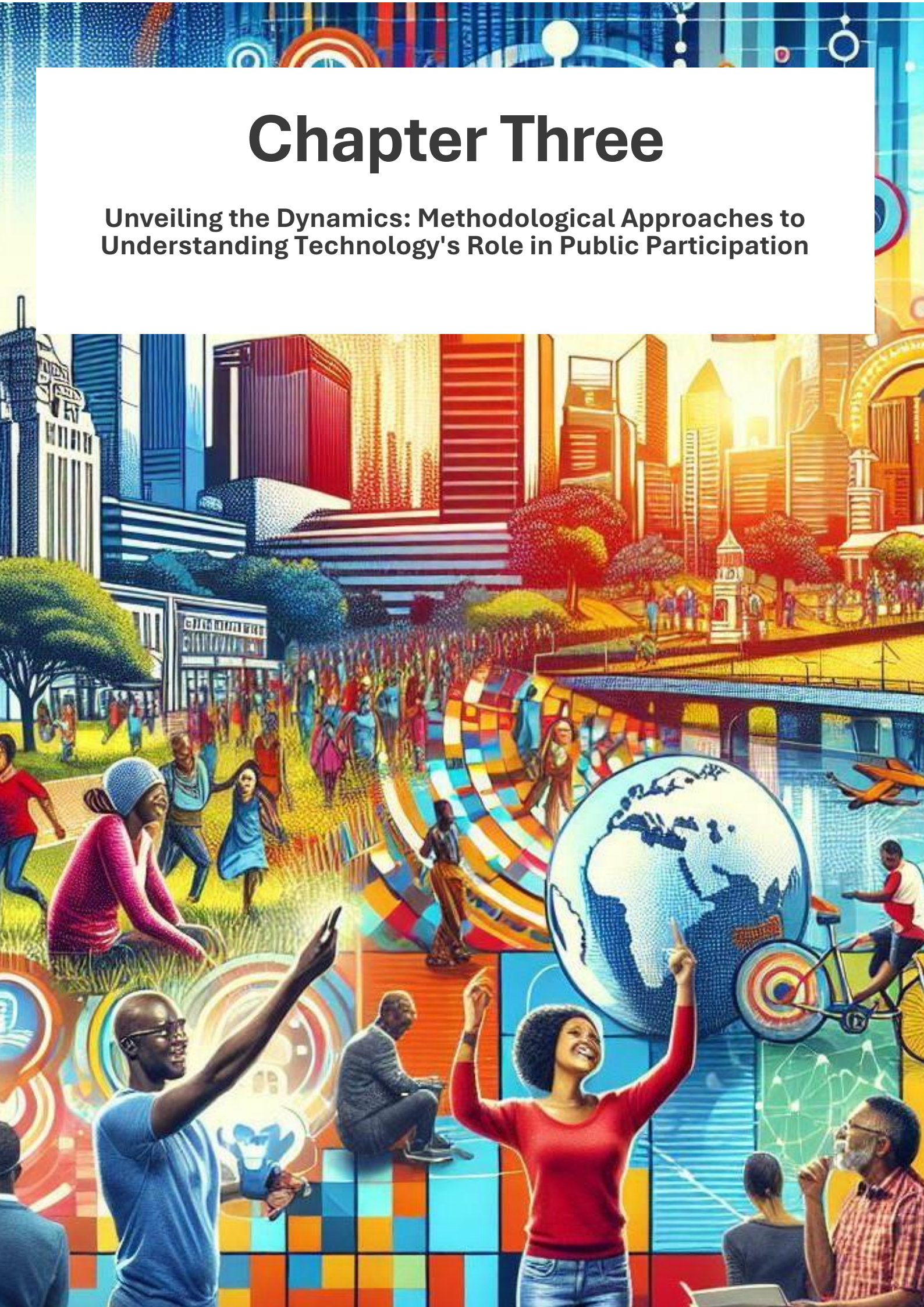


Figure 3: Conceptual Framework depicting the interplay between information technologies, social and political factors, and public participation in the Gauteng City Region (Source: Author, 2024).

Chapter Three

Unveiling the Dynamics: Methodological Approaches to Understanding Technology's Role in Public Participation



3.1. Introduction

In the pursuit of unravelling the complexities of public participation in the digital age, this chapter outlines the foundational methodology that guides the research. The question at the heart of this study, how information technologies shape the way citizens participate with the political and social fabric of the Gauteng City-Region, demands a methodological approach that is both rigorous and adaptive. Here, we delve into the strategic collection of data, the selection of appropriate variables, and the ethical considerations that inform the integrity of this work. Each step in this process, from choosing the GCRO Quality of Life Survey to constructing a causal diagram of the relationships between variables, reflects an approach to uncovering the dynamics that influence public participation. The methodological choices presented here not only serve as the backbone for our analysis but also as the lens through which the influence of technology on public participation will be examined.

3.2. Data Collection Strategy

After deliberating on whether to analyse the influence of information technologies on public participation in South Africa from a national or municipal perspective, various options for accessing the required data were considered. One option was to utilise national-level datasets such as the South African Social Attitudes Survey (SASAS), the General Household Survey, or the Afrobarometer. Each of these datasets offers valuable insights into the socio-political landscape of South Africa, with the potential to inform our research question. However, after consideration of factors such as data availability, relevance to the research question, data resolution and ease of access, it was decided to focus on a municipal perspective and utilise the Gauteng City-Region Observatory's (GCRO) Quality of Life Survey[3].

The GCRO Quality of Life Survey is a biennial survey that comprehensively measures various aspects of quality of life, socio-economic circumstances, attitudes to service delivery, psycho-social attitudes, values, and other characteristics within the Gauteng Provincial Government administrative area. Drawing on 58 indicators from a range of questions measuring objective circumstances and subjective opinions, this dataset provides insights into the factors influencing public participation at the municipal level (Neethling, 2021). Moreover, the availability of demographic details, housing

[3] The Quality of Life survey data is publicly distributed under a CC BY 4.0 licence. The datasets can be accessed through University of Cape Town's DataFirst service or by contacting the GCRO directly. Quality of Life Survey 7 (2023/24) | GCRO

information, and household services data within the survey enhances its suitability for addressing our research question.

In utilising open-source data such as the GCRO Quality of Life Survey, ethical considerations play a crucial role. It is imperative to ensure the ethical use of data, including obtaining appropriate permissions for data access, maintaining data confidentiality and anonymity, and adhering to ethical guidelines for data analysis and reporting. Additionally, it is essential to acknowledge and respect the contributions of survey participants and the organizations responsible for collecting and managing the data. By upholding these ethical standards, we can ensure the integrity and validity of our research findings while respecting the rights and privacy of individuals within the dataset.

3.3. The Gauteng City-Region

The Gauteng City-Region represents an interconnected cluster of cities, towns, and urban hubs, forming the economic nucleus of South Africa. At its core lies Gauteng, the nation's smallest yet most densely populated province, encompassing Johannesburg, a former global centre of gold production and now the country's financial capital, and Pretoria, South Africa's administrative hub. Surrounding these major cities are additional commercial, industrial, and mining centres, including Germiston, Springs, Alberton, and Vereeniging, which collectively contribute to the region's economic dynamism (GCRO, 2025).

Beyond Gauteng's provincial boundaries, a broader urban network extends to areas such as Rustenburg, a centre for platinum mining, and Sasolburg, focused on coal-to-oil production. The region also includes former gold-mining towns like Potchefstroom and Klerksdorp, which have experienced economic stagnation. To the east, towns like Witbank, Middelburg, and Secunda thrive on coal mining, steel production, and energy generation. Meanwhile, the north-east semi-urban settlements, shaped by apartheid-era displacement, remain economically dependent on Gauteng through subsidised bus routes that enable long-distance commuting to Pretoria for thousands of workers (GCRO, 2025). The spatial distribution of these urban and economic linkages is illustrated in figure 4 below.

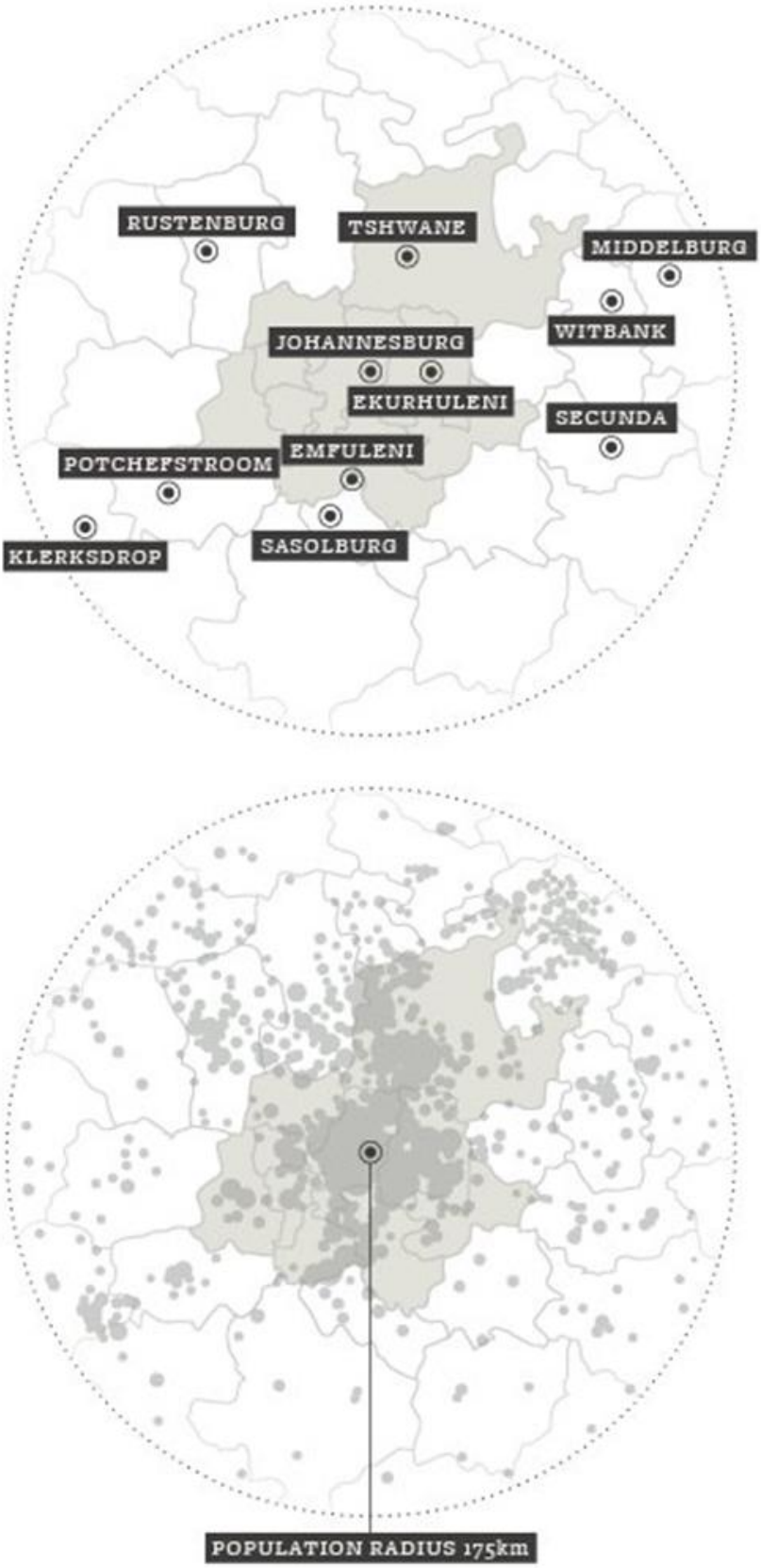


Figure 4: Maps depicting the composition of the Gauteng City-Region and the spatial distribution of its population across the broader region, based on 2011 Census data (GCRO, 2025).

3.4. Research Design

This study employs an explanatory research design to investigate and clarify the causal mechanisms underpinning the observed phenomena. Explanatory research, as defined by Trymata (2024) and Saunders *et al*. (2019), seeks to elucidate the reasons behind a phenomenon and to uncover the relationships between variables. Unlike exploratory research, which prioritises the identification of new aspects within a topic, explanatory studies aim to determine how and why specific variables influence one another (Trymata, 2024; Saunders *et al*. 2019). Central to this approach is the determination of causes and effects, often through post-facto analyses (Bhat, 2023; Neuman, 2014). By focusing on these causal relationships, explanatory research offers an enhanced understanding of the underlying mechanisms at play (Bhat, 2023).

In line with these objectives, this study relies on secondary research, drawing from an extensive selection of literature and published articles to establish a balanced and comprehensive understanding of the subject matter (Bhat, 2023; Neuman, 2014). The explanatory design further integrates statistical analysis and controlled experimentation to identify causal links, providing evidence-based explanations for the phenomena observed (Trymata, 2024; Saunders *et al*. 2019). While not always yielding conclusive results, explanatory research contributes to problem-solving by uncovering overlooked data and refining our grasp of the issue (Bhat, 2023; Neuman, 2014). The analytical process focuses on moderation analysis, which is conducted using regression techniques to examine the influence of the moderator variable on the relationship between the independent and dependent variables as illustrated in figure 5.

By adhering to this rigorous methodology, the study aims to advance both theoretical understanding and practical insights, leveraging a structured yet dynamic framework to answer critical research questions. This integrated approach ensures a methodical yet

flexible investigation, aligning with the overarching aim of illuminating complex interdependencies between the variables under scrutiny.

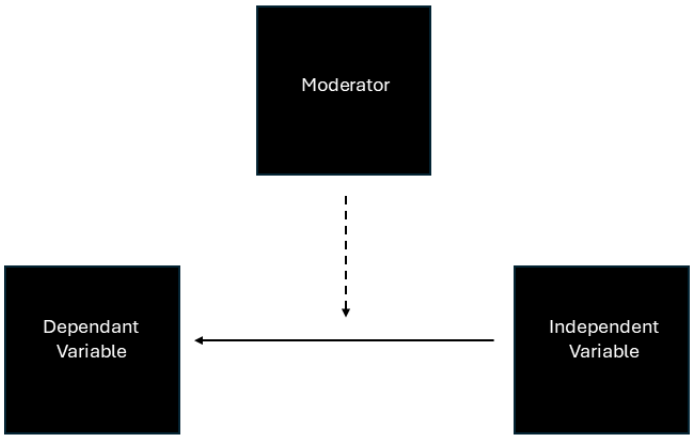


Figure 5: Moderator Effect: an illustration of the control variable or moderator impacting the relationship between the dependant and independent variable.(Source: Author 2024)

To effectively plan and conduct this study on the influence of information technologies on public participation in the Gauteng City Region, it is essential to clearly outline the variables and observations that will form the basis of the analysis. One useful approach for organizing these components is to conceptualise a matrix. This matrix serves as a visual representation for the data, guiding the study's efforts to compile existing data. At its core, the matrix encapsulates the key elements of the research design, presenting the dependent variable, independent variables, interaction variables, as well as observations or cases specified in our study. By visualising this matrix, one can systematically identify the data requirements necessary to address the outlined research questions and ensure that the analysis is both thorough and methodologically sound.

Variable	**Description**
Dependent Variable	Level of public participation in decision-making
Independent Variable	Digital Access Capability Index - Information technology usage and access
Interaction Variables	Socio-economic status
	Government satisfaction
	Geographical factors: Municipality
	Socio-demographic factors: age, gender, socio-economic status

Table 1: Matrix serving as a comprehensive repository for data (Source: Author, 2024).

3.5. Analytical Framework and Index Construction

This study adopts a structured quantitative approach to assess the relationship between technological access and public participation in the Gauteng City-Region. The analytical framework is grounded in linear regression modelling, with a focus on moderation effects, to explore how the Digital Access Capability Index interacts with various contextual factors to shape public participation.

To enable this analysis, key constructs were operationalised through the construction of composite indices. These indices translate multi-dimensional survey data into measurable variables that reflect the lived realities of respondents. For example, the Digital Access Capability Index consolidates multiple indicators (such as internet access, smartphone ownership, and fibre connectivity) into a single continuous variable, capturing a holistic measure of technological availability. Similarly, variables for public participation, socio-economic status, and government satisfaction were adapted from the GCRO's established dimensions.[4]

The decision to construct indices was both theoretical and practical. Theoretically, this approach aligns with literature that emphasises the interconnected nature of digital inclusion and civic participation. Practically, it enables the simplification and quantification of complex social constructs into forms suitable for statistical analysis. Figure 5 in the preceding section visually illustrates the core relationships under investigation, positioning Digital Access Capability as the independent variable, public participation as the dependent variable, and various control and moderating variables, including socio-economic status, government satisfaction, and geography, as intervening factors. This model guides the statistical procedures employed in the subsequent analysis.

3.6. Analytical Methods

As deduced from the literature chapter of this report, the relationship between public participation and access to technology is complex, and so, this study includes control variables to better understand the complexities. In the context of a linear regression

[4] The socio-economic status, government satisfaction, and public participation indices were integrated directly from the GCRO Quality of Life Survey Round 7 (2023/24) without modification. According to Naidoo and de Kadt (2024), these indices were constructed by the GCRO using standardised procedures: multiple survey items were grouped by thematic domain, transformed into comparable scales, and then aggregated into composite scores. Specifically, each variable's items were rescaled, summed, and scaled to ensure consistent interpretability. Index internal consistency and weighting procedures are fully documented in the GCRO's *Quality of Life Index methodology* report.

model, control variables allow us to assess whether the impact of one predictor variable on the dependent variable shifts depending on the level of another predictor. This method enables us to explore the combined effects of multiple variables, rather than examining their contributions in isolation.

Control variables enable the analysis to move beyond the isolated effects of individual predictors and examine how the influence of one variable might depend on the levels of another. For instance, the impact of Digital Access Capability on public participation may vary depending on an individual's socio-economic status or trust in political institutions. By incorporating control variables, the model captures these dynamics, aligning with the study's objective to uncover insights into the interdependent factors shaping public engagement.

The study undertakes a moderation analysis to explore the relationships between continuous variables. Effect decomposition is applied, using linear regression to estimate the total association between these variables. In the following chapter, the report will delve into the implications of these findings, offering a comprehensive understanding of the complex dynamics between information technologies, socio-political factors, and public participation within the Gauteng City Region. Through this methodological framework, the study generates valuable insights that contribute to advancing knowledge in this field.

3.6.1. Rationale for Employing Linear Regression Models in the Analysis

Utilising a regression-based analysis for this study was driven by the need to quantitatively assess the relationship between technology access and public participation. Linear regression models were selected for their clarity and ease of interpretation, allowing for a straightforward analysis of how variations in an independent variable are associated with changes in the dependent variable.

However, given the potential influence of additional factors, a more refined analysis was required. To address these complexities, control variables were introduced into the regression model, which allowed for the examination of moderation effects.

Moderation, as outlined by Hayes (2013) and Muller Prado *et al*. (2014), refers to the influence of a third variable, termed the moderator, which affects the strength or direction of the relationship between an independent and a dependent variable. In this study, the moderator represents factors that may alter the intensity or nature of the connection between technology access and public participation.

3.6.2. Data Preparation Steps

This section outlines the preparation of data for this study. Each step was carefully designed to align with the research objectives and to facilitate the construction of meaningful variables and indexes. The following outlines the key steps undertaken:

1. Identifying Relevant Variables for the Digital Access Capability Index

   The first step involved identifying survey questions from the QoL Round 7 (2023/24) dataset that were conceptually and theoretically aligned with the construct of Digital Access Capability Index (refer to table 3). These questions formed the foundation for creating a composite index variable.

2. Recoding for Consistency

   Once the appropriate variables were selected, they were subjected to recoding to ensure consistency within the dataset. For example, binomial responses such as "Yes" and "No" were transformed into numerical equivalents of 1 and 0, respectively. This step was essential for enabling mathematical operations and ensuring the variables were prepared for aggregation and regression analysis.

3. Assessing Measures through a Correlation Matrix

   To justify the selection of variables for the new dimension, a correlation matrix was employed as indicated in Chapter Three (Table 3). This analytical tool allowed for the assessment of relationships among the selected variables, ensuring that they collectively represented a cohesive and meaningful dimension of Digital Access Capability.

4. Creating the Digital Access Capability Index (Independent Variable)

   A new index, named *Digital Access Capability Index*, was constructed in alignment with the methodology used for other GCRO dimensions. This process involved aggregating and weighting the selected variables from the dataset. The resulting index was rescaled and weighted to generate a dimension score out of ten, adhering to established GCRO practices (Naidoo & de Kadt, 2024).

5. Utilising Existing GCRO Dimensions for control variables

   For control variables, the study leveraged existing GCRO dimensions, integrating them into the analytical framework to unpack the complexities of the relationship between Digital Access Capability and public participation.

6. Handling Missing Data

Addressing missing data was a critical step to maintain the integrity of the analysis. Instances of missing values, identified across certain variables, were deemed to be

missing at random. These were imputed using the *missForest* package in R, a tool capable of imputing both continuous and categorical data. This approach ensured that the dataset was complete and ready for subsequent analyses (Naidoo & de Kadt, 2024).

3.7. By the Numbers: A Snapshot of the Data

Prior to investigating how access to information technologies influences public participation, it is essential to summarise the key characteristics of the dataset through descriptive statistics. Fabricant (2024) as well as Alabi and Bukola (2023) state that descriptive statistics ultimately serve as a tool to assist researchers to summarise and describe the main features of a dataset. Through descriptive statistics one is able to make sense of large datasets and make informed decisions on the rationale informing the data analysis as well as interpretation (Loeb, 2017). In executing the descriptive statistical step, this study outlines measures of central tendency and dispersion in Table 2 for each variable. Table 2 presents that Participation has the highest mean score (6.94), suggesting that individuals are generally engaged, and Government Satisfaction with the lowest (3.40), indicating possible widespread dissatisfaction. Socio-economic status is moderate, with a mean of 4.59, suggesting that respondents tend to fall slightly below the midpoint of the scale. Digital Access Capability Index is moderate to high, with a mean of 5.50, implying a relatively good level of technological availability. The standard deviation indicates the average distance of each data point form the mean. The highest standard deviation is observed for Socio-economic Status (2.70), suggesting greater variability in economic conditions among respondents. Government Satisfaction has the lowest standard deviation (2.45), implying that the survey respondents' opinions on government satisfaction are more closely clustered around the mean.

Variable	**N**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**	**Skewness**	**Skewness SE**
Socio-economic Status	13,185	0	10	4.59	2.70	0.64	0.02
Government Satisfaction	13,185	0	10	3.40	2.45	0.42	0.02
Participation	13,185	0	10	6.94	2.59	-0.42	0.02
Digital Access	13,774	0	10	5.50	2.53	-0.09	0.02

Variable	N	Minimum	Maximum	Mean	Standard Deviation	Skewness	Skewness SE
Capability Index							

Table 2: Descriptive Statistic of key variables. (Source: Author, 2024)

Regarding the distribution and skewness, a skewness value of 0 suggests a perfectly symmetrical distribution. Positive skewness indicates a longer right tail, while a negative skewness suggests a longer left tail. Table 2 provides the numerical representation of the distribution through the skewness values, and Figure 6 illustrates the distributions graphically. What is observed from both Table 2 and Figure 6 is:

1. Socio-economic Status (0.64) and Government Satisfaction (0.42) are both positively skewed.
2. Participation (-0.42) is negatively skewed
3. Digital Access Capability Index (-0.09) is close to zero, indicating a near-symmetrical distribution.

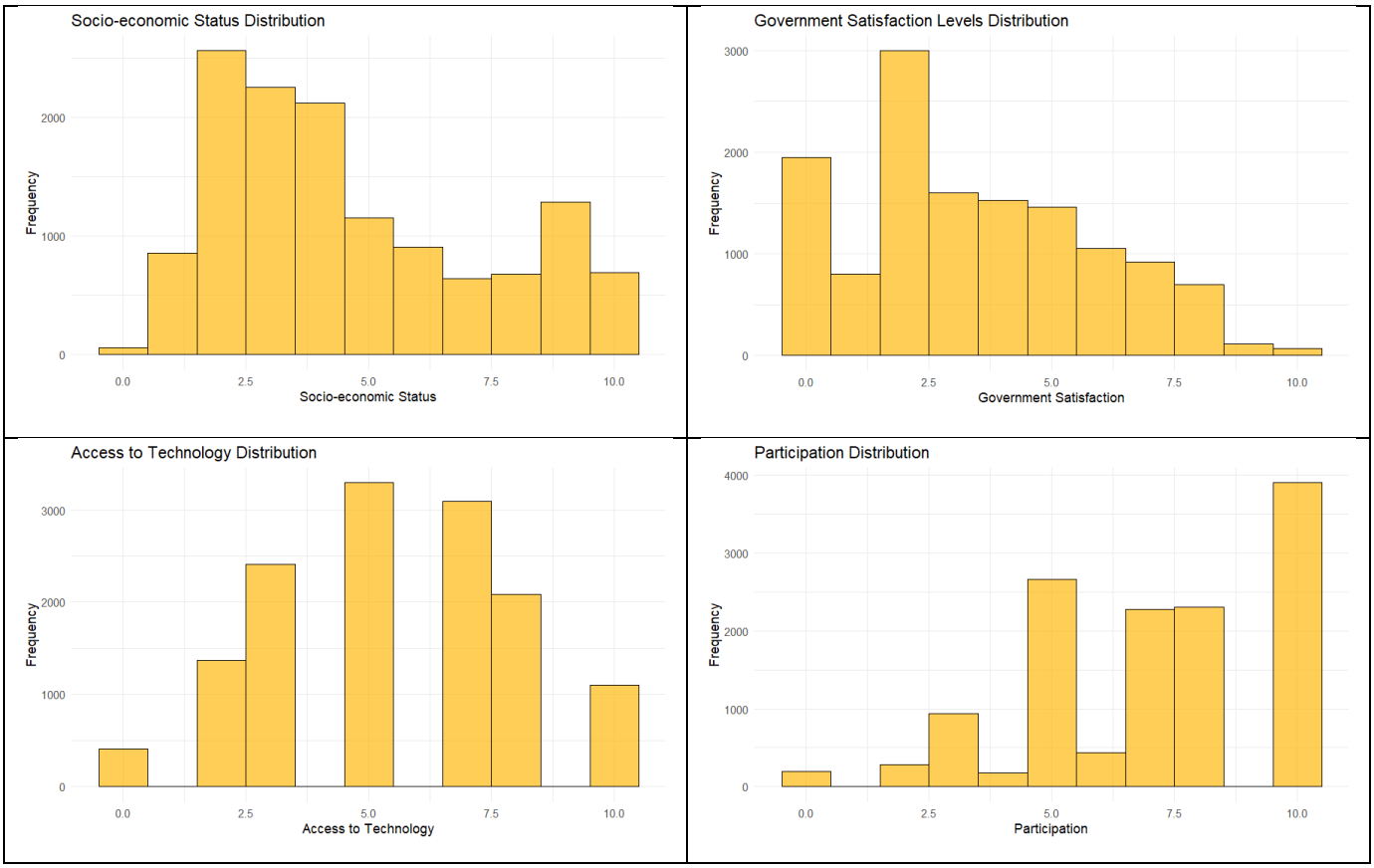


Figure 6: Distributions of key variables. (Source, Author, 2024)

3.7.1. Crafting the Core Variable: Unearthing Key Insights from the Survey

The correlation matrix presented in Table 3 empirically validates the grouping of variables included in the Digital Access Capability Index. Moderate to strong positive correlation between internet access and other variables such as computer ownership (0.291), fibre-based internet (0.238), and smartphone usage (0.593). These associations suggest a coherent conceptual relationship, as internet access is often facilitated and enhanced by the availability of technologies and devices. This highlights their integral role in defining the broader construct of technological accessibility.

The high correlation between smartphone ownership and internet access (0.593) further underscores the critical importance of smartphones as a primary gateway to the digital world, particularly in contexts where they may serve as the primary device for accessing online resources. Similarly, the strong association between computer ownership and fibre-based internet (0.495) demonstrates how connectivity and device usage are complementary dimensions of technological access, reinforcing the argument for their inclusion in the index.

Interestingly, the correlation matrix also reveals distinctions within the dataset, such as the near-zero correlation between traditional cellphone usage and other variables, along with a slight negative correlation with smartphone ownership (-0.103). This indicates that traditional cellphones may represent a separate, less advanced dimension of access. Including this variable within the index adds depth by recognising diverse forms of access, from basic to advanced, ensuring that the index captures the full spectrum of technological engagement.

Thus, the measures selected for the technology index collectively reflect a viable and multidimensional understanding of technological access. The correlations demonstrate how these variables are theoretically and empirically connected while also accounting for diversity in forms of access. Together, they form a well-justified framework for analysing access to technology (Digital Access Capability Index), ensuring the index's relevance and applicability to broader discussions on digital inclusion.

	q6_1_internet	q6_3_2_cell	q6_3_4_computer	q6_3_7_fibre_based_internet	q6_3_11_smartphone	q6_3_12_other_home_internet
q6_1_internet	1	-0.080	0.291	0.238	0.593	0.227
q6_3_2_cell	-0.080	1	0.016	0.034	-0.103	0.039
q6_3_4_computer	0.291	0.016	1	0.495	0.287	0.274
q6_3_7_fibre_based_internet	0.238	0.034	0.495	1	0.211	0.174
q6_3_11_smartphone	0.593	-0.103	0.287	0.211	1	0.239
q6_3_12_other_home_internet	0.227	0.039	0.274	0.174	0.239	1

Table 3: Correlation matrix illustrating the relationships between variables included in the technology index.

3.8. Justification of Control Variables

3.8.1. Qualitative Justification

In this study, the control variables are critical for isolating the effect of information technology usage on public participation in decision-making. As previously noted by Roefs and Liebenberg (1999), willingness to participate is not always actualised due to participation obstacles. They argue that participation is more likely among citizens who trust the government than among those who do not. Therefore, trust in political institutions can influence public participation. Individuals who trust the government are more likely to engage in public decision-making processes. Controlling for this variable ensures that the effect of information technology access and usage on participation is not conflated with levels of political trust. The relationship between these variables is illustrated in Figure 1.

Additionally, the propensity for participation is influenced by citizens' familiarity with government policies and legislation, as well as their affiliation with political parties (Roefs & Liebenberg, 1999). Party affiliation, as well as the lack thereof, can shape participation patterns. Supporters of certain parties may have different levels of engagement based on their party's stance on public participation. Thus, including the government satisfaction variable will allow for a clearer understanding of how information technology usage impacts participation across the political spectrum.

Political interest, another crucial social factor, is a strong predictor of public engagement. Individuals with a higher interest in politics are more likely to participate. By controlling for political interest, we can better understand the specific impact of information technology usage on public participation. Similarly, digital access is a requirement for the consumption of digital technologies. Without controlling for access, it would be challenging to determine whether information technology usage itself or merely access to technology is influencing public participation.

Socio-demographic factors also play a role in public participation. Gender can influence both digital access and participation in public decision-making, making it essential to control for gender to account for gender-related differences. Education level often correlates with both technological proficiency and civic engagement, so controlling for education helps to isolate the impact of information technology usage independent of educational attainment. Socio-economic status can affect both access to technology and levels of public participation. Controlling for socio-economic status helps to separate the effects of IT usage from those associated with economic disparities.

Geographical factors, particularly metropolitan districts, are also important. The metropolitan-local divide can influence digital access and opportunities for public participation. Metropolitan residents typically have better digital access and more

opportunities for engagement. Controlling for geographical residence ensures that the results reflect the impact of information technology usage rather than differences between the varying contexts.

By including these control variables, this study aims to account for various external influences that might otherwise confound the relationship between information technology usage and public participation. This approach ensures that the observed effects are more likely to be a true reflection of the impact of information technology usage on public engagement in the Gauteng City Region.

3.8.2. Quantitative Justification

Alongside the above qualitative justifications for the chosen control variables, this study utilised Cronbach's Alpha reliability test to validate the use of the control variables. Ahmad et al (2024) states that Cronbach's Alpha can be utilised to determine the internal consistency of variables to measure constructs such as engagement, survey perceptions, as well as satisfaction. According to DeVellis (2016), reliability is defined as the extent to which a variable yields consistent results, demonstrating their shared effectiveness in capturing the intended construct. Typically, a Cronbach's Alpha score above 0.6 is generally considered to be acceptable. As shown in Table 4 the reliability scores of the control variables utilised within this study vary.

Composite Variable	Number of Items	Cronbach's Alpha	Interpretation
Digital Access Capability Index	6	0.591	Poor Internal Consistency
Socio-economic Status	6	0.706	Acceptable Internal Consistency
Government Satisfaction	5	0.775	Acceptable Internal Consistency
Participation	15	0.68	Questionable Internal Consistency

Table 4: Cronbach's Alpha Reliability Test Scores for key variables. (Source: Author, 2025)

The scores indicate that Digital Access Capability Index ($\alpha = 0.591$) demonstrates poor internal consistency (Ahmad et al, 2024), suggesting that the items used to measure this construct may not be closely related. However, despite the low score, the QoL survey questions composing the Digital Access Capability Index remain valid. These are the only items within the survey that directly capture different aspects of technological access, making them critical for inclusion. Additionally, the correlation matrix (Table 3) presented in the sections above revealed moderate to high correlations among majority of the components. This indicated that the components making up Digital Access Capability are conceptually linked. A key factor reducing the reliability score is the

inclusion of traditional cellphones, which does not strongly correlate with other components (smartphone ownership or internet access). However, this component was intentionally retained, as it adds depths by recognising diverse forms of technology access. On the other hand, Government satisfaction (α = 0.775) and Socio-economic Status (α = 0.706) are deemed to have acceptable internal consistency, supporting their inclusion in control variables. However, Participation (α = 0.680) falls slightly below, indicating questionable reliability.

3.9. Foundations of Analysis: Statistical Relationship Between Technology Access and Participation

After establishing the Digital Access Capability Index as an initial step, this study conducted a simple linear regression analysis of the variables. The results of the regression analysis are shown in Table 5. The model explains a small proportion of the variance in participation (Adjusted R^2 = 0.0087), suggesting that additional factors may be influencing engagement levels. Yet, several predictors emerge as statistically significant.

Access to technology (Digital Access Capability Index) exhibits a positive and significant association with participation (β = 0.057, p < 0.001), indicating that higher levels of technological access correspond with increased public engagement. Government satisfaction also demonstrates a positive effect (β = 0.072, p < 0.001), indicating that individuals who express greater satisfaction with governance are more likely to participate. Notably, socio-economic status is negatively associated with participation (β = -0.038, p = 0.0005), implying that individuals with higher socio-economic standing may be less engaged.

Predictor	Estimate	Std. Error	t-value	p-value
Intercept	6.529	0.078	83.758	< 2e-16
Access to Technology	0.057	0.012	4.872	1.12e-06
Socio-Economic Status	-0.038	0.011	-3.502	0.000462
Government Satisfaction	0.072	0.009	7.716	1.29e-14
City of Johannesburg	-0.132	0.066	-1.995	0.0461
City of Tshwane	0.015	0.073	0.212	0.8321
Emfuleni	0.521	0.102	5.093	3.57e-07
Lesedi	0.095	0.116	0.819	0.4130
Merafong	0.020	0.112	0.174	0.8617
Midvaal	-0.048	0.113	-0.422	0.6732
Rand West	0.255	0.110	2.322	0.0203

Table 5: Linear model regression analysis results of relationship between access to technology and participation. (Source: Author, 2025).

In terms of municipal variation, Emfuleni ($\beta = 0.521$, $p < 0.001$) and Rand West ($\beta = 0.255$, $p = 0.0203$) show higher levels of participation compared to the reference category, whereas other municipal areas do not exhibit statistically significant differences. These findings provide an initial understanding of the factors influencing participation, they also highlight the need for further investigation. The low explanatory power of the model suggests that additional factors may moderate these relationships, potentially altering the strength or direction of effects. Understanding explanatory power helps to identify the limitations of the model and highlights the need for further investigation into additional variables that might improve the accuracy of the analysis.

Therefore, the next chapter expands on this analysis by introducing moderation analysis, where socio-economic status, government satisfaction, and each municipality are tested as moderators. This approach seeks to uncover whether the impact of technology access on participation varies across different socio-economic groups, levels of government satisfaction, and municipal contexts, offering an understanding of the underlying mechanisms at play.

3.10. Limitations of the Methodological Approach

While this study adopts a systematic and statistical methodology, several limitations must be acknowledged. First, the use of secondary data from the GCRO Quality of Life

Survey means that the analysis is constrained by the variables available within the dataset. Some dimensions of digital access or public participation are not fully captured, particularly aspects relating to informal or non-digital modes of participation. Second, the construction of the Digital Access Capability Index is based on selected indicators that, while conceptually aligned, may not represent all aspects of digital capability. In particular, the inclusion of traditional cellphones, though justified for capturing technological diversity, lowered internal consistency. Despite this, the variable was retained to reflect the broader spectrum of access realities within Gauteng.

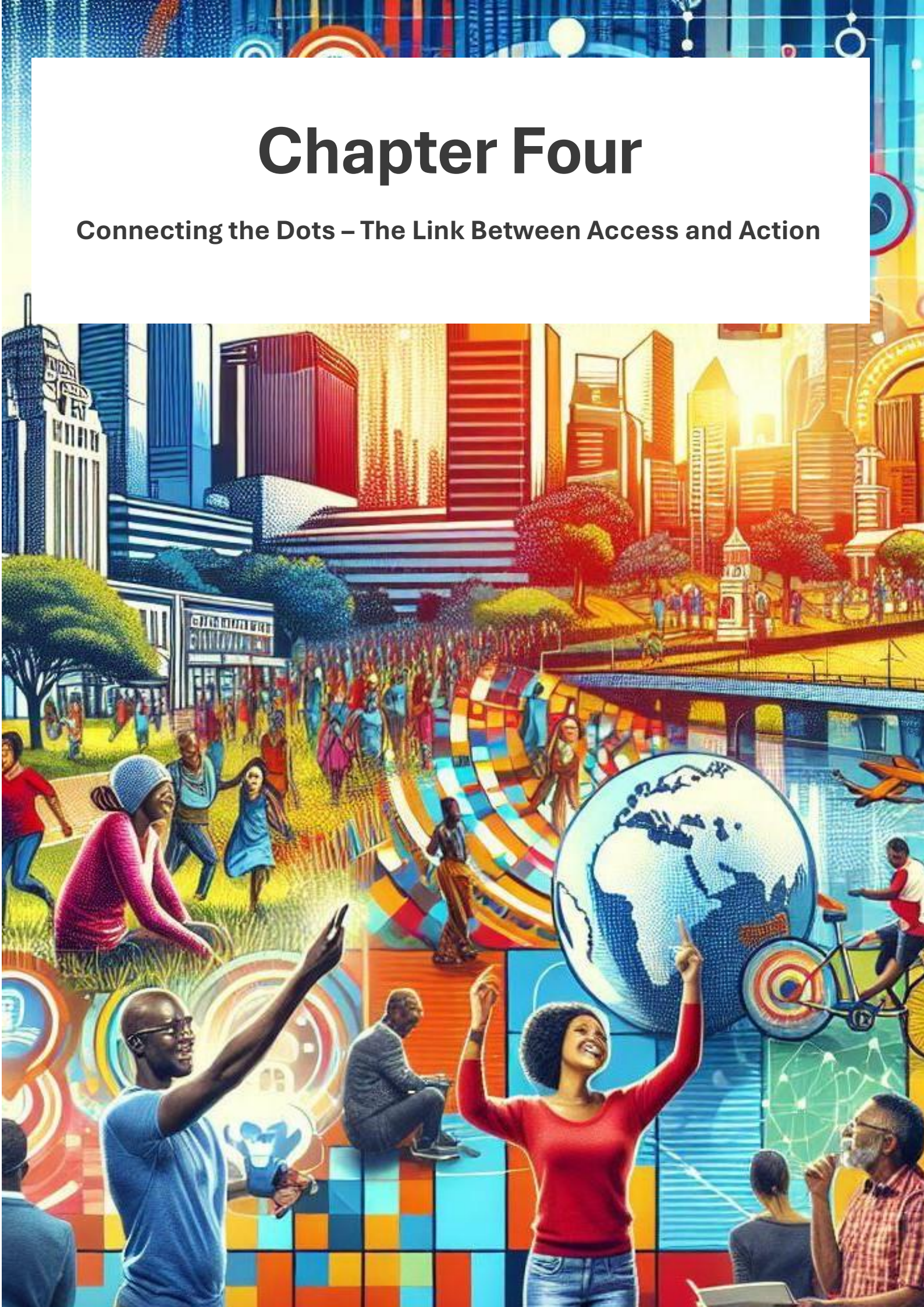
Third, the study is cross-sectional in nature, limiting the ability to draw causal inferences from the observed relationships. While linear regression and moderation analysis offer insight into associations, they cannot fully account for temporal changes or establish causality. Lastly, the generalisability of the findings is restricted to the Gauteng City-Region and may not extend to other provinces or national contexts with different socio-economic and technological conditions. These limitations do not undermine the validity of the study, but rather contextualise its findings and point to opportunities for further research.

3.11. Conclusion

In conclusion, the methods and data collection strategies outlined here set the stage for the exploration of the interplay between technology, socio-political factors, and public participation. By leveraging the GCRO Quality of Life Survey and employing analytical techniques such as linear regression and moderation, this study aims to bring to light the subtle forces that drive public participation in the digital realm. What emerges from this methodological framework is not only a refined understanding of the factors that shape public participation, but also a solid foundation upon which to build the study.

Chapter Four

Connecting the Dots – The Link Between Access and Action



4.1. Introduction

This report has provided a view on the interplay between access to technology and public participation which is a relationship interlaced into the fabric of modern urban societies today. As digital tools become the cornerstone of communication, knowledge dissemination, and empowerment, understanding their influence on public participation is no longer a mere academic curiosity, but a pressing societal concern. This chapter undertakes an analysis to examine the relationship between these two dimensions, using statistical models to shed light on this relationship.

Grounded in the context of the Gauteng City Region, this analysis explores whether access to information technologies serves as a catalyst for public engagement. Through the lens of linear regression and moderation, the discussion delves into the statistical significance and effect sizes that speak to the power of connectivity in shaping participatory behaviour. Yet, these models do more than quantify; they provoke questions about causality, complexity, and the interplay of unmeasured factors. This chapter presents not just the findings, but also the limitations and possibilities they unveil.

4.3. Findings and Discussion

This section presents the findings of the statistical analysis conducted to explore the influence of access to information technologies on public participation in the Gauteng City Region. To uncover the dynamics, the study begins by investigating whether the relationship between public participation and access to technology is moderated by government satisfaction and socio-economic status. We then move on to the municipal level to observe for contextual differences.

4.3.1. Interaction Effects of Technology Access with Social Class and Government Satisfaction

To examine whether the relationship between access to technology and public participation is moderated by social class and government satisfaction, two separate interaction models were estimated. The results are summarised in Table 6 and Table 7. This moderated regression was conducted using Hayes Process Macro (Hayes, 2013) using the processR package.

The first model investigated the interaction between access to technology and social class (see Table 6). The overall model was statistically significant ($F(3, 13181) = 6.7100$, $p = 0.0002$), though with a small explanatory power ($R = 0.0390$, $R^2 = 0.0015$). Access to technology had a positive association with public participation ($\beta = 0.0458$, $p = 0.0001$), suggesting that individuals with greater access to technology are more likely to participate in public affairs. Soci0-economic Status, on the other hand, displays a significant negative effect ($\beta = -0.0367$, $p = 0.0018$), indicating that individuals from higher

social classes are less likely to engage in participation. However, the interaction between access to technology and socio-economic status was not statistically significant (β = -0.0042, p = 0.2861), suggesting that social class does not moderate the effect of technology access on participation.

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
Constant	**6.9587**	**0.0284**	**244.86**	**0.0000**	**(6.9030, 7.0144)**
Digital Access Capability Index	**0.0458**	**0.0119**	**3.8396**	**0.0001**	**(0.0224, 0.0691)**
Socio-economic Status	**-0.0367**	**0.0117**	**-3.1271**	**0.0018**	**(-0.0596, -0.0137)**
Digital Access Capability Index × Socio-economic Status	**-0.0042**	**0.0039**	**-1.0667**	**0.2861**	**(-0.0118, 0.0035)**
Model Summary: • **R = 0.0390, R^2 = 0.0015, MSE = 6.6750, F(3, 13181) = 6.7100, p = 0.0002** • **Sample size: 13,185**					
Interaction Effect (Moderation by Social Class): • **ΔR^2 = 0.0001, F(1, 13181) = 1.1378, p = 0.2861**					

Table 6: Regression Analysis Results Examining the Effect of Technology Access on Public Participation with Moderation by Social Class. Note: Confidence intervals are set at 95%. The independent variables (Tech Access and Social Class) were mean-centered before analysis.

The second model assessed the interaction between access to technology and government satisfaction (see Table 7). The model was significant overall (F(3, 13181) = 18.9695, p = 0.0000) but explained a relatively small portion of variance (R = 0.0656, R^2 = 0.0043). In this model, both Digital Access Capability (β = 0.0213, p = 0.0166) and government satisfaction (β = 0.0658, p = 0.0000) had significant main effects, with government satisfaction displaying a stronger relationship with participation. However, the interaction between Digital Access Capability and government satisfaction was not significant (β = -0.0011, p = 0.7558), indicating that government satisfaction does not alter the effect of technology access on public participation.

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
Constant	**6.9400**	**0.0225**	**308.79**	**0.0000**	**(6.8959, 6.9840)**
Digital Access Capability Index	**0.0213**	**0.0089**	**2.3950**	**0.0166**	**(0.0039, 0.0388)**
Government Satisfaction	**0.0658**	**0.0092**	**7.1422**	**0.0000**	**(0.0477, 0.0838)**
Digital Access Capability Index × Government Satisfaction (Int_1)	**-0.0011**	**0.0036**	**-0.3110**	**0.7558**	**(-0.0081, 0.0059)**

Model Summary:

- **$R = 0.0656$, $R^2 = 0.0043$, $MSE = 6.6565$, $F(3, 13181) = 18.9695$, $p < 0.001$**
- **Sample size: 13,185**

Interaction Effect (Moderation by Government Satisfaction):

- **$\Delta R^2 = 0.0000$, $F(1, 13181) = 0.0967$, $p = 0.7558$**

Table 7: Regression Analysis Results Examining the Effect of Technology Access on Public Participation with Moderation by Government Satisfaction. Note: Confidence intervals are set at 95%. The independent variables (Tech Access and Government Satisfaction) were mean-centered before analysis

From a qualitative perspective, these findings suggest that while access to technology facilitates engagement, structural factors such as social class and trust in government play a more direct role in shaping participation. The absence of significant interaction effects implies that digital access alone is insufficient to bridge disparities in participation across different social levels. Rather, systemic barriers related to economic standing and institutional trust must be addressed to enhance inclusive public participation. The findings underscore the importance of complementary interventions, such as digital literacy initiatives and governance reforms, to maximise the participatory potential of technological access.

Given the non-significance of both interaction effects, additional covariate analysis was conducted at the municipal level to account for possible contextual differences. This approach aimed to explore whether local governance structures and socioeconomic conditions influenced the observed relationships in the section to follow.

4.3.2. Covariate Analysis of Significant Interaction Effects at the Municipal Level

To explore the relationship between Digital Access Capability and participation across different municipal contexts, moderation analyses were conducted for each municipality, using Johannesburg as the reference category. Coefficients are interpreted with the public participation intercept (constant) at the mean of Digital Access Capability, government satisfaction, socio-economic status and those residing in Johannesburg. Therefore, the constant is the value of public participation of participants residing in Johannesburg when Digital Access Capability, government satisfaction and socio-economic status are at their mean values. The interpretation of the coefficients is thus a change in one unit from the predictor means.

4.3.2.1. City of Tshwane

Table 8 presents the results for City of Tshwane, where the overall model was significant ($F(5,13179) = 16.3654$, $p < 0.001$, $R^2 = 0.0062$). The main effect of Digital Access Capability was significant ($\beta = 0.0625$, $p < 0.001$, CI: [0.0383, 0.0866]), indicating that greater digital access is associated with increased participation. However, the interaction between access to technology and Tshwane ($\beta = -0.0763$, $p = 0.001$, CI: [-0.1215, -0.0310]) was negative and significant, suggesting that the positive relationship between access to technology and participation is weaker in Tshwane compared to Johannesburg. Conditional effects revealed that while access to technology positively influenced participation in Johannesburg, the effect was not significant in Tshwane ($\beta = -0.0138$, $p = 0.5386$, CI: [-0.0578, 0.0302]), indicating that other contextual factors may limit the role of technology in facilitating participation within this municipality.

Beyond technology access, government satisfaction also had a significant and positive effect on participation ($\beta = 0.0654$, $p < 0.001$, CI: [0.0474, 0.0834]). This suggests that individuals who express greater satisfaction with government are more likely to participate in civic or political activities. Given that government satisfaction was a strong predictor across the model, it may indicate that trust in governance structures is a crucial driver of participation, potentially outweighing technological barriers in some contexts. Conversely, socio-economic status had a significant but negative effect on participation ($\beta = -0.0395$, $p = 0.0003$, CI: [-0.0610, -0.0181]), implying that individuals with lower socio-economic standing were more likely to participate than those with higher socio-economic status. This could reflect a scenario where individuals from lower socio-

economic backgrounds engage more actively in civic matters due to greater reliance on public services or a need to advocate for socio-economic improvements.

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
Constant	6.9021	0.0637	108.35	0.0000	(6.7772, 7.0270)
Digital Access Capability Index	0.0625	0.0123	5.0708	0.0000	(0.0383, 0.0866)
City of Tshwane	-0.0004	0.0574	-0.0074	0.9941	(-0.1129, 0.1120)
Digital Access Capability Index × Tshwane (Int_1)	-0.0763	0.0231	-3.3014	0.0010	(-0.1215, -0.0310)
Government Satisfaction	0.0654	0.0092	7.1347	0.0000	(0.0474, 0.0834)
Socio-economic Status	-0.0395	0.0109	-3.6138	0.0003	(-0.0610, -0.0181)

Model Summary:

- **$R = 0.0786$, $R^2 = 0.0062$, $MSE = 6.6450$, $F(5, 13179) = 16.3654$, $p < 0.001$**
- **Sample size: 13,185**

Interaction Effect (Moderation by Tshwane):

- **$\Delta R^2 = 0.0008$, $F(1, 13179) = 10.8992$, $p = 0.0010$**

Conditional Effects of Tech on Participation at Different Levels of Tshwane:

- **When Tshwane = 0: Effect = 0.0625, SE = 0.0123, t = 5.0708, p < 0.001, 95% CI = (0.0383, 0.0866)**
- **When Tshwane = 1: Effect = -0.0138, SE = 0.0225, t = -0.6150, p = 0.5386, 95% CI = (-0.0578, 0.0302)**

Table 8: Regression Analysis Results Examining the Effect of Technology Access on Public Participation with Moderation by City of Tshwane. Note: Confidence intervals are set at 95%. The independent variable (Tech) was mean-centered before analysis.

4.3.2.2. Midvaal Local Municipality

In Midvaal Local Municipality (Table 9), the overall model was statistically significant ($F(5,13179) = 17.0197$, $p < 0.001$, $R^2 = 0.0064$), and the interaction between digital access and Midvaal was significant ($\beta = 0.1500$, $p = 0.0002$, CI: [0.0707, 0.2293]). The results suggest that digital access plays a role in participation levels, but the relationship is moderated by the municipal context. Specifically, the conditional effects indicated that while digital access is positively influenced participation in both Johannesburg and Midvaal, the effect was significantly stronger in Midvaal ($\beta = 0.1924$, $p < 0.001$, CI: [0.1135, 0.2713]) compared to Johannesburg ($\beta = 0.0424$, $p = 0.0003$, CI: [0.0192, 0.0657]). This suggests that in Midvaal, digital access is a particularly strong driver of participation, it can be assumed that this is potentially due to the need for better digital infrastructure or more effective integration of technology into public participation mechanisms.

Government satisfaction was also a significant predictor of participation ($\beta = 0.0658$, $p < 0.001$, CI: [0.0477, 0.0838]), indicating that individuals with higher satisfaction levels were more likely to engage in participatory activities. This aligns with broader trends suggesting that trust in governance fosters public participation, as individuals who perceive or experience government institutions as responsive may be more inclined to participate in democratic processes. Conversely, socio-economic status had a significant negative relationship with participation ($\beta = -0.0413$, $p = 0.0002$, CI: [-0.0627, -0.0199]), implying that individuals with lower socio-economic standing were more engaged than those in higher income brackets. This may reflect a greater need for advocacy among lower-income groups, who may be more reliant on public services and thus have a stronger incentive to participate.

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
Constant	**6.9094**	**0.0633**	**109.23**	**0.0000**	**(6.7854, 7.0334)**
Digital Access Capability Index	**0.0424**	**0.0118**	**3.5841**	**0.0003**	**(0.0192, 0.0657)**
Midvaal	**-0.1249**	**0.1043**	**-1.1977**	**0.2311**	**(-0.3293, 0.0795)**

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
Digital Access Capability Index × Midvaal (Int_1)	0.1500	0.0405	3.7059	0.0002	(0.0707, 0.2293)
Government Satisfaction	0.0658	0.0092	7.1435	0.0000	(0.0477, 0.0838)
Socio-economic Status	-0.0413	0.0109	-3.7811	0.0002	(-0.0627, -0.0199)

Model Summary:

- **R = 0.0801, R^2 = 0.0064, MSE = 6.6434, F(5, 13179) = 17.0197, p < 0.001**
- **Sample size: 13,185**

Interaction Effect (Moderation by Midvaal):

- **ΔR^2 = 0.0010, F(1, 13179) = 13.7335, p = 0.0002**

Conditional Effects of Tech on Participation at Different Levels of Midvaal:

- **When Midvaal = 0: Effect = 0.0424, SE = 0.0118, t = 3.5841, p = 0.0003, 95% CI = (0.0192, 0.0657)**
- **When Midvaal = 1: Effect = 0.1924, SE = 0.0402, t = 4.7812, p = 0.0000, 95% CI = (0.1135, 0.2713)**

Table 9: Regression Analysis Results Examining the Effect of Technology Access on Public Participation with Moderation by Midvaal Local Municipality. Note: Confidence intervals are set at 95%. The independent variable (Tech) was mean-centered before analysis.

4.3.2.3. Merafong City Local Municipality

Table 10 presents the results for Merafong City Local Municipality, the overall model was statistically significant ($F(5,13179) = 15.1873$, $p < 0.001$, $R^2 = 0.0057$), and the interaction between digital access and Merafong was also significant ($\beta = 0.1061$, $p = 0.0249$, CI: [0.0134, 0.1987]). The conditional effects indicate that the positive relationship between digital access and participation was stronger in Merafong ($\beta = 0.1511$, $p = 0.0013$, CI: [0.0593, 0.2429]) than in Johannesburg ($\beta = 0.0450$, $p = 0.0001$, CI: [0.0218, 0.0683]). These findings imply that, in Merafong, technology access plays a particularly distinct

role in fostering participation, potentially due to a lack of alternative means of public participation or greater reliance on digital platforms in local governance initiatives.

Government satisfaction was again a significant predictor of participation (β = 0.0667, p < 0.001, CI: [0.0487, 0.0847]), reinforcing the notion that individuals who are more satisfied with government performance are more likely to engage in civic activities. This may indicate that higher levels of trust in public institutions encourage active participation, as individuals perceive greater responsiveness to their participation. Conversely, socio-economic status had a significant negative relationship with participation (β = -0.0403, p = 0.0002, CI: [-0.0618, -0.0189]), suggesting that yet again lower-income individuals were more likely to participate than those with higher socio-economic standing. This finding aligns with previous results, indicating that participation may be driven by necessity, particularly in municipalities where access to resources is limited, and participation serves as a means of advocating for service delivery and policy responsiveness.

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
Constant	**6.9000**	**0.0636**	**108.48**	**0.0000**	**(6.7753, 7.0246)**
Digital Access Capability Index	**0.0450**	**0.0119**	**3.7960**	**0.0001**	**(0.0218, 0.0683)**
Merafong	**0.0973**	**0.1161**	**0.8380**	**0.4020**	**(-0.1303, 0.3249)**
Digital Access Capability Index × Merafong (Int_1)	**0.1061**	**0.0473**	**2.2438**	**0.0249**	**(0.0134, 0.1987)**
Government Satisfaction	**0.0667**	**0.0092**	**7.2699**	**0.0000**	**(0.0487, 0.0847)**
Socio-economic Status	**-0.0403**	**0.0109**	**-3.6914**	**0.0002**	**(-0.0618, -0.0189)**

Model Summary:

- **R = 0.0757, R^2 = 0.0057, MSE = 6.6479, F(5, 13179) = 15.1873, p < 0.001**
- **Sample size: 13,185**

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
Interaction Effect (Moderation by Merafong): • **$\Delta R^2 = 0.0004$, $F(1, 13179) = 5.0345$, $p = 0.0249$**					
Conditional Effects of Tech on Participation at Different Levels of Merafong: • **When Merafong = 0: Effect = 0.0450, SE = 0.0119, t = 3.7960, p = 0.0001, 95% CI = (0.0218, 0.0683)** • **When Merafong = 1: Effect = 0.1511, SE = 0.0469, t = 3.2253, p = 0.0013, 95% CI = (0.0593, 0.2429)**					

Table 10: Regression Analysis Results Examining the Effect of Technology Access on Public Participation with Moderation by Merafong. Note: Confidence intervals are set at 95%. The independent variable (Tech) was mean-centered before analysis.

4.3.2.4. Lesedi Local Municipality

In Lesedi (Table 11), the overall model was statistically significant ($F(5,13179) = 14.8206$, $p < 0.001$, $R^2 = 0.0056$), indicating that the included predictors contributed meaningfully to explaining variation in participation. The interaction between digital access and Lesedi was not statistically significant at the conventional 5% level ($\beta = 0.0729$, $p = 0.0870$, CI: [-0.0106, 0.1563]), though the conditional effects suggest that the relationship between digital access and participation was stronger in Lesedi ($\beta = 0.1192$, $p = 0.0047$, CI: [0.0366, 0.2018]) compared to Johannesburg ($\beta = 0.0464$, $p = 0.0001$, CI: [0.0231, 0.0697]). While the control variable did not reach statistical significance, the observed trend suggests that access to technology may still play a more substantial role in participation within Lesedi, potentially due to differences in digital infrastructure, governance engagement strategies, or socio-economic conditions affecting how residents interact with technology.

Government satisfaction was again a significant predictor of participation ($\beta = 0.0664$, $p < 0.001$, CI: [0.0484, 0.0843]), reinforcing the trend observed across other municipalities that individuals with greater confidence in government institutions are more likely to engage in participatory activities. This finding highlights the role of trust in shaping civic behaviour, as satisfaction with governance may enhance perceptions of efficacy and encourage individuals to take part in decision-making processes.

As in previous models, socio-economic status demonstrated a negative association with participation ($\beta = -0.0406$, $p = 0.0002$, CI: [-0.0620, -0.0192]), suggesting that lower-

income individuals in Lesedi were more likely to participate than their higher-income counterparts. This may indicate that economic constraints drive public participation as a means of seeking improved service delivery or policy responsiveness.

Overall, while the interaction between access to technology and Lesedi did not reach significance, the results suggest a potential trend where access to technology plays a greater role in participation compared to Johannesburg. Additionally, the importance of government satisfaction and socio-economic status in predicting participation highlights the need to consider both institutional trust and socio-economic disparities when examining participatory behaviour across different municipal contexts.

Predictor	**Coefficient**	**Standard Error (SE)**	**t-value**	**p-value**	**95% Confidence Interval (LLCI, ULCI)**
Constant	6.8980	0.0635	108.70	0.0000	(6.7736, 7.0224)
Access to Tech	0.0464	0.0119	3.9025	0.0001	(0.0231, 0.0697)
Lesedi	0.1201	0.1121	1.0720	0.2838	(-0.0995, 0.3398)
Tech × Lesedi (Int_1)	0.0729	0.0426	1.7117	0.0870	(-0.0106, 0.1563)
Government Satisfaction	0.0664	0.0092	7.2410	0.0000	(0.0484, 0.0843)
Socio-economic Status	-0.0406	0.0109	-3.7132	0.0002	(-0.0620, -0.0192)

Model Summary:

- $R = 0.0748$, $R^2 = 0.0056$, $MSE = 6.6489$, $F(5, 13179) = 14.8206$, $p < 0.001$
- Sample size: 13,185

Interaction Effect (Moderation by Lesedi):

- $\Delta R^2 = 0.0002$, $F(1, 13179) = 2.9298$, $p = 0.0870$

Conditional Effects of Tech on Participation at Different Levels of Lesedi:

- **When Lesedi = 0: Effect = 0.0464, SE = 0.0119, t = 3.9025, p = 0.0001, 95% CI = (0.0231, 0.0697)**

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
• **When Lesedi = 1: Effect = 0.1192, SE = 0.0421, t = 2.8295, p = 0.0047, 95% CI = (0.0366, 0.2018)**					

Table 11: Regression Analysis Results Examining the Effect of Technology Access on Public Participation with Moderation by Lesedi. Note: Confidence intervals are set at 95%. The independent variable (Tech) was mean-centered before analysis.

In closing, these results highlight the varying role of technology in public participation across municipalities, with the strength of this relationship differing based on contextual factors. While access to technology generally supports participation, its impact is not uniform and is influenced by what can be assumed as municipal-specific conditions such as governance structures, infrastructure availability, and socio-economic disparities. In Tshwane, the weaker relationship between access to technology and participation suggests that structural barriers may hinder the full potential of digital engagement. Similarly, in Merafong, while access to technology remains a positive predictor of participation, the interaction effect indicates that contextual factors may shape the extent of its influence.

Conversely, in Midvaal, the stronger interaction effect suggests that technology plays a more evident role in participation compared to Johannesburg, potentially reflecting differences in digital accessibility or institutional efforts to integrate technology into governance processes. Lesedi follows a similar trend, where the positive conditional effect implies that residents may rely more heavily on technology for public participation.

The variation in effects across these municipalities emphasises the influence of local governance dynamics in shaping the effectiveness of technology as a tool for participation. Thus, further qualitative research is necessary to explore the structural or institutional constraints that may be limiting technology's impact in municipalities where its effect is weaker and to understand the factors that enhance its role in those where it is stronger.

4.3.3. Covariate Analysis of Non-Significant Interaction Effects at the Municipal Level

4.3.3.1. City of Ekurhuleni

Table 12 presents the results for City of Ekurhuleni, where the overall model was significant ($F(5,13179) = 14.5274$, $p < 0.001$, $R^2 = 0.0055$). The main effect of access to technology was significant ($\beta = 0.0442$, $p = 0.0004$, CI: [0.0196, 0.0688]), indicating that increased access to technology is associated with higher levels of participation.

However, the interaction between digital access and Ekurhuleni (β = 0.0263, p = 0.2435, CI: [-0.0179, 0.0706]) was not significant, suggesting that the relationship between technology access and participation does not differ meaningfully in Ekurhuleni compared to Johannesburg. Conditional effects showed that digital access significantly influenced participation in both municipalities, with no significant variation in the strength of the effect (β = 0.0705, p = 0.0000, CI: [0.0475, 0.0935] for Johannesburg; β = 0.0968, p = 0.0000, CI: [0.0648, 0.1289] for Ekurhuleni).

Government satisfaction was positively associated with participation (β = 0.0658, p < 0.001, CI: [0.0478, 0.0837]), supporting the view that trust in governance structures plays a role in shaping civic behaviour. Socio-economic status had a negative and significant effect (β = -0.0406, p = 0.0002, CI: [-0.0621, -0.0192]), indicating that individuals with lower socio-economic status were more likely to participate.

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
Constant	6.9105	0.0647	106.85	0.0000	(6.7837, 7.0373)
Digital Access Capability Index	0.0442	0.0126	3.5177	0.0004	(0.0196, 0.0688)
City of Ekurhuleni	-0.0348	0.0570	-0.6098	0.5420	(-0.1465, 0.0770)
Digital Access Capability Index × Ekurhuleni (Int_1)	0.0263	0.0226	1.1664	0.2435	(-0.0179, 0.0706)
Government Satisfaction	0.0658	0.0092	7.1748	0.0000	(0.0478, 0.0837)
Socio-economic Status	-0.0406	0.0109	-3.7144	0.0002	(-0.0621, -0.0192)

Model Summary:

- **$R = 0.0740$, $R^2 = 0.0055$, MSE = 6.6496, $F(5, 13179) = 14.5274$, $p < 0.001$**
- **Sample size: 13,185**

Interaction Effect (Moderation by Ekurhuleni):

- **$\Delta R^2 = 0.0001$, $F(1, 13179) = 1.3605$, $p = 0.2435$**

Table 12: Regression Analysis Results Examining the Effect of Technology Access on Public Participation with Moderation by Ekurhuleni. Note: Confidence intervals are set at 95%. The independent variable (Tech) was mean-centered before analysis.

4.3.3.2. City of Ekurhuleni

Table 13 presents the results for Emfuleni, where the overall model was significant ($F(5, 13179) = 20.6839$, $p < 0.001$, $R^2 = 0.0078$). The main effect of the digital access was significant ($\beta = 0.0540$, $p < 0.001$, CI: [0.0306, 0.0774]), indicating a positive association between digital access and participation. However, the interaction between digital access and Emfuleni ($\beta = -0.0166$, $p = 0.6552$, CI: [-0.0895, 0.0563]) was not significant, suggesting that the effect of digital access on participation does not differ significantly in Emfuleni compared to Johannesburg. Conditional effects indicated that access to technology had a positive and significant effect in both municipalities. Government satisfaction was significantly associated with increased participation ($\beta = 0.0713$, $p < 0.001$, CI: [0.0532, 0.0893]). Socio-economic status had a negative and significant effect ($\beta = -0.0387$, $p = 0.0004$, CI: [-0.0601, -0.0173]), indicating that individuals with lower socio-economic status were more likely to participate.

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
Constant	**6.8415**	**0.0641**	**106.66**	**0.0000**	**(6.7158, 6.9673)**
Digital Access Capability Index	**0.0540**	**0.0119**	**4.5184**	**0.0000**	**(0.0306, 0.0774)**
Emfuleni	**0.5078**	**0.0972**	**5.2249**	**0.0000**	**(0.3173, 0.6983)**
Digital Access Capability Index × Emfuleni (Int_1)	**-0.0166**	**0.0372**	**-0.4465**	**0.6552**	**(-0.0895, 0.0563)**
Government Satisfaction	**0.0713**	**0.0092**	**7.7441**	**0.0000**	**(0.0532, 0.0893)**
Socio-economic Status	**-0.0387**	**0.0109**	**-3.5424**	**0.0004**	**(-0.0601, -0.0173)**
Model Summary:					

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
• **R = 0.0882, R^2 = 0.0078, MSE = 6.6342, F(5, 13179) = 20.6839, p < 0.001** • **Sample size: 13,185**					
Interaction Effect (Moderation by Emfuleni): • **ΔR^2 = 0.0000, F(1, 13179) = 0.1994, p = 0.6552**					

Table 13: Regression Analysis Results Examining the Effect of Technology Access on Public Participation with Moderation by Emfuleni. Note: Confidence intervals are set at 95%. The independent variable (Tech) was mean-centered before analysis.

4.3.3.3. Rand West Local Municipality

Table 14 presents the results for Rand West, where the overall model was significant (F(5, 13179) = 15.2938, p < 0.001, R^2 = 0.0058). The main effect of the Digital Access Capability Index was significant (β = 0.0512, p < 0.001, CI: [0.0279, 0.0746]), indicating that greater access to technology is associated with increased participation. The interaction between digital access and Rand West was not significant (β = -0.0182, p = 0.6499, CI: [-0.0968, 0.0604]), suggesting no moderating effect of municipal context on the relationship between access and participation in Rand West. Government satisfaction had a positive and significant association with participation (β = 0.0667, p < 0.001, CI: [0.0487, 0.0846]). Socio-economic status was negatively associated with participation (β = -0.0405, p = 0.0002, CI: [-0.0620, -0.0191]), suggesting that individuals with lower socio-economic status are more likely to participate.

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
Constant	**6.8870**	**0.0637**	**108.12**	**0.0000**	**(6.7622, 7.0119)**
Digital Access Capability Index	**0.0512**	**0.0119**	**4.3035**	**0.0000**	**(0.0279, 0.0746)**
Rand West	**0.2239**	**0.1018**	**2.1993**	**0.0279**	**(0.0243, 0.4234)**

Predictor	Coefficient	Standard Error (SE)	t-value	p-value	95% Confidence Interval (LLCI, ULCI)
Digital Access Capability Index × Rand West (Int_1)	-0.0182	0.0401	-0.4540	0.6499	(-0.0968, 0.0604)
Government Satisfaction	0.0667	0.0092	7.2703	0.0000	(0.0487, 0.0846)
Socio-economic Status	-0.0405	0.0109	-3.7078	0.0002	(-0.0620, -0.0191)

Model Summary:

- **$R = 0.0760$, $R^2 = 0.0058$, $MSE = 6.6477$, $F(5, 13179) = 15.2938$, $p < 0.001$**
- **Sample size: 13,185**

Interaction Effect (Moderation by Rand West):

- **$\Delta R^2 = 0.0000$, $F(1, 13179) = 0.2061$, $p = 0.6499$**

Table 14: Regression Analysis Results Examining the Effect of Technology Access on Public Participation with Moderation by Rand West. Note: Confidence intervals are set at 95%. The independent variable (Tech) was mean-centered before analysis.

In contrast to the municipalities where digital access demonstrated a moderated or amplified effect on participation, the results for Ekurhuleni, Emfuleni, and Rand West Local Municipality show no significant interaction effects. While digital access remains a significant and positive predictor of participation in these areas, its influence appears to be consistent with the broader pattern observed in Johannesburg, without evidence of local contextual factors altering this relationship.

These findings suggest a divergence in how municipal environments either facilitate or neutralise the influence of technology on public participation. In places like Tshwane and Midvaal, the interaction effects indicate that local dynamics either constrain or enhance the role of technology in shaping participation. Conversely, in Ekurhuleni, Emfuleni, and Rand West, the absence of significant interaction terms implies a more stable or homogenous relationship between digital access and participation, unaffected by municipal-specific characteristics.

This contrast underscores the uneven integration of digital tools in participatory processes across the Gauteng City-Region. It also signals that in some municipalities, technology alone may not be sufficient to overcome deeper structural or institutional

barriers. The uniformity in non-significant municipalities may point to either a lack of targeted digital governance strategies or consistent limitations in the enabling environment. Future research would benefit from exploring these underlying conditions more closely to understand what accounts for the variation in digital participation outcomes across municipalities.

4.4. Implications of the Findings Relating to Literature and Theoretical Frameworks

4.4.1. Trust in Government and Public Participation

The findings support the argument that trust in government is a critical determinant of public participation (Roefs and Liebenberg, 1999; Kumagai and Iorio, 2020). Roefs and Liebenberg (1999) found that South Africans who trust government are more likely to participate in policy-making processes. This relationship was evident in in all the municipalities discussed above, where government satisfaction was a significant predictor of participation. In these municipalities, individuals who expressed confidence in governance structures were more engaged in civic activities, aligning with broader research that suggests political trust enhances participatory behaviour (van der Meer and Zmerli, 2017). Conversely, low trust in government can weaken the social contract and discourage engagement (Brixi et al., 2015). This finding echoes the work of Devine (2024), who emphasises the pivotal role of political trust in voter turnout and policy compliance.

However, some scholars caution that excessive trust in government may lead to disengagement, as citizens defer decision-making to authorities (Kumagai and Iorio, 2020). This may partly explain why the relationship between access to technology and participation is weaker in municipalities such as Tshwane, where digital engagement tools are not as integrated and digitally advanced (Kwedamedia, 2025). In contrast, Johannesburg, which has a more established digital infrastructure, demonstrates a stronger relationship between technology access and participation.

4.4.2. Socio-Economic Status and Participation

The findings also align with research suggesting that lower-income individuals are more likely to engage in public participation than those in higher socio-economic brackets (Dlamini et al., 2022; Hook & Vrdoljak, 2002). In this study, socio-economic status was negatively associated with participation across municipalities, indicating that individuals with fewer economic resources may be more reliant on public services and thus more inclined to engage in civic activities to advocate for service delivery improvements. Tsoriyo (2024) similarly found that marginalised groups often have a strong attachment to their communities, which drives higher levels of participation. This

was particularly evident in Lesedi and Merafong, where lower-income residents may be more engaged in public participation efforts due to a stronger need for municipal services and infrastructural improvements.

Moreover, the interaction effects between technology access and socio-economic status, as well as government satisfaction, reveal valuable insights. While socio-economic status did not significantly moderate the relationship, the main effect of government satisfaction was positively associated with participation. This suggests that while technology access is a critical enabler, the motivations for public participation are intertwined with political attitudes and trust in institutions.

4.4.3. Municipal Governance and Digital Participation

Municipal governance structures also play a crucial role in determining the effectiveness of technology in facilitating participation. The Midvaal municipality, for instance, has been recognised for its strategic planning and investment in digital transformation to streamline governance (Kwedamedia, 2025). This may explain why access to technology in Midvaal had a stronger effect on participation than in Johannesburg, as municipal efforts to integrate digital tools into public engagement are more deliberate.

By contrast, the City of Tshwane has only recently begun implementing digital participation initiatives, such as the development of a new Digital Service Portal (Kwedamedia, 2025). This may account for the weaker positive relationship between technology access and participation observed in Tshwane compared to Johannesburg, where digital engagement opportunities are more established. Additionally, the high population growth rate in Tshwane (3% annually) compared to Johannesburg (0.7%) may place additional strain on municipal resources, potentially limiting the effectiveness of digital engagement initiatives (Tsoriyo, 2024).

Similarly, Lesedi faces infrastructural challenges, including limited internet access, which could explain why the interaction between technology access and participation was not statistically significant. However, the municipality has expressed its intention to enhance digital participation through an ICT strategy currently under review (Lesedi Local Municipality, 2023). This aligns with research indicating that communication strategies, blending both traditional and digital participation platforms, are necessary to overcome barriers to public engagement (Tsoriyo, 2024).

The echoes of Critical Theory resonate through the results, as we observe how access to technology can democratise information and amplify marginalised voices, challenging entrenched power structures (Feenberg, 2008). Yet, as Hovik and Giannoumis (2022) caution, the promise of digital tools is often tempered by the realities of their implementation. The findings align with this duality, revealing that while technology

access positively influences public participation, its impact is modulated by geographical and socio-political contexts.

Networked Governance Theory, with its emphasis on collaboration and interconnectivity (Mashiteng et al., 2021), finds empirical support in the analysis. The significant interaction effects between technology access and municipal context underscore the importance of localised strategies. In municipalities like Midvaal, where digital infrastructure is less prevalent, the transformative potential of technology is more evident. This aligns with the theoretical argument that participatory spaces must be carefully constructed to empower citizens genuinely (Tshoose, 2015).

Furthermore, the stronger conditional effects of access to technology on participation observed in Merafong compared to Johannesburg suggest that municipalities with less established digital infrastructures may experience greater benefits from increased technological access. Johannesburg, being more advanced in digital governance and having a broader, more integrated approach to civic technology, may already have high levels of participation through digital means, thereby reducing the relative impact of increasing access. In contrast, in municipalities like Merafong and Lesedi, where digital adoption is still expanding, access to technology may present newer opportunities for participation, leading to stronger observed effects.

Additionally, the empirical evidence of digital tools enhancing public engagement, as discussed by Brabham (2013) and Nguyen et al. (2016), is reflected in the findings. The success of digital platforms in fostering collaboration between citizens and planners underscores the potential of technology to enhance the quality of life in marginalised communities. However, as Mokhele and De Beer (2007) caution, these tools must be inclusively implemented to ensure meaningful engagement. The comparison between digital and traditional participation methods, as highlighted by Kolsaker and Lee-Kelley (2006), reveals distinct advantages and limitations. It can be deduced that while digital tools offer greater flexibility and reach, they remain underutilised in Gauteng City Region municipalities. This aligns with the observations of Ramirez-Madrid et al. (2024), who highlight the need for further studies to understand citizens' intentions to adopt e-government systems.

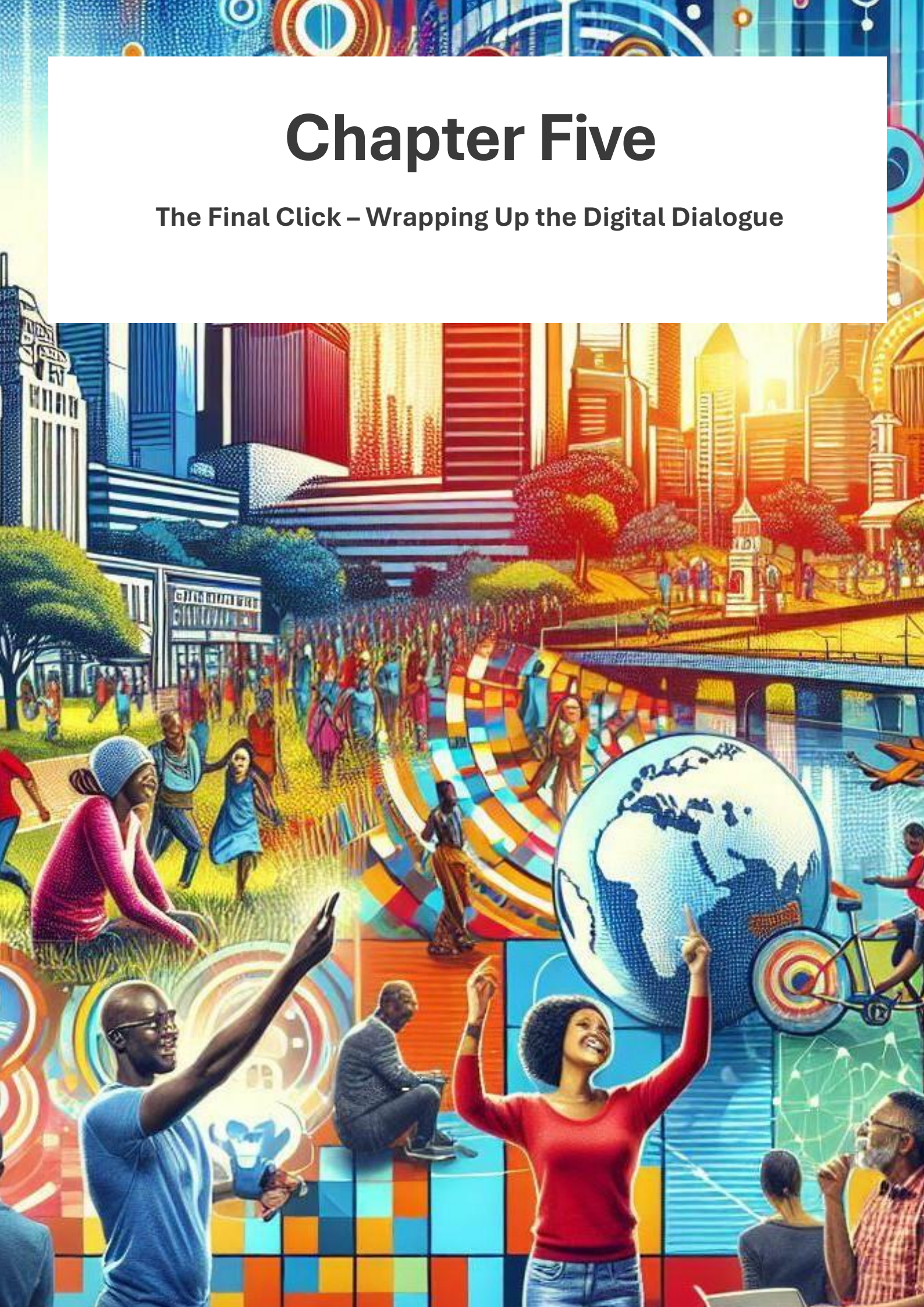
4.5. Conclusion

In conclusion, this study builds on existing literature by providing empirical evidence that access to technology facilitates public participation but does so in varying degrees depending on municipal-specific factors. The findings highlight the need for a more localised approach to digital governance, ensuring that technological interventions are tailored to address the unique infrastructural, socio-economic, and political dynamics of each municipality. Future research should further explore the qualitative dimensions

of these moderating factors to develop more comprehensive strategies for enhancing public participation in the Gauteng City Region.

Chapter Five

The Final Click – Wrapping Up the Digital Dialogue



5.1. Introduction

This study titled, 'Voices of The City: Deciphering the Role of Technology in Transforming Public Participation within the Gauteng City Region'; asks 'In what ways do access to information technologies influence public participation in the Gauteng City Region?' To solve this question the main statement of inquiry is broken into two components: the statistical relationship and the social, political as well as geographical factors.. By adopting a quantitative approach, this study has complemented the traditionally qualitative domain of urban planning, offering insights and empirical evidence. The initial presumption is that socio-economic status and government satisfaction would have substantial significance or influence to the relationship between access to technology and public participation when moderated by these two variables. However, that was not the case, resulting in the covariate analysis for each municipality. This chapter serves as a closing chapter to the study. This will be

provided by outlining the constraints of the study, examining if all questions were adequately responded to and thoroughly engaged, implications for future research and a summation.

5.2. Examining if All Questions Were Adequately Answered and Thoroughly Engaged

5.2.1. Answering the Primary Research Question

The findings indicate that while access to technology generally facilitates public participation, its impact varies depending on the specific municipal context. In some areas, such as Midvaal Local Municipality and Lesedi Local Municipality, technology appears to play a stronger role in encouraging participation, whereas in others, such as the City of Tshwane and Merafong City Local Municipality, the relationship is weaker or shaped by additional constraints. This suggests that although technology can enhance participation, its effectiveness is not uniform and may be influenced by structural, institutional, or socio-economic factors unique to each municipality.

5.2.2. Addressing the Sub-questions:

How do social, political, demographic, and geographical factors shape the influence of information technologies on public participation?

- The results reveal that geography plays a key role in determining how technology affects participation. Differences across municipalities suggest that governance structures, infrastructure, and socio-economic conditions shape the extent to which digital access translates into public participation. For example, the comparatively weaker effects observed in City of Tshwane and Merafong City

Local Municipality may point to political or infrastructural barriers limiting the effectiveness of technology in fostering participation. In contrast, stronger effects in Midvaal and Lesedi could indicate more supportive institutional environments or greater digital literacy. Moreover, the inclusion of government satisfaction and socio-economic status in the models emphasises the role of political attitudes and economic conditions in shaping participation patterns.

What is the statistical relationship between access to information technologies and levels of public participation?

- The statistical models confirm that access to technology is positively associated with public participation, but this effect is not uniform across all municipalities. While the general trend suggests that technology supports participation, the moderation analyses demonstrated that this relationship is contingent on municipal-specific factors. In some cases, access to technology significantly enhances participation, whereas in others, its influence is less prominent, possibly due to underlying barriers.
  These findings reinforce the idea that increasing access to technology alone is not a sufficient strategy for boosting participation; rather, local conditions must be considered to ensure that digital tools are effectively leveraged for public participation.

5.2.3. Contribution of the Moderation Analyses:

By incorporating municipal-level differences, the analyses provide a more distinct understanding of how technology influences public participation. Instead of treating technology as a universally beneficial factor, these findings highlight the importance of addressing localised constraints to ensure that digital access translates into meaningful engagement. The results suggest that policy efforts to enhance public participation through technology should be tailored to the specific challenges and opportunities present in each municipality, ensuring that technology serves as a facilitator rather than a passive resource.

5.3. Implications for Policymakers, Stakeholders, and Practitioners

For policymakers in the Gauteng City Region, the findings offer a call to action. The positive correlation between technology access and public participation underscores the need for digital infrastructure. However, the significant interaction effects with municipal context suggest that a one-size-fits-all approach will not suffice. Policymakers must adopt a strategy, investing in digital tools that cater to the specific needs of each municipality. In areas like Tshwane, where technology adoption is in place, efforts

should focus on enhancing digital literacy and fostering engagement. Conversely, in less urbanised regions like Midvaal, Merafong and Lesedi, the priority should be on expanding access to technology and addressing infrastructural deficits.

Stakeholders, including civil society organisations and community leaders, play a crucial role in bridging the digital divide. The findings highlight the importance of trust in political institutions as a facilitator of public participation. Stakeholders must work to build and sustain this trust, leveraging digital platforms to foster transparency and accountability. By doing so, they can create a more inclusive participatory environment, where citizens feel empowered to engage in the democratic process.

For practitioners, particularly those involved in urban planning and governance, the results offer valuable insights into the design and implementation of participatory initiatives. The negative socio-economic status association with participation suggests that practitioners must be mindful of the diverse needs of their communities. Tailoring digital tools to accommodate varying levels of income groups, digital literacy and access can enhance the efficacy of participatory efforts. Practitioners should also consider the broader socio-political context, ensuring that digital platforms are not merely tools of tokenism but catalysts for genuine engagement.

5.4. Implications for Future Research

This study represents an attempt to apply quantitative methods to the field of urban planning, traditionally dominated by qualitative approaches. The insights gained from this research open several avenues for future exploration:

1. **Longitudinal Studies**: Future research could adopt a longitudinal approach to examine how the relationship between technology access and public participation evolves over time. This would provide further understanding of the long-term impacts of digital tools on civic engagement.
2. **Digital Literacy and Inclusion**: Further investigation into the barriers to digital literacy and inclusion is essential. Understanding the challenges faced by marginalised communities in accessing and utilising digital tools can inform the development of more inclusive participatory strategies.
3. **Policy Impact**: Evaluating the impact of specific policies and interventions aimed at enhancing digital participation can provide evidence-based recommendations for policymakers. This could involve assessing the effectiveness of initiatives such as digital literacy programs, infrastructure investments, and e-governance platforms.

4. **Interdisciplinary Approaches**: Integrating insights from disciplines such as sociology, political science, and information technology can enrich our understanding of the complex dynamics between technology and public participation. Interdisciplinary research can offer a more holistic perspective on the challenges and opportunities in this field.

5.5. Conclusion

In conclusion, this research has highlighted the statistical relationship between technology and public participation, offering a roadmap for fostering more inclusive and democratic urban governance. By adopting a quantitative approach, this report has provided empirical evidence that complements the traditionally qualitative domain of urban planning. The insights gained from this study underscore the transformative potential of digital tools in enhancing public participation, while also highlighting the importance of localised strategies and collaborative governance.

As we look to the future, it is clear that the journey of connecting access to action is complex, but with informed strategies and collaborative efforts, it is a journey well worth undertaking. By aligning our strategies with the theoretical insights and empirical evidence presented in this study, we can harness the transformative potential of digital tools to create more equitable and participatory urban futures.

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Annex A: Quality of Life Survey Index

Table A1: The seven dimensions and constituent variables of the QoL Index, along with the relevant variable names in the QoL Survey 7 (2023/24) dataset.

Dimension	Index Variable Label	Index Variable Description	QoL 7 (2023/24) variable(s)
Socio-economic status	h5	Personally covered by medical aid	q13_5_medical_aid
	e2	Education level	q14_1_education
	e5	Household has working internet connection	q6_3_7_fibre_based_internet
			q6_3_12_other_home_internet
	w5	Employment status	q10_2_working
	w6	Monthly household income	q15_3_income
Government Satisfaction	p6	Satisfaction: National government	q7_4_ng
	p7	Satisfaction: Provincial government	q7_5_pg
	p8	Satisfaction: Local municipality	q7_6_lg
	r5	Government has improved quality of life	q7_8_level_gov
	p9	Agrees most government officials adhere to Batho Pele	q7_9_batho_pele
Participation	c4		q12_1_1_church

		Participated in organised social activities	q12_1_2_social
			q12_1_3_stokvel
			q12_1_4_community
			q12_1_5_political
			q12_1_6_other
	p10	Participated in formal political engagements	q12_2_1_ward
			q12_2_2_street
			q12_2_3_cdf
			q12_2_4_idp
			q12_2_5_mayor
			q12_2_6_sbg
			q12_2_7_cpf
	r4	Satisfied with municipal communication	q7_12_munic_comm
	p11	Planning to vote in the local election	q7_2_vote

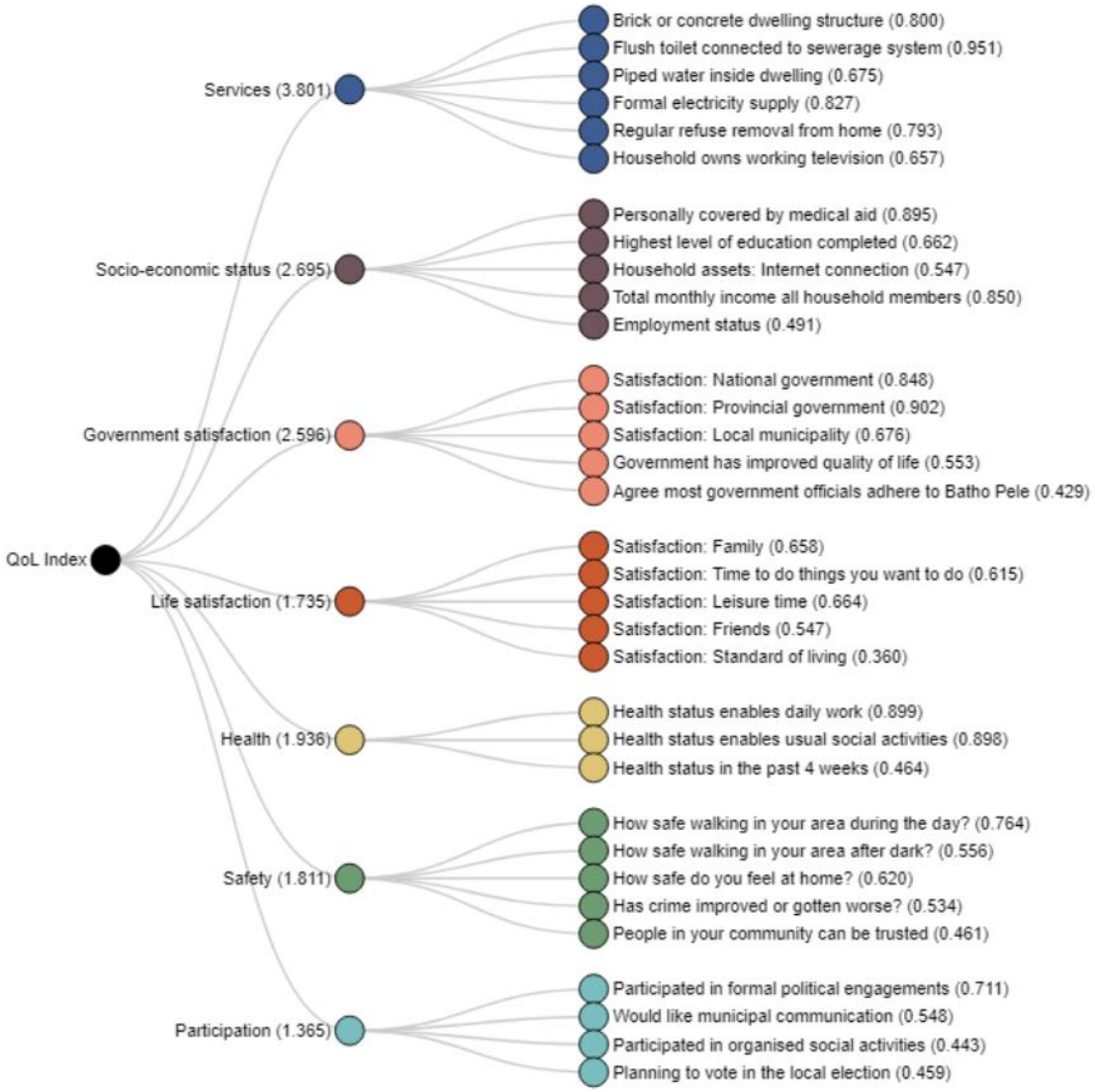
Source: Adapted from Gauteng City-Region Observatory (GCRO) (2024, p. 6-8).

Table A2: Questions/Variables utilised to create Digital Access Capability Index

q6_1_internet
q6_3_2_cell
q6_3_4_computer
q6_3_7_fibre_based_internet
q6_3_11_smartphone
q6_3_12_other_home_internet

(Source: Received from Gauteng City-Region Observatory (GCRO) QoL Survey based on survey data, 2025)

Figure A2: Tree diagram showing the variables comprising each of the seven dimensions of the revised QoL Index. For variables, the factor loading is included in brackets, while for dimensions, the eigenvalue is included.



Source: Gauteng City-Region Observatory (GCRO) (2024, p. 4).

Annex B: Cronbach's Alpha Ranges, and Interpretations

Table B1: Reliability Levels, Cronbach's Alpha Ranges, and Their Interpretations.

Reliability Level	Cronbach's Alpha Range	Interpretation
Excellent	0.90 and above	Indicates very high internal consistency.
Good	0.80 - 0.89	Reflects strong internal consistency.
Acceptable	0.70 - 0.79	Indicates acceptable internal consistency.
Questionable	0.60 - 0.69	Reflects questionable internal consistency.
Poor	Below 0.60	Indicates poor internal consistency.

Source: Ahmad et al (2024, p. 116)

Annex C: Descriptive Analytics

Table C1: Frequency Distribution of Population Group

Value	Frequency	Percent	Valid Percent	Cumulative Percent	Variable
Black African	10,834	78.649728	78.649728	78.64973	Population Group
Coloured	584	4.239564	4.239564	82.88929	Population Group
Indian/Asian	379	2.751361	2.751361	85.64065	Population Group
Same	0	0.000000	0.000000	85.64065	Population Group
White	1,978	14.359347	14.359347	100.00000	Population Group

(Source: Author's own calculations based on survey data, 2025)

Table C2: Frequency Distribution of Sex

Value	Frequency	Percent	Valid Percent	Cumulative Percent	Variable
Female	7,073	51.34664	51.34664	51.34664	Sex
Male	6,702	48.65336	48.65336	100.00000	Sex

(Source: Author's own calculations based on survey data, 2025)

Table C3: Frequency Distribution of Municipalities

Municipality	Frequency	Percent	Valid Percent	Cumulative Percent
City of Ekurhuleni	2,717	19.724138	19.724138	19.72414
City of Johannesburg	3,934	28.558984	28.558984	48.28312
City of Tshwane	2,629	19.085299	19.085299	67.36842
Emfuleni	915	6.642468	6.642468	74.01089
Lesedi	624	4.529946	4.529946	78.54083
Merafong	676	4.907441	4.907441	83.44828
Midvaal	726	5.270417	5.270417	88.71869
Rand West	730	5.299456	5.299456	100.00000

(Source: Author's own calculations based on survey data, 2025)