

**Understanding the contributing factors and the
barriers prohibiting successful implementation of
smart cities in Africa**



**Minor dissertation
MSc Project management**

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Abstract

Africa is a rapidly developing continent with immense potential. Several “Smart solutions” or “Smart Cities” have been initiated at various scales and with different ethos’s. The Smart City concept has been proposed as a solution that aims to aid in solving some of the socio-economic problems that are currently being faced in the different contexts on the continent. What is important to consider and understand is how these developments have fared and understand the barriers and contributing factors to the different results that have been produced.

This research used interviews from different perspectives from subjects who have knowledge of or have been involved with Smart Cities to uncover the barriers and contributing factors to smart city implementation on the continent. Themes were uncovered in the literature that the interviews tested to prove or disprove the research proposition made.

The research proved the proposition to be true. Various socio-economic issues have hindered the execution and progression of the smart city concept in the selected African cities analysed. Literature has noted smart cities as a potential aid in combating rapid urbanisation and the research corroborated this claim. The research determined that urbanisation can be looked at from different perspectives and that innovative solutions regarding transport, the economy and housing will contribute to positive reactions to urbanisation. Governance served to be a multi-faceted issue. Governance relates to the level of understanding of the smart city concept that staff in decision-making decisions have and their ability to implement the concepts that are relevant. The research uncovered that a lack of understanding led to the reluctance of implementing smart solutions and the lack of robust systems meant that the operations taking place during the development and running of smart solutions were often sub-optimal. This brought into question the design considerations that have been made in the smart solutions that have been designed and implemented. The research determined that there have been holistic considerations when designing smart cities and solutions to consider all the facets of an urban space that are relevant and constitute as “smart solutions”. Additionally, the research identifies the design considerations are contextual to the application and serve to solve some of the issues that currently exist and have been forecasted. Ultimately, the success of these projects and the project success criteria determines the value system and the direction that the project will take, and the research illustrated congruency between the projects and literature. Smart city project success criteria, from the research, can be seen as the fulfilment of people/user-centric solutions that is tangibly felt by the integration and usage of the solutions provided.

Finally, the research recommended that improved stakeholder engagement will create a foundation with better direction for the development of smart cities. Additionally, governing bodies should task

themselves to do the following: review and overhaul the old systems they're currently looking to use in new applications, understand the smart city concept in its most ideal form for application, pivot to use more innovative solutions that may be more productive than the outdated solutions they have attempted to use in the past.

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Table of Contents

Plagiarism declaration.....	2
Abstract.....	3
Acknowledgements	5
1 Chapter 1	8
1.1 Introduction	8
1.2 Background.....	8
1.3 Problem Statement	12
1.4 Research Question	12
1.5 Research Aim	12
1.6 Research Proposition.....	12
1.7 Research Objectives	12
1.8 Research Methodology	12
1.9 Report Structure.....	13
2 Chapter 2: Literature Review	14
2.1 Introduction	14
2.2 Theoretical significance of smart cities.....	14
2.3 Contextual need for smart cities.....	16
2.4 Understanding Smart cities	20
2.5 Global North smart cities.....	22
2.6 African smart city application.....	23
2.7 Stakeholder engagement in smart cities	28
2.8 Project success criteria	30
2.9 Smart City Criticism	34
2.10 Summary	36
3 Chapter 3: Methodology.....	37
3.1 Introduction.....	37
3.2 Research Philosophy	37
3.3 Research Approach	39
3.4 Research Strategy	40
3.5 Data Collection Methods	42
3.6 Data Analysis	44
3.7 Ethical Considerations.....	45
3.8 Limitations.....	45
3.9 Summary.....	46

4	Chapter 4: Data Analysis	47
4.1	Introduction.....	47
4.2	Interview methodology.....	47
4.3	Interview Question Outline.....	48
4.4	Critical Themes.....	49
4.4.1	Smart initiative experience.....	50
4.4.2	Governance.....	54
4.4.3	Urban densification.....	58
4.4.4	Project success.....	60
4.4.5	Design Considerations.....	64
4.5	Summary.....	68
5	Conclusion	69
5.1	Research Question.....	69
5.2	Research Aim.....	69
5.3	Research Proposition.....	71
5.4	Research Objectives.....	72
5.5	Limitations.....	73
5.6	Summary.....	74
6	References	75
7	Appendices	79
7.1	Appendix 1: Konza City interview plan.....	79
7.2	Appendix 2: Century City interview plan.....	80
7.3	Appendix 3: Melrose Arch interview plan.....	81
7.4	Appendix 4: Oxford Parks interview plan.....	83
7.5	Appendix 5: Researcher interview plan.....	83

Table of Figures

Figure 1: 3RC framework in relation to the schools of thought in smart cities (Kummitha & Crutzen, 2017: 45).....	20
Figure 2: Smart Cities and multi-stakeholder perspective. (Bifulco et al.: 31 2014).....	30

1 Chapter 1

1.1 Introduction

This chapter aims to analyse the concept of smart cities in the African context from different perspectives. There is a need for solutions to the rapid urbanisation and progression of society in the world. The concept of smart cities has been proposed to fulfil this but has faced critiques on the execution of the final product that has been produced (Department of Corporate Governance, 2021).

The importance and interest of this research lies in the fact that as we approach the critical point of urbanisation statistics where urban populations are increasing faster than urban infrastructure can handle, there is a need to understand what must be done to effectively solve the problem optimally. The African concept of smart cities also presents its own problems given the socio-economic standpoint of the continent and the various countries that have sought to implement smart cities. A focused critical analysis of this topic should hopefully uncover trends and phenomena that may be of use to improving the implementation of smart cities.

1.2 Background

At present, 56% of the population in the world lives in cities and the expectation is that this will increase with 2050 projections at 70% (World Bank, 2023). This incentivises the need for cities to develop to accommodate the inhabitants in a way that meets the current needs but that accounts for the technologically centred future that is expected to exist. Giffinger (2007) developed the smart city concept. A smart city can be defined as an urban environment that integrates software and technology into the inherent characteristics of a city and its environment to stimulate economic development by means of information communication technology (Kitchin, 2015).

The implementation of smart cities in the global context has mixed results regarding their success and the African continent finds itself in the same position. The existent systems make the implementation of smart solutions more difficult in most African environments and for these to be addressed, there needs to be an understanding of the overall needs to progress.

The concept of a smart city is dynamic and follows the trend and era of technology in the age that the city exists. The concept of a smart city originally began with the concept of sustainable cities in the 1950's where the overarching strategy was to curate city environments to tackle climate change. With the surge of technology in the 1990's, "digital cities" started to develop to accommodate for the magnitude of information and telecommunication needs in the new world. This initiative and paradigm shift also aimed to drive inhabitant participation in curating the environments they reside in. Finally, the term "smart city" emanated from the progression of the previous stage where sustainability in addition to technological advances were merged (Ermiya & Sandflea, 2017).

Smart city research is currently in the preliminary phases given the age of the new-age smart cities and contextually understanding that their success cannot be judged prematurely. However, the planning phases of smart cities have seen shortcomings that have increased the difficulty in implementation. The broader categories to consider in smart city shortcomings are the strategic elements (Angelidou, 2017). Case study research on nine smart cities, both greenfield and brownfield, suggests that physical planning, technology, financing, timing, and stakeholder resonance can be cited as focal points in the shortcomings of smart city implementation (Angelidou, 2017). The observed factors exhibit variability across the nine examined case studies; however, a commonality among the identified shortcomings appears to be rooted in economic factors on a global perspective. Smart cities can either be greenfield or brownfield. Greenfield smart cities are developed and planned from the grassroots level on a “blank canvas”, speak. Brownfield developments, on the other hand, use an existing city to restructure and make improvements to consider it a smart city. These two templates provide their own challenges. The challenge that greenfield smart cities are faced with is the element of integrating conceptual ideologies with the reality and contextual standpoint of the area of development.

Measuring the performance of a smart city is equally as dynamic as the concept itself. Consolidating this into a generalised framework poses a challenge but literature continues to allude to a widely used framework. Giffinger (2007) developed a hierarchical six-dimensional theory using 74 indicators to measure smart city performance, each of them allocated to 31 factors used to describe the six characteristics used for analysis. The following characteristics constitute the characteristics of what a smart city entails: smart economy, smart people, smart governance, smart mobility, smart environment, and smart living. Outside of comprising of the characteristics used to measure performance of smart cities, these characteristics are additionally utilised for the direction of development of smart cities. This is, of course, a generalisation but similarities can be found in other smart city framework to illustrate the adjacency and consistency of how encompassing the characteristics are.

Various definitions of smart cities exist. One such definition comes from Hall, Bowerman, Braverman, Taylor, Todosow and Wimmersperg, (2000). The definition formulated is:

“the urban center of the future - safe, protected, ecologically friendly and efficient - because all structures (e.g., power, water, transport) are designed, constructed, and maintained making use of advanced, integrated materials, sensors, electronics, and networks which are interfaced with computerized systems comprised of databases, tracking, and decision-making algorithms”

A common factor used between the definitions provided by Giffinger and Hall, Bowerman, Braverman, Taylor, Todosow and Wimmersperg is that information communication technology will be an important component to incorporate into essential factors of human like such as water, transport, water etc. The definitions provided thus far utilise integration and interfacing to describe the involvement of

technology and this is an important distinction to note as the success of these solutions is prohibited in scenarios where there is fragmentation and isolation between sectors.

This research will call on other African Cities attempts at smart cities, their framework and ideologies as references for the existing thinking and application. In conjunction, Giffinger's six-dimensional model will be used both as performance indicators and developmental guides due to the widely accepted use of the framework.

The increasing dependence of technology in society today has shaped the routes of development of our urban spaces. Emanating from this are concepts of digital and smart cities with important distinctions to be made between the two. An important point of emphasis to distinguish is that smart cities are not defined by technology deployment as solutions but must rather heavily account for citizen and stakeholder engagement in addition to the governing policies and practices used by those in power and overseeing the urban space or city in question (Boyle & Staines, 2019). As mentioned before, the concept is dynamic and has changed over time. Consequently, the terms tend to be used interchangeably

Surveys and research from Nair et al. (2020) on drivers and barriers to the adoption of the smart city paradigm in developing countries from a South African perspective identified 128 barriers to smart city implementation. By percentage, skills and competency accounted for 11% of the barriers, ranking third after Organisational and economic factors (Nair et al., 2020).

Fourteen specific factors were identified, where the lack of understanding of the smart city concept by leaders was identified to be the biggest skills and competency barrier. This posing an obvious challenge for progress as one can deduce the consequent effect the leaders possess that directly relates to tangible change. Additionally, Naier et al (2020) surveyed participants for greater depth on the issue and further unearthed a lack of the necessary technological skills to maximise the usage of smart solutions.

Participants of another study on smart city readiness in South African municipalities by Enwereji & Uwizeyimana (2022) revealed the role played by governing bodies and members. Leaders' reluctance to commit to understanding new technologies and how they can be actualised was cited as a reason for poor readiness for the smart city concept, the desire to remain using crude and outdated methods overpowering the desire for smart solutions. This, aided by inconsistencies and instability in leadership accumulates to produce stagnancy.

The bridge between smart cities and property development lies in the planning and framework that is required to execute the ideologies successfully. As mentioned prior, smart cities may be greenfield or brownfield and regardless of this distinction, either scenario will incorporate infrastructure to execute smart solutions. Governing bodies and the regulations they maintain regarding urban development's dictate the general direction of development of said infrastructure. Investors and developers may often be ushered into compliance as opposed to the innovative solutions where regulations play a role in the

direction of development, and this is counterproductive to the intention of solving issues in urban spaces in the manner that the definition of a smart city has outlined (Apanaviciene et al., 2020).

One such example of the role of governance and leaders in smart city implementation is Cape Town. A Case study of the city that is said to be a leader of smart city developments and solutions reveals that leadership change caused a loss of momentum of development and stagnancy in the ideals that smart cities are pinned on. Change both in the form of organisational change of staff responsible for development but additionally, the somewhat unquantifiable change of eagerness to fill the previously proposed strategies (Boyle, 2019). Intertwined in this change of leadership is a new knowledge and skill gap that is created where the handover process can be brought into question. A necessary factor to consider in governance of smart cities is ensuring that the vision lives on through phases of change (regardless of the type of change) to avoid deviation in addition to the loss of momentum seen in Cape Town due to the absence of appropriate guidance on the determined priorities.

The change in leadership has also been found to have a consequent effect on the vision of the smart city vision. Distortion of the vision influences the implementation and maintenance of the proposed plans regarding to decision-making and the relationship between important stakeholders required for the successful implementation of the systems and infrastructure. The relationships forming an integral part of smart solutions due the involvement of the private sector (Boyle, 2019)

Having gained a brief understanding of how and why the smart city concept was developed and examples of its application, the pillars and foundation of the research were set to decipher what it is that makes cities “smart”. This is an aim of the main research question and will be determined using the data collection methods the research has proposed. The six characteristics defined by Giffinger (2007) form the pillars that this study will use as guidelines to understand the barriers and contributing factors to smart city implementation. Preliminarily, the background investigated these characteristics to illustrate the importance of defining them and how they influence the smart city. Furthermore, the background briefly illustrated the consequences of suboptimal implementation. The aim of this research is to further understand the themes that exist in the smart city and urban megaproject space that influence the implementation of smart cities.

The research ultimately aims to understand some of the shortcomings of the smart city concept in its application in the African context and provide context that has been detailed by firsthand staff involved in smart city concepts of different characteristics. This begins with the definition of what a smart city or solution entails. This is important to understand how the approaches are determined using the definition. The background thus far has illustrated how diverse definitions exist and the deductions that can be made from this diversity will be detailed in this research.

Further to this, the barriers and contributing factors from the projects that will be analysed will be triangulated to determine the running common themes to provide insight.

1.3 Problem Statement

Despite growing interest in smart cities as a response to urbanisation and infrastructural strain, the concept remains inconsistently understood in many African contexts. This limited conceptual clarity has had consequences, including misaligned expectations, flawed planning, and suboptimal implementation. In certain instances, smart city initiatives have struggled to deliver on their intended outcomes due to barriers related to governance, stakeholder alignment, and contextual adaptability. The challenge is multi-faceted, encompassing both the capabilities of those responsible for implementing these projects and the suitability of the models being applied. This research seeks to investigate the barriers and contributing factors that have influenced the implementation of smart city projects in the selected African cities in this study. By doing so, it aims to create a clearer understanding of the structural and strategic adjustments required to enhance the prospects of success for future initiatives.

1.4 Research Question

The research question is as follows:

- a) How do the African cities selected for this study define a smart city and what are the barriers and contributing factors to their implementation?

1.5 Research Aim

Determine the barriers and contributing factors to smart city implementation in the selected African cities.

1.6 Research Proposition

The implementation of smart cities in the selected African cities is affected by challenges associated to socioeconomic issues which impact the success and sustainability of these initiatives.

1.7 Research Objectives

- a) Determine how African countries define smart cities in their context.
- b) Identify the contributing factors to both successful and unsuccessful smart city implementation.
- c) Identify barriers that hinder the successful implementation of smart city projects.

1.8 Research Methodology

The research methodology proposed for this research is an interview-based qualitative approach that will aim to develop credible conclusions regarding the barriers and contributing factors to smart city implementation in the selected cases. The interviews will take place with staff that have been involved in specific smart solutions or have sufficient knowledge of the topic. This is the option selected as it should provide different information and insight on the concept of smart cities in Africa. The data will

be analysed in a manner that looks at the responses that have been gathered and link them to the themes that literature review has determined. The links between the themes from the literature and the uncovered information from the interviews will form part of understanding what the barriers and contributing factors to smart city implementation.

There are limitations associated with the methodology selected. A limited number of case studies will be used for this research, and this may introduce difficulties associated to the data gathered as the different projects may at be different stages and will naturally be facing different socio-economic conditions due to location. Thus, generalisation will be limited in the data analysis phase.

1.9 Report Structure

Chapter 1: This chapter of the research project will comprise of the content in the proposal. This will assist in outlining the research topic chosen by means of the research aims, objectives, questions, proposition, and the methodology proposed.

Chapter 2: The literature review will follow to ascertain the prior research on smart cities pertaining to what the concept is founded on, case studies of where smart cities have been implemented, and the reviews of smart cities (regarding both successful and unsuccessful implementation).

Chapter 3: This chapter will expand on the research methodology proposed in chapter 1. More specifically presenting he method of data collection for the qualitative approach, how the analysis there of will be performed.

Chapter 4: The data will then be provided with the aim of this chapter being to analyse and discuss the data with reference to the hypothesis and research question initially devised.

Chapter 5: This chapter will form the conclusion of the research. The findings will be summarised with conclusive and definitive presentation of answers for the research questions. Furthermore, recommendations will be made for further research in addition recommendations pertaining to improving the state of smart cities and making it a more robust working connect in the African context.

2 Chapter 2: Literature Review

2.1 Introduction

This chapter reviews existing literature on smart cities, using Giffinger's six-dimensional model (2007) as a foundation. It traces the evolution of smart city concepts from technology-driven models to more inclusive, human-centered approaches. The chapter assesses examples, highlighting common challenges shared between them and establishes a strong foundation for the research while aiming to justify the importance of the research that is being undertaken. The themes that will be uncovered in the data collection and analysis phases are introduced and discussed in this chapter.

2.2 Theoretical significance of smart cities

To realize the theoretical significance of smart cities, the realization that needs to be consists of understanding the need for our urban spaces now and the needs of the world and where they emanate from. Giffinger (2007) developed the six-dimensional theory of a smart city that consists of: smart economy, smart mobility, smart governance, smart environments, smart people, and smart living. These six dimensions have further classifications and categories that specify what they constitute and from those specifications one can then allocate or decipher different solutions to ensuring that these categories are satisfied within the development of smart cities.

The six dimensions of a smart city—economy, people, governance, mobility, environment, and living are interdependent factors that shape urban development. A smart economy drives innovation and entrepreneurship, which influences real estate through the creation of economic hubs and specialised zones for industrial or innovation purposes. Smart people is defined equipping citizens with education, creativity, and social inclusion. Smart governance facilitates transparent and efficient public administration, which enhances investor confidence and streamlines real estate project approvals. This characteristic influences the framework and freedom of innovation that real estate developers can incorporate when investing into spaces. An understanding of the smart city concept from governing bodies can be considered a valuable foundation for the solutions that will be produced. Smart mobility encourages the integration of public transit and digital infrastructure, impacting property values and promoting transit-oriented developments that prioritise the end user by incorporating efficiency and ease of access. Smart environment emphasizes sustainability, encouraging green building practices, energy efficiency, and eco-friendly urban layouts in real estate projects. When connected to smart governance, frameworks ideally seek to engrain the consideration of the environment in them. Lastly, smart living enhances quality of life through various factors with the aim of increasing the desirability of residential and mixed-use developments. The accumulation of all these factors produces what can be considered a smart city.

An important need for smart cities is in the need to cater to all the inhabitants of a country or area in a future-centric manner. Urbanization is on the rise at a rapid rate as mentioned in the background of the study and what emanates from this is needed to provide for people in a way that incentivizes cooperation and participation in progressing countries forward but also in a way that provides benefit to stakeholders that are providing these services. Smart cities are a forward way of thinking that accounts for the future and are aiming to also rectify or improve previous solutions. Urbanisation, especially in the Global South, has placed pressure on urban infrastructure and service delivery (UN-Habitat, 2020). As a result, smart cities have emerged as a conceptual and practical solution aimed at leveraging ICT to improve urban efficiency, inclusivity, and sustainability (Cocchia, 2014; Hollands, 2008).

Research from the World Bank has not only identified that the world's population living in cities will reach 70% by 2050 but they have currently accounted for 80% of the GDP generated worldwide stemming from cities themselves (World Bank Group, 2050). Further to this research, the conclusion that they have reached is inequality and exclusion within cities is another existing issue aside from the rising rapid urbanization within cities (World Bank Group, 2050).

With Giffinger's six-dimensional theory of smart cities in mind, the World Bank themselves have identified that spatial inclusion, social inclusion and economic inclusion are factors that require attention, particularly in the Global South (World Inclusive Cities Approach Paper, 2015). The nature of these spaces being that these factors are dependent on each other to thrive. However, one may preliminarily identify that these needs for inclusiveness within cities also intersect with the six-dimensional theory of what constitutes maturity and from this one can determine the cause and effects as well as the perceived solutions that are necessary within our open spaces to mitigate urban issues.

Giffinger's model has expressed the purpose of serving as a framework that is flexible yet comprehensive to aid development of the contexts it is applied in. An initiative such as the IBM Smart Cities Challenge illustrates the flexibility and comprehensiveness of Giffinger's model as different cities with their own socioeconomic challenges were able to participate and implement solutions that fit their context.

The IBM smarter cities challenge played a pivotal role in the development of the smart city concept. The challenge saw its inception in 2010. Although it was not the root of the concept, the IBM smarter cities challenge propelled the smart city concept and challenged big global digital corporations to understand the concept but also the effect that they may have in making it impactful. The timing of this concept also coincided with a big uptick of discourse of the concept and inquiries into how viable it could be to undertake such developments. The IBM smart cities analyzed cities of distinct characteristics and challenged the cities (such as Lagos, Rio De Janeiro, Jakarta, and Delhi, and 126 more that participated in the first 5 years) to make attempts at implementing the concept. The result of

this was understanding how smart cities were understood by governments, how integration of smart solutions can be done and how these solutions can shape urban spaces (Alizadeh, 2017).

IBM proposed improvements to cities in five sectors: water management, public safety, traffic, buildings, and energy. The challenge implemented these by employing experts to collaborate with countries governments to “offer digitally enabled solutions in diverse areas of citizen engagement, public-safety, transportation, sustainability, economic development, social services, and land-use planning.” (Alizadeh, 2017) in an integrated manner that did not restrict each sector to a silo. The overarching purpose of the challenge was to challenge the status quo with guidelines to change that account for modernity.

2.3 Contextual need for smart cities

The need for smart cities is contextual. Every application in every city has its own contextual need. However, there are similarities or common denominators that are rooted in the theoretical significance of the issues that smart cities aim to address. One such acknowledgment of smart cities is that they are a shift in paradigms. The Lanseria smart city is a new proposed development. Snowy Mountains Engineering Corporation, Australia (SMEC) have appropriately stated that it is “shifting the paradigms of a smart city” (SMEC, n.d.: 1). They have further stated that the project is a move towards increasing levels of sustainability, innovation, and inclusivity by means of pushing the boundaries planning, and engineering, urbanisation (SMEC, n.d.).

Studies have raised concerns about smart city projects focusing on technology while ignoring the basic needs of people. Tan and Taihagh (2020) explain that in many developing countries, smart city plans are implemented without ensuring there is access to water, housing, and sanitation. Clark (2020) also denotes that these projects are susceptible to benefiting private companies more than the people who live in the cities. An example from the Global North is the Sidewalk Toronto project, which failed after local communities felt left out of the planning process (McCord and Becker, 2019). To avoid issues of this nature, Esteban-Narro et al. (2025) suggest that governments and developers need to involve a wide range of stakeholders from the beginning, to ensure that the solutions meet the needs of the communities they are meant to assist.

In the case that a smart city is being developed, it should aim to use a more contextual application as opposed to a generic structure that is not compatible with the issues of the country it is being applied to. The South African context of cities and towns should always account for the apartheid regime and the lasting effect that is had on the current state of urban spaces. Nuclear zones that typically provide more jobs and economic activity are easily accessible to the affluent who live in much closer proximity than the underprivileged who tend to be in the peripheries that are of higher density and poorly serviced (Department of Corporate Governance, 2021).

Further to the issue of legacy spatial planning and its effects is the disconnect between the services that would allow for access and more equality for all the underprivileged. This is essentially a reinforcement of the historic social and economic inequalities of the past. A World Bank (2025) study from 2021 indicated that 56% of the South African population was living in poverty and this has since risen to 63% (World Bank, 2018; World Bank 2024). Furthermore, the top 10% of South Africans own approximately 86% of the country's wealth, highlighting significant wealth inequality (Chatterjee, Czajka and Gethin, 2021). The influence of this is found in the settlements and money generation methods that are devised to improve conditions, both socially and economically. This is where auxiliary issues become prevalent and need to be addressed through their own means of mitigation (Department of Corporate Governance, 2021). South Africa additionally displays an unemployment rate of 31.9%, a 1% increase the third quarter of 2020 (World Bank, 2023).

One of the consequences of the issues discussed above is the failure to retain qualified individuals who will maintain and improve the urban spaces they are applied in. A lack of training, the appropriate resources, and the necessary senior management support to operate efficiently as a municipality have been found to be sources of the state of state of municipalities. As a product of the above inadequacies in municipal management and capabilities, the inhabitants of municipalities tend to revolt against the poor service delivery they are receiving in conjunction with potential investors becoming sceptical to invest with the understanding that there may be a disconnect between what has been invested and what is produced due to the mentioned issues (Kolondaisami, 2020). Thus, a need for better or smart governance can be found to fill the gap and create more robust systems that mitigate the current issues being faced in municipalities. It is also important to note that smart city implementation cannot only account for the nuclear or central hubs of cities or areas but must also aim to be more inclusive.

Kolondaisami (2020) uncovered the drivers for smart cities in South Africa that have become part of the framework used to make a case for developing the concept. The research uncovered 23 unique drivers with 15 perceived benefits:

- Improved Service Delivery
- Enhanced Quality of Life
- Resource Optimization
- Cost Reduction
- Investment Attraction
- Economic Development
- Job Creation
- Infrastructure Development
- Public Safety Enhancement
- Environmental Sustainability

- Digital Inclusion
- Citizen Engagement
- Transparency and Accountability
- Data-Driven Decision Making
- Smart Mobility Solutions

An analysis of these factors provides the hierarchical order of their importance in addition to the parties that contributed and their perspective for why smart cities may be beneficial to all concerned. A broad outlook on this study illustrates that of the 23 identified issues, there were 8 citizen related factors. Illustrating that this category is of most importance as that is who the solution is intended for. On the other side of the scale, leadership, and external factors each possessed two drivers each.

A CEO from the private sector said the following when discussing community engagement and made an important point regarding the effect of COVID-19 on the world:

“Because the millennial now, he does everything from his mobile phone. I don’t need to walk into a store or do anything, and I think even with COVID-19, where people have now accepted that online ordering is the new way of doing business, the same with the municipality. I am going to engage my municipality online” (Participant 1). (Kolondaisami, 2020: 57)

This can be categorised under the more technologically driven factors surrounding smart cities, but the nature of smart cities is that all factors are interconnected. COVID-19 solicited and highlighted the importance of productivity and living using online and technologically driven solutions. The socio-economic disparities that exist in our communities became even more prevalent during this time. Different demographics were able to adjust and acclimatise to the conditions of that era while others did not fare as well. The world is not far removed from that time and the effects are still being felt today. What the COVID-19 era illustrated is also the ability for those in governing roles to operate and deliver services in addition to the adequacy of the systems in use to fulfil this role. Further to this was an indication of the generational difference that exists. Where the younger generation were accustomed to a digital-centric world, the older generation lacked the skills and knowledge to function optimally and maximise the resources available to them.

Numerous African countries such as South Africa, Nigeria, Egypt, Ghana, Kenya, and Rwanda have proposed and explored the concept of smart cities in their own contexts. The justification of these propositions stems from the perception of the problems that faced in the cities. a brief investigation of African smart city cases provides more insight.

Although Cairo, Egypt, is not considered a smart city, efforts have been made to implement infrastructure and ideologies that align with the smart city framework. As part of its 2050 development vision, the city identified several interconnected challenges commonly addressed by smart city

frameworks: high population density, traffic congestion, environmental degradation, and the expansion of informal settlements (Tarbush, 2012). In 2006, Greater Cairo's population was approximately 16.3 million, and by 2020 it had expanded to an estimated 23 million, exceeding earlier projections (Clean Air Fund, 2020). Current forecasts suggest that the population could reach as high as 38 million by 2050 (UN-Habitat, 2020). This concentration of people, particularly in central areas, has placed significant strain on infrastructure and services. This has led to increased informal development and elevated levels of congestion and pollution. These dynamics highlight the urgency of adopting a more holistic, integrated urban planning approach, such as that offered by smart city models, which emphasise sustainable development, inclusive governance, and coordinated infrastructure expansion.

There should ideally be an understanding of why there is poor service-delivery in cities and why there is a need for holistic improvement in the management as well as the user experience. Regarding the management, the analysis of the IBM smarter cities challenge made an appropriate assessment. The relationship between expectations and the support provided to fulfill these expectations is disproportionate.

It has been theorized that the desire for smart cities may be a fixation on the aesthetic image that is portrayed by a smart city, as opposed to the planning and implementation that qualifies a city as smart (Sadowski & Pasquale, 2015).

Gaps between the expectation and the reality of African cities that have attempted to implement smart solutions have been realized. Part of the desire to develop at a rapid pace and to develop these grand megaprojects also comes from investors and developers understanding the growth rate of the African continent and wanting to capitalize on it (AP News, 2025). Coupled with being the second fastest growing economy in the world, there is also an outlook on Dubai as the sample model of growth and development and the desire to have adjacency to the “global elite” status that they have achieved (Splinter & Van Leynseele, 2019b).

The New Urban Agenda (2017) is a United Nations endorsed agenda that possesses a shared vision for the improvement of a better and more sustainable future. The agenda serves as an accelerator for the sustainable goals with particular focus on the intention to make cities more inclusive, resilient, and safe. Thirty-six member states, including African countries, signed the agenda. This serves a valuable perspective of analysis to contextually understand the case for the smart city concept. Within this framework is a commitment to “adopting a smart city approach.” This is a commitment to developing service delivery, solidifying economic growth, and increasing environmental sustainability. The usage of innovative transport and clean energy technologies in addition to general implementation of digitization in cities will propel the ethos of making cities smart (*United Nations, 2017*).

2.4 Understanding Smart cities

Smart cities can be understood from numerous perspectives. This study aims to explore how African countries that have attempted to implement the concept understand it, as this is vital to determining their trajectory toward the intended outcomes. Merriam-Webster defines a *school of thought* as “a way of thinking.” Countries and cities that have explored or implemented the smart city concept can be grouped under various schools of thought that have been developed around it (*School of thought*, Merriam-Webster, accessed 9 Dec. 2024).

Kummitha & Crutzen’s (2017) smart city research began with qualifying smart city approaches from two overarching perspectives. Technology-driven approaches and human-driven approaches. The most common understanding of technology-driven approaches is that the implementation of ICT solutions will introduce the missing factor in urban spaces and aid solve the issues that are currently faced. This is idealised by notion that there will be an increase of community empowerment and involvement that will influence the economic prosperity of the city, amongst other factors.

This was followed by a critical analysis of literature that produced the Three “R” framework (3RC framework) that divided the evaluation of smart cities into the four schools of thought (Kummitha & Crutzen, 2017: 45).

The positioning of 3RC framework with regard to the Technology/Human Driven methods.

School of thought	Technology driven methods			Human driven methods		
	High	Medium	Low	High	Medium	Low
Restrictive	x					x
Reflective	x				x	
Rationalistic		x		x		
Critical			x			x

Figure 1: 3RC framework in relation to the schools of thought in smart cities (Kummitha & Crutzen, 2017: 45)

The Figure above illustrates the two overarching methods of smart city implementation in relation to the schools of thought. The four schools of thought place emphasis and bias towards different factors that place them more towards one of the overarching schools of thought.

The restrictive and critical schools of thought are on complete opposite sides of the scale generated to qualify their level of emphasis of an overarching approach. The restrictive school of thought highly emphasises high technological deployment and the role of data in creating a smart city. The understanding of this school of thought is that the storing of knowledge will drastically improve how those responsible for the management of cities will be able to undertake their role. Primary to this is that the citizens will be provided with more comprehensive and efficient methods of increasing citizen and

government interactions and having a better sense of current affairs regarding citizen requirements and needs. This school of thought essentially sees ICT deployment and involvement in smart cities as an end, an all-encompassing solution and mainstay in the criteria of a successful smart city (Kummitha & Crutzen, 2017).

Although the critical school of thought illustrated similar bias to the restrictive school of thought towards the technology-driven smart city, the understanding of the smart city is drastically different in this school of thought. This school of thought focuses on the notion that private investors and stakeholders are accountable for the smart city concept and its insurgence. They are the main party looking to privatise urban spaces through their investments under the guise of upgrading infrastructure and introducing their technologies and solutions. It is primarily a top-down approach where the implementation of these perceived positive solution is also seen as the end and where the social and human-oriented solutions are accounted for through their implementation. The understanding and critiques that emanate from this school of thought imply the smart city is more of a business model rather than an all-encompassing social endeavour to solve the core issues that are faced in urban spaces. (Kummitha & Crutzen, 2017).

Similarly to the two schools of thought briefly outlined, the reflective and the rationalistic schools of thought share adjacent consensus given their bias towards the human-driven methods of smart city implementation. There is the understanding that the technology-driven methods of smart city implementation have their benefits to offer. However, the creation of human capital and enhancing the capabilities is seen as the main proponent of the rationalistic school of thought. This is motivated by the data-sharing and monitoring capabilities that can become a by-product of the technological implementations, a shift in mindset from the previously explored schools of thought. Instead of being an end, technological advances are seen as means to an end (Kummitha & Crutzen, 2017).

Reducing the gap between implementation and the maximising of the technology proposed for smart cities consumes most of the ideology of smart cities. What differentiates this school of thought from the reflective school of thought is how it proposes that solutions are testes and practiced by citizens in the developmental phase of smart city developments. Intuitively, this is an apt solution as it should uncover whether the solution is appropriate for the application that is being utilised in as well provide real-time feedback prior to the operational phase for stakeholders and investors to process and further alter the final product.

Kummitha & Crutzen (2017) aid in providing what can be considered a reference for policymakers to develop smart cities with knowledge of what each approach incentivises and promotes in its implementation. The application of each school of thought is contextual to the current situation of the city it belongs to, the stakeholders involved and the agreed goals of the development. This understanding of the school of thought adopted should provide insight into how the project will progress

and what the final product will provide to the citizens. Where this study is concerned, the interviewees and the contextual experience investigated may fall under these schools of thought and a qualification of the barriers and contributing factors to how the project performed or was developed may become clearer.

Understanding that smart cities are complex systems is essential to adding a perspective that may aid integrate the internal systems with the current situation of the city. Complex systems contain individual components that need to be contextualised with components they have a relationship with. Additionally, their behaviour cannot be predicted individually. There is no central control or focal point of the constituents of the smart system, thus constant feedback loops of each system and drawing patterns eventually reveals their performance and behaviour for analysis to occur (Ammara et al., 2022).

Complexity science aims to synthesize unpredictability, nonlinearity, and general problems in systems into an understandable and palatable theory founded on simple causes with complex effects. This is a product of the thinking that simple rules are not prescriptive and clear enough. When related to smart cities, there is a correlation between poor framework for smart cities and the consequent solutions that are implemented that are not deemed successful (Ammara et al., 2022).

2.5 Global North smart cities

General discourse surrounding smart cities in Africa has alluded to the African application of the concept looking to the global north to mimic and adapt their principles. Questions have been raised regarding whether contextual sensitivity has been considered and what the effect of this is when analysing the success of smart city projects in Africa. There are a variety of cities in the global north that vary regarding how “smart” they are. This pertains to a scale of cities that have smaller smart initiatives integrated to them to cities that consider themselves holistically smart.

Camboim et al. (2019) conducted a comparative analysis of smart city initiatives in Barcelona, Amsterdam, Vienna, and Lisbon, identifying several shared features that contributed to their success. Each city demonstrated the existence of an urban innovation ecosystem, where collaboration among stakeholders enabled knowledge exchange and innovation. Strategic planning was a core characteristic to guiding the development of these cities. A notable emphasis was placed on participative governance, with all cities incorporating mechanisms for community engagement and input. Technological infrastructure was complemented by green development efforts, integrating sustainability with digital advancement. Institutional flexibility was also a common trait, allowing cities to adapt and coordinate across different sectors. Importantly, all four cities prioritised human-centric development, aiming to enhance quality of life, social inclusion, and educational access. The study concludes that smart city success is highly context-dependent and relies on aligning technological innovation with local social and institutional frameworks (Camboim, Zawislak and Pufal, 2019).

In comparison to the other cities in Caboim et al. (2019), Barcelona exhibited a difference in its approach to the implementing smart solutions. Their approach can be described as a revitalisation effort that took the physical and economic state of a formerly industrial region and transformed it into an economic hub. This revitalisation stood on the premise of public-private collaboration and stakeholder engagement, which have been discussed thus far in this research. The result of these efforts was a balanced solution that accounted for technological implementation, sustainability, and social inclusion. Thus, forming the justification for selecting Barcelona from the study presented by Caboim et al. (2019)

At the core of the change that took place in Barcelona was a programme such as BUILD, the Barcelona Urban Innovation Lab and Dev programme, amongst other programmes and initiatives. This programme was used as a method to incorporate private sector involvement. Living labs serve as resources to performing controlled tests and research on solutions that may be implemented on a larger scale at a later stage. This concept has gained traction on other smart cities because of paying dividends through easing market access and increasing competitiveness in the market that the solution exists in.

Open data initiatives as detailed in the Open Data Impact for Smart Cities framework (ODISC) have also been a point of emphasis in smart city developments due to the need to provide transparency for the public. (Sadowski & Pasquale, 2015).

Patrão et al. (2020) detailed the benefit of the 22@Barcelona regarding to the improvements made to several sectors. 25% of the 400 new housing units were at minimum level economically, 1500 companies were initiated with 55000 jobs created in addition to a focus on the ICT and media industry growing in the city through the ability to pilot and develop their ideas in a space conducive to growth. These statistics provide a case of the holistic development that smart cities aim to achieve for all the affected stakeholders. The housing crisis is at the forefront of the motivation to develop smart cities. The construction of new housing is not only something to consider regarding the number of houses developed, but also the demographics that are catered to once developed. With reference to Giffinger's model, this development illustrates an account for smart people and smart living due to providing adequate housing, employment and inclusivity of demographics that require provision in addition to the overall enhancement of the quality of life.

2.6 African smart city application

PricewaterhouseCoopers (PwC) (2019) developed a continuum that provided their understanding of the progression that is occurring in urban spaces to develop smart cities and applications on a global platform. This three-tier system accounts for all the stakeholders and role-players involved in smart cities. Governments and private sector-players are tasked with implementation. This is due to the delegated responsibilities concerning policy making, funding, construction, and the management of the

city. The integration of these stakeholders and the exchange of how they deliver their roles is integral to smart city success or failure (Gupta, 2019).

The first tier of this continuum follows conventional methods of private-public partnerships where private entities are contracted to implement public-led solutions which are typically the grassroots resources required for the beginning of the “smart” journey. One such example of this is smart metering for electricity and water in Johannesburg, South Africa. City Power Johannesburg is a municipal-owned entity that partakes in public-private partnerships for their projects. The introduction of smart metering is an example of a project that aims to enhance efficiency, confront energy challenges and replace legacy technology with SMART technology. Considering the loadshedding challenges experienced in South Africa, the ability for the revamped smart metering to remotely manage load distribution is an effective solution to implement which is contextually sensitive to the problems faced. In a bid to promote inclusion, previously unmetered households in less affluent areas were also a focus of the initiative through an agent-based house-to-house audit process (Mathobela-Nhlapo, 2023).

Its foundational nature causes numerous challenges that are usually resolved for successful implementation. These challenges include conflicting interest between innovative endeavours that the private sector may want to implement in comparison to the rudimentary solutions the government may see fit due to the current standpoint of the area of interest. This tier has positive implications as it builds relationships between the sectors that may set the stage for future development occurring in more progressive manners. Establishing cohesion between the parties in the two sectors is essential for the second tier to seamlessly operate (Gupta, 2019).

The second tier is built on the shoulders of the first tier where robust digitally integrated infrastructure can be improved on. This improvement allows for additional services and shorter construction and deployment due to the following factors: the parties responsible should already have relationships between each other and the in-situ infrastructure should be able to undergo change and improvement without rework. Where value-addition is the focus of this tier, the outcome should be beneficial for multiple parties. The private sector party involved in this tier would usually implement a solution with a wider reach of users which produces the benefit of more revenue and additional service provision. Additionally, the nature of public-private partnerships means there is an allocation provided to the public sector that would conventionally be used for the city itself. There is inherent complexity in this tier due to the contracting methods used and the need to maintain flexibility and fair competition that does not short-change the numerous stakeholders involved (Gupta, 2019).

What is important to note when understanding PwC’s model is that different sector of a city may not be at the same stage of development or in the same tier, but this does not pose a hindrance to progressing with the third tier of the continuum. Smart cities are ideally a hub for data that can be used by various

parties. Data analysis can be used to troubleshoot and improve the function of a city in real-time but can also be used by manufacturers and retailers for future products and solutions.

This is done by implementing infrastructure and systems that can store and redeliver data in a manner that can be analysed. This tier is a promising sign for growth once a city has reached that stage as it allows for quicker feedback loops and ideation concerning solutions (Gupta, 2019).

The city of Cape Town has been looked at as a hub of opportunity due to the city being at an intersection between the reality of African circumstances such as inequality and ambitions to present or exist in similar nature as cities in the global north (PwC Africa, n.d.). This is a recurring theme in the study of smart cities pertaining to Africa specifically. The desire to replicate the global north's applications of the smart city concept has often led African countries astray due to their approach overlooking the contextual sensitivity needed to achieve successful solutions.

Kigamboni in Tanzania is such an example of the oversight of contextual sensitivity regarding smart city developments (Lindell et al., 2017: 15.) . Stakeholder engagement is an integral part of smart city development that has numerous considerations for the achievement of success. As a precursor for the section of the literature review that will explore that, exploring the case of Kigamboni may provide some insight. The Kigamboni New City was a proposal from the Jakaya Kikwete and was considered part of a wider plan to formalise property in the capital of Dar Es Salaam. The intention was to transform some of the informal and under-serviced settlements that existed with preventative measures to limit the inception of new settlements of similar nature. Economic stimulation and development in addition to creating residential solutions for those in need were the main avenues of improvement targeted in this endeavour, and this practically made sense until execution was concerned (Lindell et al., n.d.).

Lindell et al. (n.d.) conducted interviews with residents to understand their perspective of how the project was developed and revealed some of the flaws in the process. Interviewees alleged that the media was the source of their information on the project after one meeting was held to present it to them. Additionally, there was poor understanding of the conditions of the residents and how their limited access to the master plan would affect their knowhow of the project. This type of oversight speaks to the theme of contextual and its importance when applying the smart city concept to Africa. Developing an underprivileged area should have been a signal to make considerations on what to develop in line with their needs, how to intermittently update them on the progress and how to integrate their opinions and perspectives with the bigger picture and numerous other stakeholders involved.

PwC Africa's (n.d.) study used ten indicators to describe a standpoint of a city and compared Cape Town to 31 global cities. The ten indicators are illustrated in the figure below:



Figure 3: Smart cities model (PwC Africa, 2012)

Their study revealed that the City of Cape Town is equipped with the tools and intangibles to elevate itself should it improve on the implications that stakeholders should invest in. A recurring theme in the development of smart cities is their initiative to stimulate economic growth. In the PwC (n.d.) study, Cape Town was ascertained as a city that stimulates economic growth by means of being a hub for incubators, start-ups, and tech firms. The city at the time possessed over 60% of the country's start-ups and 58% of its venture capital firms. These statistics contributed to the moderate ranking of 22 out of the 31 studies cities worldwide when analysing intellectual capital and innovation. Educational ranking of higher learning institutions also proved vital in rankings and the readiness of a city to be considered smart. The rankings of the University of Cape Town (UCT) and the University of Stellenbosch contributed to the intellectual capital score with an important contribution made by expatriates' expertise and qualifications due to the attractiveness of Cape Town as a location for those wanting to relocate.

The South African Smart Cities framework (2021: 31) notes that a pre-requisite for implementing smart initiatives and technologies is the capacity possessed by government officials and communities. The framework goes further to state that an assessment must be conducted to determine the capabilities of the community to use the infrastructure, but there is also the intuitive need to assess how the community

will interact to facilities, where stimulating economic growth is concerned. This is due to the intention of smart cities to create new economic development opportunities.

Cape town is not the only city in South Africa to attempt the implementation of smart city initiatives. Johannesburg is the largest city in South Africa and its proximity to large metropolitan areas motivated the venture into smart mobility using numerous modes of transport. Rea-Vaya is a bi-product of a 2006 feasibility study centred around the integration of the Gautrain and the proposed rapid bus system including a multi-disciplinary delegation conducting a study and site visit of Bogota and Pereira, Columbia to investigate their Transmilenio project (Rea Vaya, n.d.). At the time, there was a need to decrease the usage of private cars and where possible, minibus taxis on the road but also allow for seamless commutes between the metropolitans near the city of Johannesburg and within the expansive metropolitan city of Johannesburg itself. Although not developed at the time, this is in alignment with one of the smart cities promises and opportunities outlined in the South African Smart city framework developed in 2021 (Department: Cooperate governance: 2021: 8). The framework promises to improve the quality of life by aiming to ensure that commuters “spend less time sitting in traffic”.

In lieu of the World cup but also for socio-economic needs, the Gautrain was developed as the first rapid rail system in Africa with an integrated bus system that serves the Pretoria and Johannesburg in the north and south direction but also the Sandton to Kempton Park area including the OR Tambo Airport. Similarly, the MyCiti bus system was developed in Cape Town during the 2010 world cup and has seen further progression regarding routes and reach for the potential users. Like the Gautrain system, this system operates on various routes with the aim serve numerous groups. The MyCiti system has routes reaching the CBD (central business district) where most people would work, the high-density areas such as Khayelitsha and other townships that would form part of the workforce of the CBD in addition to tourist routes like the Table Mountain area and the airport region. This is in alignment to one of the smart city definitions set out in the South African Smart City framework (2021: 19) that details the definition of a smart city as one that is “shaped by, and responds to, the local context”. These developments have also not been implemented in isolation but also with the intention of integration of non-motorised transport and incentivising fewer private cars on the road and thus decreasing traffic overall (Musakwa et al., n.d.).

Eko Atlantic city was a proposed megacity development that was initiated in 2004. As classified by Slavova & Okwechime (2016) in their research regarding African Smart City strategies for 2063, Eko Atlantic City is considered a small and new city (like Konza city) due to the population bracket it fits in. Lagos itself in 2013 had a population of 25 million with Eko Atlantic City (EAC) aiming to provide for approximately 0.3 million people with an additional 150,000 people commuting to the region to utilise the ten different districts. The contextual standing of the city and its surroundings influenced the direction of development, and this contrasted some of the other smart city developments that have been

discussed thus far with regards to their goals. It is a coastal city that aimed to reclaim the eroded coastline, serve as a preventative measure to sea level rise and to create space for multi-use developmental infrastructure and create jobs and capitalise on tourism in the country in an area that is adjacent to an already affluent population (Eko Atlantic Nigeria's New Global City Issue 1, n.d.).

The development of EAC was performed through means of a private public partnership with numerous influential investors involved. In an address to congratulate all involved in the project such as South Energyx Nigeria who were tasked with planning and developing the project, the local government of Lagos state who are managing the project and the citizens of Lagos state, the president at the time, H.E. Goodluck Mbele Jonathan stated that:

“When completed, this Atlantic city will not only benefit the promoters of the project, but it will also be an important addition to our nation’s aim to promote tourism and good living. The project is a great example of partnership which brings together private individuals and companies who have the knowledge and requisite expertise to transform land lost to erosion into a delightful ocean city.”

When analysing the strategic objectives of Nigeria’s vision for 2050, alignment can be seen between the goals of EAC and the country’s 2050 vision. Nigeria has been solidifying themselves as a strong economy on the African continent and through the development of infrastructure, their 2050 vision aims to increase GDP by creating infrastructure that supports productivity and mobilised economic growth (NIGERIA AGENDA 2050, n.d.). This is always an important point of enquiry when multi-use developments of different scales (including smart cities) are being developed. There is a need to ensure that they are driven by the holistically beneficial incentives and that in their delivery, the incentives will be realised. Where humans need basic needs, EAC sets those needs as the baseline of what the development will provide through non-stop independent water supply, land with connectivity to utility services such as electricity and in-situ wastewater services that will be treated on site at a plant that has been developed.

Additionally, the bid to maximise space to accommodate for increasing urbanisation also influenced the need to develop medium to high density developments that form part of the objective to reach a target of 1,000,000 (and rising to 1,500,000) housing supply rate per year from 2025 through to 2050 (NIGERIA AGENDA 2050, n.d.).

2.7 Stakeholder engagement in smart cities

Defining stakeholders in the smart city realm is of great importance as they can have numerous roles. Bifulco et al. (2014) suggests that stakeholders can be defined as “performance evaluators, holders of useful information, addresses of information, decision makers, beneficiaries of services, and co-creators of new services.”. Additionally, different stakeholders possess different needs and there is a need to

cater for all the needs where possible. This is executed through an analysis of the capacity of the various parties to fulfil the needs as well as the resources they must integrate into the equation. This places emphasis on the requirement of smart governance to account for all these actors and requirements in a manner that accounts for the inherent dynamic nature of the risk and problems that may arise from this level of complexity.

The findings from Bifulco et al. (2014) determined that different smart city applications illustrated that stakeholders could act as advisory boards to mitigate social issues and develop design plans for the city. As mentioned in the three-tier model, there may be a plethora of data that is present in smart cities. This may present stakeholders with an opportunity to elaborate on this data from the public usage of the smart initiatives and develop solutions that improve the management of the city but also improve how the public interact with the city. Another unrelated but vital factor for the megaprojects that smart cities are, is funding. Dependent on the stakeholder of concern, they may possess the role of sourcing funds for development and implementation of the smart solutions.

The model that was developed from this research ascertained the method best suited for smart cities was to begin with the implementation of ICT solutions that will promote citizen participation through apps, forums, communities, and adjacent technological solutions. This is contrary to other literature that has criticised the way smart initiatives simply implement technological solutions with the assumption that, that alone is the fix. The disconnect between what has been implemented, how to promote participation and how to use the data and engagement still presents itself as a factor to understanding smart city progression. Nonetheless, Bifulco et al. (2014) presented the model in Figure 2 below that illustrates a bottom-up approach was founded on ICT solutions to solicit participation and create culture within the city in a cyclical manner that should continuously improve urban space.

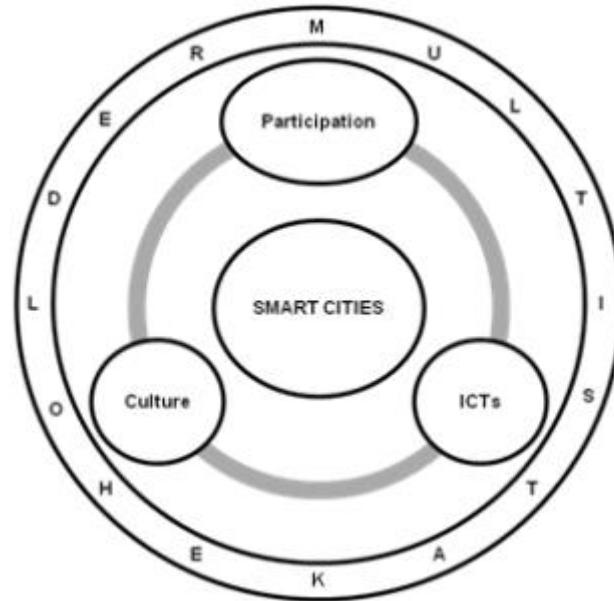


Figure 2: Smart Cities and multi-stakeholder perspective. (Bifulco et al.: 31 2014)

2.8 Project success criteria

Chourabi et al. (2012) proposed eight factors to closely monitor and determine success criteria that pertain to both internal and external factors. These factors influence design choices, implementation methods and the eventual utilisation. The amalgamation of these should ideally produce a smart city that is a holistic improvement on an existing city or a new greenfield development that fills an important gap in implementation. Chourabi et al. (2012) also developed an integrative framework for the clusters of factors they determined. The framework aims to communicate that each factor is influential and influences other factors in the model. Additionally, the impact can be allocated to two levels. The outer level serving as the layer that is more influenced rather than influential.

Sharifi's (2019) study gathered 34 smart city assessment tools and sought out to understand their strengths, weaknesses and ultimately determine their fitness for purpose. This type of study wouldn't be ideal to implement some of the tools verbatim as they were used in other contexts. There is always a need to contextualize tools and solutions to the application and that is also a big theme of this research as the aim to understand the socio-economic (amongst other characteristics) characteristics of African cities that play a factor in their success or failure.

Of the 34 criteria chosen, some were notable due to the approach of this research. Contextual sensitivity will be a recurring theme of this research as the aim is to assess smart cities in the global north and compare their attempts at smart cities to their counterparts in Africa. This comparison will account for contextual differences and aim to assess if the decision makers in African cities considered this in their perceived pursuit of smart cities. Sharifi (2019) also identified that feasibility is an area of research in smart city assessment criteria that few tools have addressed. This is an essential criterion to be

knowledgeable as the consensus on whether a smart city approach is feasible should take feasibility into account at the earlier stages of the project.

Further to this, Sharifi (2019) also identifies that these tools have faced limited success in their usage, and this may also present an avenue for enquiry in the study as the lack of success of assessment tools may render the smart cities at a disadvantage until the issues become glaring.

Lack of information and resources in the planning phase have been cited as a key factor in the struggle for smart city planners and decision makers to fully understand the context of the city before proceeding. There is validity to this, and the suggested solutions have been to apply weights to the assessment indicators with contextual backing to ascertain the weightings. This is something that will differ from case to case and the ability to make this bespoke is a positive development in smart cities. In conjunction to the data intensive nature of the era we are in and the monitoring that comes from data processing and analysis, the contextually sensitive assessment tools may be used once the smart city solutions have been implemented.

Types of indicators to calculate effectiveness of projects and develop baseline data for the management of cities have been produced from real-time data harvested from the technology implemented in the cities. The two overarching types outlined from Zavedeev et al.'s (n.d.) research are one-dimensional and composite indicators. Where it has been previously said that smart cities are multi-faceted environment and should not be analysed with focus on one characteristic, there is still value in analysing one characteristic in isolation and that is the aim of one-dimensional indicators. Through further and thorough data analysis, one-dimensional indicators can be grouped as direct and indirect. The utilisation will be dependent on the needs of the interviewees experience and is related to the topic of contextual sensitivity.

Zavedeev et al. (n.d) combined several one-dimensional indicators to produce composite indicators. These composite indicators used weightings for the one-dimensional indicators and accounted for the perceived importance of the individual factors towards the smart city. Where context was important, indicators were utilised in a descriptive manner to better understand or develop smart city characteristics. Where there was a lack of understanding of a smart city characteristic's performance or role in urban function, statistics, and data was used in a diagnostic manner by filtering and highlighting certain trends and connections to understand the impact (Zavedeev et al., n.d.-b).

The implementation of smart city solutions should also account for the future regarding their performance and impact. The failure to do so solicits rework and re-analysis in the future that has broad effects on all the concerned parties depending on the extent of the work to be done. Data can be used in a predictive manner by detailing previous trends and applying forecasted conditions before applying the data set to it and producing the ultimate forecast. These forecasts can be used to pre-emptively

mitigate issues that may worsen in the future by starting the ideation and problem-solving phase at an earlier stage (Zavedeev et al., n.d.-a).

Further categorisation of indicators was performed and an indicator that can be used to identify opportunities for successful implementation in smart cities was identified. This indicator category is called a resource indicator and uses direct correlation to draw a relationship between the increase or decrease in a related trend in a city or urban space to its effect on smart city implementation and the six characteristics developed by Giffinger. Result indicators are the other category, and these indicators are used almost in the opposite manner of resource indicators to look at the improvement or deterioration of one of the smart city characteristics to analyse the performance of the sub-factors within that characteristic. This type of identification is important to ensure that there isn't an inaccurate assessment of smart city characteristics performance (Zavedeev et al., n.d.-a).

What must be noted is that the accuracy of the data for all intents and purposes is important. Every step of the data's utilisation plays a role in the eventual analysis and decision making where the data was a tool.

Of the 34 tools selected by Sharifi (2019), 32% illustrated the ability to analyse contextually relevant issues, predominantly through the weighting of factors. Additionally, other tools showed the ability to use bespoke additions to the assessment tools using local benchmarking information to approximate the contextual use in a new development. The criteria do not operate in silos; thus, this is an important assessment criterion as the validity of an assessment will always be brought to question and there should ideally be credible information and systems in place for the robustness of the entire project.

There is an underlying narrative in the smart city concept that competitiveness is intertwined in their development. The foundation of competitiveness is said to be grounded based on territorial capital. This is defined as "a set of localised assets – natural, human, artificial, organisational, relational, and cognitive – that constitute the competitive potential of a given territory (Camagni & Capello, 2013).

Understanding a cities territorial capital is a precursor for ranking its function as a smart city and this can be performed by tools such as an assessment matrix. Intangible assets are one of the focus groups of ascertaining the territorial capital of an area and this is in relation to the interconnectivity and networks that exist between the sectors involved in the development and function of cities (public, private and semi-public). This becomes even more pertinent as conditions change and the reason for these smart city endeavours becomes more apparent (although critics question whether the concept is the necessary solution for the problem). Competitiveness in this realm considers the socio-economic conditions provided by a smart city and its ability to elevate and transform the lives of its inhabitants. It cannot only consider either the social or economic factors and must consider both (Giffinger et al.,

2010). This speaks to bigger factors such as economic positioning and tourism that have become incentives for planners and decision makers to improve their cities for perceived benefits.

Giffinger et al. (2010) developed the smart city ranking model and criteria. These rankings were initially misconstrued as the users of the ranking did not fully internalise the ability of the tool to act as a method of strategic planning and a tool to use for identifying strengths and weaknesses of the city.

Baselines were set for the ranking typologies to include a minimum of two cities with two indicators that would be used to detail the hierarchy. Five cases of smart city ranking types were analysed that aligned loosely and cover all six factors identified by Giffinger et al. (2010) for smart city characteristics.

The following ranking typologies were analysed:

- Commissioned economy/ consulting-oriented ranking with missing transparency
- Commissioned rankings with insufficient transparency created by expert panels or other private research institutes.
- Rankings compiled by magazines and NGOs without sponsoring.
- Well-documented and methodically advanced rankings conducted by universities or economic research institutes with sponsors in different areas.
- Special cases

What is evident in the above ranking models is that they aim to use different perspectives regarding staff and the information available to them to rank the cities. This is beneficial as inherent biases that exist from certain parties or actors are mitigated as there is more than one model available. Additionally, where transparency has been omitted in certain ranking models, others may compensate for this when using ranking models in tandem. The different ranking models also utilise different numbers of indicators and this affects the credibility of the rankings. Of the four typologies, rankings compiled by magazines and NGOs without sponsoring was ranked as the best while commissioned economy/consulting-oriented ranking with missing transparency areas ranked last. The main separators were the transparency of the ranking calculation and the city-sample selection. Transparency is crucial in this type of development as it instils credibility by providing the necessary resources for everyone to utilise and understand the result of the rankings. Additionally, the best-ranked typology used the least number of cities on average with the greatest number of indicators. This speaks to the detail that the magazines and NGOs went into to develop their rankings in contrast to the worst-ranked model illustrating the greatest number of cities with contrastingly low number of indicators.

Additionally, an enquiry can be made to analyse the capacity of the researchers/rankers to be thorough with their methodology. Although consulting firms may have the expertise to rank the smart cities, prioritisation, the capacity, and the incentive to conduct such research may lack in contrast to NGOs

and magazines whose purpose may be more driven by critical analyses and enacting changes by highlighting issues with smart cities considering the concept has always solicited great discourse.

Where smart cities have been said to be used as a political posturing and a method to self-promote by politicians and the like, the rankings are beneficial to scrutinize development strategies. Cities may be incentivized to understand their current ranking, focus on improvement and the objectives of their concept. Furthermore, where transparency has influenced smart city solutions negatively, the actors may move towards becoming more transparent and articulate with their data and decision-making processes (Giffinger et al., 2010).

Where these rankings may negatively direct smart city development is that there may be this incentive to present the city well for rankings, but the internal workings may be flawed and suboptimal end-users. The method of development may also fall by the wayside in the bid to provide an end solution that is satisfactory for ranking purposes, and this may have effects such as regulatory oversight or neglect, spatial inconsideration in a bid to meet housing number requirements and structural oversight in a bid to develop quickly.

The competitive nature of the smart city concept may also position lowly ranked cities to disregard the comparative benefits that the rankings can provide due to the lack of impersonality that may be ingrained in them.

Where contextual sensitivity was previously discussed, these smart city ranking typologies need to account for that when making city-sample selections for the ranking. The absence of this will alter the rankings' credibility as the approach would not have used cities with similar characteristics and context to develop the rankings. The transparency of the city-sample selection is also crucial in this task for the purpose of the users of the rankings to draw comparisons of cities that may aid their own development.

The discourse around smart cities that is hard to control is that the decision-makers in smart cities often strive to present their city in similar fashion to a more desirable city elsewhere and overlook the contextual characteristics that may be hindrances to that endeavour. This is a concern as retrofitting concepts or solutions is often suboptimal without holistic analysis of feasibility and the appropriate methodology that can be utilised.

2.9 Smart City Criticism

The interest in the smart city concept has raised scrutiny on how it has manifested itself in application and whether it is a vehicle for intentions outside of improving urban spaces and equipping them for the future. The development of the term "smart" has been traced back and matched to the decisions and policies made and these connections help make a case for the arguments raised by academics and

theorists concerning smart cities, particularly; the difficulties in adoption due to education and inclination, the attraction to foreign investment and commercial interests and the disconnects between concepts and implemented solutions where contexts are concerned. This analysis has uncovered questions regarding whether the progression of digital development and production should dictate how cities and urban spaces and whether the development of digital technology is a revolution on its own (Rosati & Conti, 2016).

Lytras & Visvizi (2018) study was conducted to determine the user of smart city services and what to make of it by answering key research questions. One of the key questions that smart city advocates need to answer is how smart city users perceive the implemented solutions and whether there is value added by their implementation. This is a valuable question to answer to ascertain the effectiveness of the initiatives implemented but to also scrutinize the concept itself and its interpretation by those responsible for their implementation (Lytras & Visvizi, 2018).

Majority of the respondents to Lytras & Visvizi (2018) study revealed some of the disconnects that have solicited the rethinking of the smart city concept. They expressed seeing value added to their lives and livelihood but also voiced limited adoption due to the struggle that barriers related to technical, policy and behavioural-related issues. The quality of implementation also limited users' perception of smart cities as poor quality was connected to privacy and security concerns given the technological element that is integrated into smart cities. This set the stage for further research to clearly measure the disruptiveness of smart city technology in residents' lives to determine the value added and thus user satisfaction.

There are several actors that have enabled the progression of urban cities on the African continent and these actors have all played different roles in how the narrative of development has occurred in recent history.

Outside of the state and governments, there are several actors that play a role in smart city development. An interesting group that has been analysed are the non-profit organisations and private foundations. Their injection of funding and the overt expressed interests of seeking to develop their areas of choice is also accompanied by power and influence that is usually used to promote their narratives that will be beneficial to themselves and that manifest themselves as favours that will have to be returned in future in some manner.

In connection to the influence that non-profit organizations and private foundations possess, global consultant firms that are employed to develop smart city plans in African cities also possess their own influence. Often in the development of African smart cities, the consulting firms employed to assist with these developments have been referenced almost in a validating role to corroborate the plans for the proposed smart initiatives. Research has alluded to firm's prestige and reputation as a driving force

for the perception that smart cities are “cure-alls” and that legislation and policies should cater towards their creation (Côté-Roy & Moser, 2019).

Using the EAC example to contextualise this scrutiny of smart city developments in Africa, the alignment of the project’s goals with respect to the larger initiatives that African countries are and should be striving for is an important point to discuss. The development is taking place in an already affluent area as an extension of it. As large-scale as the project is, it is providing less housing than other projects have proposed. This forms a part of the norm of satellite cities that are offshoots of larger metropolitans in close vicinity. They are largely driven by private investors and thus have different direction as technologically advanced cities that push the envelope of development. As a function of these factors, one may then begin to question the affordability of citizens to live and work in such an area. One of the leading driving forces for smart city initiatives on a large scale is the rate of urbanisation and ensuring that urban metropolitans can accommodate for the influx of people. With that in mind, inhabitants migrating from rural areas would not be best suited to afford the exorbitant prices and cost of living that would typically be presented in urban areas. Especially in an area like EAC that claims their target to be tourism and capitalising on foreign investment, as can be seen by the involvement of international developers and investors.

2.10 Summary

The literature review identified key themes to analyse during data collection. Urbanisation continues to strain existing urban spaces, prompting the development of smart cities as potential solutions. Giffinger’s (2007) holistic definition of smart cities underpins this research, framing solutions like Eko Atlantic and Cairo, which integrate high-density housing and infrastructure for sustainability.

This research will examine how stakeholder engagement impacts design. Along with governance, urbanisation, and success criteria, it forms a core theme for the interview phase. The literature has detailed how smart cities are defined and assessed globally and in Africa, laying a foundation for the research methodology.

Giffinger (2007) defined a smart city as a well-performing city built on independent, aware, and involved citizens. His six characteristics—smart economy, mobility, governance, environment, people, and living—form the research baseline.

Kummitha & Crutzen (2017) examined the contrast of tech-driven vs. human-driven smart cities, revealing different outcomes. Contextual sensitivity, as emphasised by Sharifi (2019), and the alignment of smart solutions with basic urban needs (Lytras & Visvizi, 2018), are central to this inquiry.

Finally, African smart city frameworks reflect a shift toward inclusive, contextually sensitive developments. South Africa’s 2021 Smart Cities Framework reinforces the need to tailor strategies to local realities, supporting this study’s emphasis on contextual sensitivity.

3 Chapter 3: Methodology

3.1 Introduction

This chapter aims to outline how the research that will be conducted by making a case for why the qualitative method may pay the most dividends when seeking to uncover specific themes, patterns and insight regarding the topic. The chapter will explore the data collection and sampling methods, followed by how the analysis will take place.

Employing this research methodology also requires an enquiry into the ethical considerations and limitations of this study and approach to gain a wholistic view of the validity and robustness that this study will have.

3.2 Research Philosophy

Saunders' onion (Saunders, 2014) is a research methodology framework that is often used to outline the progression of a research endeavour from its outer most layer to the inner most layer.

The outer most layered the approach is the research philosophy that sets a foundation for the beliefs of the researcher and the outlook they will have on the topic moving forward. This is divided into three main beliefs: positivism, interpretivism, and pragmatism.

Positivism is a research philosophy that believes that reality is uniform in all contexts and that there are facts that exist within that reality that can be proven by statistics and experiments that may produce observations that shed more light. Should a researcher take the positivist approach to their task, the aim would be to use the data gathered from the research and find the causal factors. From this determination stems a platform to create generalisations from the data and ground them in previous themes that solidify the generalisations. The positivism approach seeks to simplify and reduce the complexity associated with the variables associated with the study. Equally, there is the acknowledgment that isolating factors in the research may be problematic due to the related nature that they exist in. Thus, this is one of the reasons that may usher researchers to take different approaches to positivism (Alharahsheh & Pius, 2020: 41).

Additional consideration when considering a positivist research philosophy is that depth and thoroughness in the positivist approach is essential to avoid misunderstanding the subject of the study when making generalisations about the results of the research. Where utilised in the interview research method, the individuals or the subject areas intentions must be understood thoroughly with the perspectives at the forefront. The findings of the research must be descriptive to fully detail the

progression of the research from the inception to the final stages of drawing conclusions and generalisations as is akin to the positivist approach (Alharahsheh & Pius, 2020: 41).

Interpretivism as a research philosophy developed as a product of the critiques that positivism experienced. Where it was previously mentioned that positivism aims to simplify and reduce the complexity of variables and factors within the study to draw generalisations, interpretivism is the opposite as it thoroughly analyses the factors and variables independently. Specific attention is paid to humans as different to physical to natural phenomena when performing social sciences research using this philosophy by considering socio-economic factors such as cultural, circumstantial, and era-considerate factors. This is a point of conflict for the philosophy as it has been said to discount theories and facts that have been corroborated by research and consider reality as subjective in its bid to consider culture and circumstance when aiming to provide findings. As a product of this, the interpretivist approach cannot provide the generalisations that the positivist approach does as the different cases and subjects are typically not adjacent and must be contextualised in isolation. This is a critique, however, dependent on study, this may be an appropriate approach to take (Alharahsheh & Pius, 2020).

The final research philosophy is pragmatism and is what this research project will follow. Like the word “pragmatic” which is defined by Merriam-Webster as “practical as opposed to idealistic”, the method of the pragmatism philosophy is to discount the grounding of one reality but acknowledge that there may be several realities that exist and that the human experience is a social construct that forms one’s belief system and habits (Kaushik & Walsh, 2019).

An analogy is used in Kaushik & Walsh’s (2019) research regarding an object with four legs and a flat surface. Their determination is that a positivist researcher would always consider said object a table while a pragmatic researcher would categorise the object by how it helps the user achieve their intended goal. Thus, it would be a table if eaten off it, a bench if sat on, or a stool if stood on. Pragmatism asserts that one may exercise freedom in their beliefs but through thorough understanding it may be revealed that some beliefs hold more weight than others when an end goal is in consideration.

As with the other research philosophies outlined thus far, there are challenges to consider with a research approach. As mentioned, the pragmatic philosophy considers individuals’ human and social experiences as the grounding for the research, and this becomes a challenge when interpreting the research as the researcher is given free rein to make decisions and decide on the research task from their perspective and this must be understood to understand the outcomes of the research and the influence that is possessed at this stage. Where this research will utilise interviews and perspective from different subjects, there will be a point of emphasis to understand and interpret all the perspectives received and understand how they are integrated to produce findings and conclusions. This is also a function of the accepted notion in pragmatistic research that considers it a continuum of acquiring knowledge that sits between the two opposite poles of subjectivity and objectivity. Thus, the researcher in this approach is

tasked with designing their research questions and methodology in a manner that has boundaries and answers the most pertinent research questions (Kaushik & Walsh, 2019).

Dewey's theory of social inquiry delved into pragmatism and determined that the process of performing such research is typically rooted in identifying problems in a social context and standing, defining them, and following through by addressing them. In this determination was also the realisation that inquiries or research tasks often fall short where a clear definition of the problem has not been provided. Solving this challenge is often a case of reframing the perceived problem to create a foundation for inquiry (Kaushik & Walsh, 2019: 4).

Leading your research by understanding the philosophy that you fall under is essential to design the rest of the research task and how it will influence the outcomes and findings. As mentioned, prior, this research will adopt a pragmatic philosophy as there is consideration for the contextualisation that must be applied when analysing smart cities. Smart cities possess their own socio-economic foundations that influence their implementation and execution and this justifies the chosen philosophy of pragmatism. This consideration accounts for the complexities that are ingrained in the different contexts that smart cities exist in. This pertains to the socio-economic standpoint, the governmental and municipal systems and requirements or needs for the spaces of implementation.

Generalisations cannot be made but rather patterns and biases drawn to understand the progression of their ideation to the product that is produced as a realisation of the ideas and planning that takes place thereafter. The proposed manner of data collection for this research is interviews re confusing and although interviewees may be asked the same set of questions, it must be understood that their answers will emanate from their experiences and views of the world. The design of the interviews will also be conducted in a manner that introduces boundaries to avoid a wide variance of responses that will be difficult to analyse. Additionally, the interview questions aim to determine the interviewees perspective of reality in relation to the topic before asking more direct questions related to the themes vital to the data analysis. Finally, the design of the interviews and the subjects that are interviewed will aim to answer the research questions and achieve the objectives outlined prior by utilising people with contextually relevant expertise and knowledge as the method of uncovering the required information.

3.3 Research Approach

Once the research philosophy has been understood, the research approach follows. This entails a broader method of research that will be employed with the philosophy in mind to determine whether and inductive or deductive approach will be used and if that will be used in conjunction to other approaches. An inductive approach requires one to extract and generate theories from the research and present them

as their findings. Often employed when there is little insight into the topic being researched and there is the aim to uncover new information.

The deductive approach can be considered the converse of this. One approaches the research with a theory at the start and aims to elaborate on it. This can be by means of testing with the intention to debunk or create more robustness of the theory.

To use this approach, qualitative data will be used to test the theorized opinion on smart city implementation in the specific contexts selected for the interviewees, for countries that may attempt smart city implementation.

When approaching this research, certain notions need to be explored and scrutinized due to their influence on the outcome of the findings. Literature has typically been asserted to exist in two different realms of either being confirmatory or exploratory. In this assertion, deductive and inductive research approaches have been allocated respectively. However, as research has furthered, these notions are being broken down and this must be accounted for in this research as the qualitative data used will aim to make deductive conclusions regarding the research topic.

This research will take a deductive approach. The data collection phase will be designed such that deductions can be made from the results of the data gathered and be used to elaborate on the notion that there are contributing factors and barriers prohibiting smart city implementation in Africa. This data collection design entails an understanding of the literature associated in the literature review and the themes that are found therein, after this will be questions that are asked in line with these themes to make the deductions. The questions will be contextual to the individuals and their experience.

This is since different cities and countries possess their own contextual grounding. Once this grounding is understood, one may pair this with the frameworks used to propose and implement the concept and deduct how certain conclusions were reached and why certain preferences were taken in the process.

Deductively, the final product is a consequence of these decisions and their accompanying biases and preferences and that sets the stage for the progression of the analysis. This understanding will aid the process of determining how data collection is going to be performed in addition to what type of responses will provide valuable points for analysis and interpretation for the theory that was proposed as the ignition point for the research.

3.4 Research Strategy

Research “design” and “strategy” are often used intangibly, but in theme of following Saunders’ onion (2014), “strategy” will be used in this research. The strategy of the research is a more tangible layer as it details the practical methods used to follow the philosophy and approach mentioned above. The

researcher must analyse the aim of their study and how best to answer the research questions they have outlined.

As will be elaborated on at a later stage in this methodology chapter, this research will employ an interview-based approach. This was opted for as the noted research objective is that the research will seek staff that have been involved in smart city or urban megaprojects that are appropriate to gain insight on the definition of smart cities in Africa, to identify the barriers to successful implementation in addition to the contributing factors to successful and unsuccessful implementation on the continent.

A key strategy that is going to be used in this research will be thematic analysis. Vaismoradi et al. (2016) used a definition of thematic that is as follows: “an implicit topic that organises a group of repeating ideas. It contains codes that have a common point of reference and has a high degree of generality that unifies ideas regarding the subject of inquiry”. In relation to this research, this definition is apt as the literature review sets the tone for the commonality of some of the prevalent factors and barriers that have been determined and analysed prior.

Thematic analysis has its advantages that will be experienced in this research. The pragmatic philosophy that this research will use will analyse the collected data from a perspective that understand the multiple contexts and realities that exist and that the subjects have experienced. Further to this, thematic analysis is advantageous regarding the different analysis approaches that can be taken. This research will take a deductive approach that is driven by theory and themes surrounding the topics that are credible and traceable to aid the process of alignment and pattern matching (Kiger & Varpio, 2020).

The theory of flexible pattern matching is going to be used in this research as it may pay dividends regarding the subject matter and the proposed data collection strategy. Pattern matching will be advantageous to determine patterns that relate the different data collected into centralised points that can lead onto the answering the research question sand objectives.

Flexible pattern matching is defined as the “deduction of a set of theoretical patterns from prior studies, the formation of actual observed patterns through the lens of those theoretical patterns, and the comparison between them that enables the emergence of new patterns.” (Bouncken et al., 2021: 256). This definition provides partial guidance as to the direction this research will take. Prior studies and cases have been used in the literature review and the proposed data collection method will be used as a method of observation of patterns that currently exist. Where this research may differentiate itself is that the summation of this information may formulate new patters in addition to corroborating the claims made by prior studies and cases that have undergone similar research.

3.5 Data Collection Methods

Data collection is typically divided into primary and secondary research methods. Primary research is founded on collecting data first-hand using different methods and is often used in research tasks where published references do not possess the necessary information required. For this purpose, primary data is often said to be more authentic dependable due to not possessing some of the biases that secondary data is said to have (Taherdoost, 2021: 12). This research project will employ the collection of primary data to supplement the secondary data collected.

Secondary research has been criticised for often being manipulated and possessing biases as researchers could use confirmation bias to support their pre-conceived stances on their research or have changed the data toward a desired result as opposed to presenting objective outcomes from the research. To increase the validity of secondary research, it is often said that one should incorporate primary research in some form to ensure robustness of the research (Saunders, Lewis & Thornhill, 2019).

Considering this research will be conducted in a primary manner, based on interviews the data collected for the study must be of satisfactory quality to analyse and answer the research questions that have been developed.

There are several types of interviews that can be used, and this is usually dependent on the type of research being conducted. Some of the previous interview content that has been found related to this topic has been in a semi-structured manner and the proposed interview structure for this research will follow suite due to the perceived benefits it may have in uncovering information. One characteristic of semi-structured interviews is that the interviewees availability is usually limited and thus all the possible information they can provide should ideally be gathered in the one (or few) opportunities that they are available. Additionally, semi-structured interviews allow for the interviewer to develop a guide for the questions that may be deviated from as long as the topical subjects are kept consistent throughout the interview and that the main content is covered. Additionally, open-ended questions are allowed in this method as they usually aid in uncovering opinions and perspectives. To optimally conduct such semi-structured interviews, there is a requirement for the interviewer to have sufficient knowledge of the topic to allow for follow-up questions and insightful dialogue. This interview type is also best used in scenarios where the literature of topical area has not been highly developed as opposed to structured interviews that are typically used in highly developed topical areas. Thus close-ended questions can be used with full knowledge of the data to be discussed in addition to the desire to maintain consistency for comparison when all the data has been gathered (Muhammad & Kabir, 2016: 213).

Using close-ended questions also limits the bias that the interviewee may add to their answer and is something that the interviewer should try to control in their creation of the questions and the way they are delivered (Taherdoost, 2021:19)

Literature suggests that there are dividends to be gained from collecting data that counteracts the stances that the researcher has. This is due to being able to perform a holistic analysis of the subject with a full basis of the data concerning the subject and allows for the researcher to gain confidence in their stance and data by being able to challenge their research in a credible manner. Credible data is required, and the opposing stance taken can be used optimally in scenarios where it is not an alternative perspective of the same stance but rather in a manner that rejects the researcher's stance and provides rebuttal to the topic. This type of data will also be used as a form of triangulation during the data analysis to further strengthen the conclusions made by the researcher, whether they corroborate the initial claims or contradict them.

Regarding interviews, this poses some difficulty as it has been noted that interviews are approached from an understanding that human experience shapes the research. Statistical data would form the main portfolio for the opposition as opposed to the human experience that has been accounted by subjects of data collection.

To ensure the validity of an interview research design, there are certain processes that will be fulfilled during the data collection phase that will increase the validity. Preliminarily, to contrast validity in the data collection phase, "chain of evidence" or process of triangulation of data sources should be performed to proceed with the research to ensure that connections are formed between data and information can be corroborated. The succession of this corroboration and consecutive use of several data sources forms the "chain of evidence" that produces reliability of the research.

What will be employed for this research to mitigate the limitation of the number of interviews is purposive sampling. The concept involves:

"Based on the assumption that, given the aims and objectives of the study, specific kinds of people may hold different and important views about the ideas and issues at question and therefore need to be included in the sample" (Campbell et al., 2020, 654)

The key in this is that specific kinds of people may hold different and important views. The analysis of the views and insights that may be gained from people must be understood to ensure that the interviews that have been secured are productive towards the crux of what the research aims to achieve. This research factored this in by determining which projects would be useful to analyse in addition to the most suited staff on the projects that would be of must use to uncover views that do not only involve smaller sectors of the project but have a holistic view of the project. Within purposive sampling, there is a subcategory of stratified sampling that is based on stratifying the sample and categorising the

samples that will be used for the overall research, thus linking and justifying the samples used and their connection to the objectives and aims of the study (Campbell *et al.*, 2020).

3.6 Data Analysis

The analysis will be based on extracting data and evidence that helps determine whether there are barriers to the implementation of the smart city model and its initiatives in the African context and what the contributing factors are. The primary data source of the research will be the interviews undertaken with staff that have been involved with smart cities, smart initiatives or have sufficient knowledge of the current affairs and history of this topic.

An important aspect of the data analysis of the research will be to uncover the themes and concepts in a contextual manner that considers all perspectives (including opposing perspectives) and that is unbiased in the delivery of what has been extracted from the collected data. The extraction of themes will be conducted manually by utilising the themes detailed in the literature review as a guide for the themes that will be extracted from the interviews. This has been selected as a method to utilise as the literature review briefly analysed smart city applications and the themes that influenced their success or failure, and this information can be used as a reference to triangulate the claims made in the preliminary phases of the research. The themes discussed in the literature review will form the framework for constructing the questions that will be asked in the interviews. Following this, the answers will be manually analysed against the literature review content and prior research to determine if there are shared patterns or not from literature or previous studies while also allowing room for new insights to be uncovered in alignment with the pragmatic approach that accounts for multiple realities and contexts that exist as a function of people's experiences. The interview results will also be challenged against contradictory literature and prior research to avoid confirmation bias and provide a platform for further inquiry.

When performing the analysis, the manual method of analysis will consider the following factors to ensure that all the data is utilised where necessary. This research has opted to take a deductive approach to draw conclusions from the data. This approach can be a hindering factor if the data analysis is only performed in a manner that aims to seek connections between the literature reviews and desired outcomes rather than valuing all the insight gained from the collected data. The research will continue past the determined themes to provide analyses of the data that does not fall under the codes and themes initially extracted. Additionally, to draw better generalised conclusions that breach the boundaries of the contextual data received, the analyses will draw conclusions and patterns that exist for the overall phenomenon of smart cities rather than the silos or contexts that they exist in. This will also be performed manually after the data for each interview has been analysed to then compare the data from each context to each other (Mishra & Dey, 2022).

The process that it entails is a manual iterative process that reviews remaining data that has not been allocated to the chosen codes and themes from the previous stage to determine its value and the data that can be filtered and extracted from it. The benefit of this method will be the freedom of interpretation that the researcher possesses to propose perspectives and justify them using the research, should it be tackled thoroughly (Bernadette et al., 2021).

The codes will be associated with themes from the literature review to categorise the points of interest that will be expanded on during the analysis. These themes directly connect to the overarching areas of barriers and contributing factors to smart city implementation. This method of coding follows similar principles of technological methods that allow researchers to develop codes for thematic analyses. The number of planned interviews motivated the manual method of analysis as the data received would not be of great magnitude and thus need technological methods to track, store and analyse.

3.7 Ethical Considerations

The University of Cape Town's Ethics committee was issued with the required documentation including the proposed interview questions, the ethics clearance application form in addition to the research proposal. The aforementioned documentation was required to clear and authorise the research to determine that it is being conducted in an ethically sound manner. The application for ethics clearance was successful, which allowed the research to proceed as intended.

Regarding the data collection of performing interviews, the interviewees and their organisations were consulted regarding the content that would be shared and issuing authorisation to follow through with the interviews. Interviewees were voluntarily involved with full awareness given as to the content that would be questioned, the boundaries of the interview and the aim of the research holistically.

The participants were issued an informed consent letter, which outlined how their data would be collected, stored, and utilised in the study. The letter also confirmed the preservation of their anonymity, in line with ethical research standards.

3.8 Limitations

Within the interview-based data collection approach, several limitations were encountered and accounted for. One such challenge was the positionality of interviewees and the constraints this posed on the data obtained. Participants typically shared what they were comfortable disclosing, and their responses reflected their personal perspectives. Additionally, the relevance and validity of this information appeared to shift over time (Alshenqeti, 2014). This limitation was only be limited by acquiring various perspectives that were not necessarily aligned but that had shared themes that were related to each perspective.

The interview process was time-consuming during both the data collection and analysis phases. Thus, a limit on the number of interviews was implemented to ensure that the quality of both the collected data and the ensuing analysis did not suffer as a result. In some instances, participants provided lengthy responses, which posed challenges for concise thematic extraction. However, care was taken to ensure that discussions were appropriately summarised during transcription and analysis (Alshenqeeti, 2014).

Regardless of whether the data is qualitative or quantitative, the validity thereof must be considered. As mentioned, qualitative data by means of interviews were an account of the experiences and perspectives that the interviewees possessed. The validity thereof can thus be classified into two categories, internal and external. This research grounded its validity externally to ascertain if conclusions made were valid. This was a difficult point of conflict as the research aimed to take a deductive approach where conclusions were deduced and triangulated with prior themes and conclusions made from prior research. This was conflicting due to how interviews can often be designed. Confirmatory bias can be ingrained in interview design without this consideration and the answers will subsequently be a delivery of preconceived notions. As a mitigation measure the interview questions were designed in a manner that allowed the respondents to give answers that were not ushered by the leading nature of the questions that were being asked. A limited number of interviews were ultimately conducted due to initial difficulties in securing participants, which reduced the breadth of data available for analysis. Nonetheless, this was not considered a hindrance to the study. The purposive sampling approach yielded detailed interviews that comprehensively addressed the core themes of the research. Pattern matching was employed as the primary method of analysis, ensuring that the insights derived were consistent and robust.

3.9 Summary

This chapter aimed to create an understanding that the research is based on human experience and the interpretation of the and will use pattern matching to . Nonetheless, there is still the expectation that a formalised research approach that is systematic may be followed to conduct the research in a credible manner. Creating a belief system that can be understood and followed throughout the research is a necessary step to understand how the findings were uncovered and the angle that the conclusions will be made from. The chapter outlined how data will be collected using the pragmatic approach, the ethical nature that will have to be accounted for in addition to the processes taken to ensure compliance with best practices when using the deductive approach to analyse the data. Finally, there are limitations that have been outlined from the outset of undertaking this research on this topic and with the proposed methods and the research will endeavour to proceed with these considerations in mind.

4 Chapter 4: Data Analysis

4.1 Introduction

As detailed in the research methodology chapter, the collection of data took place through interviews with staff in different managerial positions that were involved in the case studies selected beforehand. These interviews were then utilised to extract themes and answer the research questions of the study.

The interviews were undertaken in a semi-structured manner with the three main goals of understanding the background of the interviewee, their understanding of smart cities and developments and finally more contextual information on the specific case study they were involved with.

4.2 Interview methodology

The interviews were undertaken on Zoom Google Meet and recorded for analysis thereafter. During the interviews, notes were taken at specific points where key findings were provided by the interviewee. These key findings form part of the quotes and highlights that will be provided in this research by means of a manual analysis to match themes of importance identified earlier in this research. This was in hope of achieving alignment with priorly identified themes and the possible identification of new themes from the collected data.

These themes were deducted and related to themes discussed in the literature review. This was due to themes in smart cities in different context having congruency with each other and relating although each application may vary regarding the socio-economic context that it exists in. The literature review discussed Smart Cities as a concept and their inception before discussing their critiques and development since the concept's inception. A key component of the literature review was to research precedent. This precedent consisted of current and previous attempts at smart initiatives to analyse their success and failure to better understand and extract the themes that the interviews would seek to expand on. The interviews used the different contexts of the interviewees to answer the research aims individually before converging them (should connections exist) to the general themes that affect Smart Cities. This is in alignment with the pragmatic research approach that this study will seek to employ where multiple realities and perspectives will be accounted for and understood. This chapter will provide the findings of the data collection with the intention of extracting important themes that relate to the crux of the research and clarify the claims made in the proposition. The themes from prior literature that were found in the literature review will be used to deduct aligned sentiments from the respondents of the interviews by means of pattern matching and thematic analysis as discussed in the methodology of the research.

As mentioned, the interviews were undertaken in a semi-structured manner that allowed the interviewees to elaborate and discuss topics and themes related to but not exactly what the questions were intending to uncover. This was integrated into the interview design to ensure that no bias was developed, and that greater context would be provided regarding the general topic of Smart Cities from the staff's views. Additionally, during the interviews, due to the semi-structured nature of the conversations being had and the flow of dialogue, the order of the questions was not followed as per the interview plans. Although not ideal, the interviews were kept within the boundaries of the general topics that were important to discuss while allowing the interviewees to feel free to express their thoughts and opinions. The interview plans for all the five conducted interviews can be found in the appendices.

4.3 Interview Question Outline

Below are the questions the interviewees were asked and what is referenced throughout the data analysis section. As mentioned, these questions were intended as outlines to spark conversations surrounding their smart city context and assist in achieving the research aim

Konza City Interview Questions

1. How is the Konza Smart City project being implemented?
2. What specific smart city solutions have been applied in the Konza Technopolis?
3. What are the key goals of the Konza City initiative?
4. What are the main barriers you have faced or are facing in implementing these smart city solutions?
5. How has governance influenced the success or failure of implementation?
6. What role does the local community play in the development and implementation process?
7. Are there challenges related to land usage or local opposition?
8. What strategies are in place to ensure long-term sustainability of smart solutions?

Century City Interview Questions

1. How would you define a smart city in the context of Century City?
2. What are the main smart technologies or innovations implemented here?
3. Who are the key stakeholders involved in development?
4. What barriers have affected your ability to achieve project goals?
5. Has Century City met its intended smart city objectives?
6. How does governance affect the implementation of smart solutions?
7. What lessons have you learned from implementing these innovations?

Melrose Arch Interview Questions

1. What was the original vision for Melrose Arch as a smart urban space?

2. How does the development integrate smart city elements?
3. What challenges did you face during the development phase?
4. Are there elements that were not implemented as planned?
5. How do you define project success for Melrose Arch?
6. What governance structures supported or hindered progress?

Oxford Parks Interview Questions

1. How would you describe the planning and execution of Oxford Parks?
2. Which technologies or planning principles guided your development?
3. Who are the main users and beneficiaries of the smart features?
4. What specific challenges arose during planning or execution?
5. Were there governance or policy-related barriers?
6. How do you evaluate the effectiveness of stakeholder engagement?

Researcher/General Interview Questions

1. What is your understanding of the smart city concept?
2. What barriers do you observe in implementing smart cities in Africa?
3. What factors contribute to the success of smart city projects?
4. How does leadership impact the smart city development process?
5. What kind of design considerations are most critical in smart city planning?
6. Are there particular projects or cases you believe exemplify successful implementation?

4.4 Critical Themes.

The analysis of the data will not look at themes in silos as projects and their themes often overlap and affect each other in a manner that often poses hard to separate and analyse. Additionally, some of the themes will illustrate sub-themes that exist within the overarching umbrella of the demarcated themes.

As mentioned previously, the themes that will be discussed below were developed from the literature that was reviewed and used to design the interview plans that extracted the information. The literature briefly outlined smart city applications that have and are taking place in Africa as their precedent and how the faired would set a direction for the broad themes to investigate for the selected applications of this research.

The theme of smart initiative experience is an essential foundational these of the analysis as it gives context as to the thoughts, perspectives and answers given to the questions that the interview asked. The different interviewees possessed different roles on the smart initiatives that they were involved in, in addition to their experience prior to the smart initiative in question. Detailing this was important as

Smart City criticism has often analysed experience as a factor that affects smart initiative outcomes. Eko Atlantic City and Cairo, discussed in the literature review, were examples of the ripple effects that sufficient knowledge, experience, and education had on certain factors of each attempt. Thus, an important factor to investigate in this research to create grounding for the projects and staff that were being investigated.

The theme of governance illustrated correlation between the experience that the staff on the projects exhibited as decisions regarding stakeholder engagement and the transparency surrounding how the projects analysed in the literature review lacked provision for the ultimate end-user of the initiatives.

Considering one of the main aims of smart initiatives is to mitigate the effects of urban densification, this posed itself to be a key theme to analyse. The coupling of the experience, knowledge and the thoughts surrounding governance is one of the determining factors in how the efforts to mitigate urban densification fair on the different scales that smart initiatives have. The variance and prioritisation of this factor came through in the interviews and this was the desired result. The literature review illustrated the different scales and types of smart initiatives that exist in Africa and how this factor operationally and theoretically affected the results of the endeavours. This was an important factor to analyse in this research and thus constituted as a theme.

The culmination of the preceding themes can be converted into tangible design considerations that were made. An additional critique of smart cities that was briefly discussed in the literature review was the skewing towards approximating a smart initiative to technological integration and implementation. Giffinger (2007) outlined six characteristics of the smart city concept where an emphasis of the consideration and provision of all these factors truly constitutes smart initiative. The oversight and lack of provision of certain factors in the implementation of some of these factors lead to inquiries and assertions that ulterior motives such as the desire to seek foreign direct investment and general foreign attraction (Côté-Roy & Moser, 2019). In the literature review, contextual sensitivity was understood as the awareness that the global north has applied smart initiatives that are appropriate from their perspectives and that African applications may use this as precedence and guidance for as long as they acknowledge their own contexts. This research sought to determine whether this was maintained in the study areas the interviewees were versed in by determining what specific design considerations were made to mitigate certain issues in the regions of their application and the perceived benefit of them.

4.4.1 Smart initiative experience

The table below illustrates the respondent identifiers will be used in the ensuing chapter, their corresponding smart city or positionality, the experience they possess in each context, followed by contextual justification for inclusion in the study:

Respondent ID	Associated Case Study / Perspective	Role / Function	Estimated Experience	Justification for Inclusion
Respondent 1	Melrose Arch	Development executive for a major urban mixed-use project	15+ years	Oversees the delivery of large-scale urban developments incorporating smart design. Offers insight into how smart infrastructure and urban integration are managed.
Respondent 2	Oxford Parks	Urban planner working in precinct development	28 years	Involved in the conceptualization and execution of precinct-based urban projects. Has significant experience aligning urban planning with smart technologies in partnership with municipal entities.
Respondent 3	Century City	Urban precinct operations and governance leader	20+ years	Provides detailed understanding of precinct governance and infrastructure. Their role involves ensuring the coordination of security, operations, and smart services across a dense urban environment.
Respondent 4	General Research Perspective	Academic researcher focused on smart cities and urban theory	6–8 years	Researches urban innovation and sustainability, particularly in African cities.
Respondent 5	Konza City	Leader of a national-level smart city development authority	20+ years	Oversees Kenya’s flagship smart city project. Offers a perspective that is focused on innovation and integration of technology into their study area’s context.

Using their experience with smart developments as a reference for how they define a smart city, respondent one said that creating “intelligent, green and secure buildings that are maintainable” encompasses what a smart development is to them in conjunction to the accessibility and usability of the developments for the end user.

A pattern can be identified between respondent one’s definition of smart initiatives in their context and the characteristics outlined by Giffinger (2007) that culminate a city being defined as smart. Giffinger’s

six characteristics are: smart economy, smart mobility, smart governance, smart environment, smart living and smart people. Developing grounding in what is defined as a “smart” development is paramount to developing in the correct direction and ensuring delivery of the right product and systems is achieved.

Respondent two defined a smart city from their experience and knowledge as “Where there's an application of strategic technology in order to enhance the benefit or to manage the shortcomings of urbanization”. This smart precinct is driven by and managed by a non-government organisation (NGO). This is an important point of interest when approaching the data collected from this respondent but to also understand the difference of definition from the respondent one’s definition that comes from a private development organisation that has undertaken the implementation of a smart solution. From analysing the response from respondent one regarding their definition of a smart city, one can deduce that the difference between the two responses is that respondent two indicate that their solutions are catered to tackling the effects of urbanisation. This is in alignment to literature that has suggested that a driver for smart city or smart solutions is the sheer necessity of urbanisation and the requirement for its provision to mitigate the effects.

Respondent four is considered a researcher whose experience revolves around Cape town as a point of focus in addition to broader work involving the future of cities and the ideas that surround their development. Although they have not worked on a smart city, their comprehensive research on the topic served as a justification to participate in the research. Like prior research that acknowledged the dynamic nature of the definition and term of what a smart city is, respondent four noted that the smart city term has had its “heyday” and that the evolved version of the same concept will appear in the future. Ultimately, they acknowledged that they have not been involved in a project of this nature but illustrated willingness to do so.

Respondent four’s precursory thoughts on defining what a smart city were that definitions are often restrictive and prohibit innovation where contextual sensitivity must be applied. This illustrates a pattern as there is congruency between this and the other responses from interviewees. Respondent four expressed that:

“What I think is smart is the strategic and appropriate use of relevant technologies that respond to specific urban challenges. So, I explain it that way and broadly because I think a lot of what is described to smart city development is a technological solution to an issue that's defined by the technology rather than a well understood urban issue that is solved using a particular technology in an innovative way.”

The framing of this definition is key to understanding that technology may serve as a tool that can be used to solve issues and should not be an application that seeks to fulfil “smartness” in its application. Further to this, where smart cities have been criticised for their contextual relevance, this has often been

found to be a disconnect between achieving success and failing. Urban Real Estate Research Unit (URERU) Smart City series part 1: Overview and Analysis of Cape Town's Digital City Strategy (2019) analysed the attempt made by Cape Town and determined that an oversight of contextual sensitivity led to suboptimal solutions being implemented. One such example being the Wi-Fi on MyCiti buses and the cost of connectivity being misaligned with the in-situ conditions of end-users and the bodies responsible for implementation and management of the solution. The human element cannot be overlooked, and these were strong sentiments expressed by respondents three and four when noting the definition and visions for successful smart city solutions.

Respondent four's research and knowledge on Cape Town also provided insights into the smart city concept and the varied development directions that exist under that umbrella. The respondent used Konza City as a measure of comparison regarding the different approaches. They noted that Konza City has advertised themselves as a satellite city with the following sectors to be developed:

- Residential,
- Industrial,
- Energy,
- Utilities,
- Innovation and research,
- Infrastructure and logistics,
- Commercial,
- Healthcare.

Respondent five is in a senior managerial position involved with the development of Konza City in Kenya. From the interview with respondent five from Konza City, they provided a definition of a smart city that their organisation uses. The definition is that "A smart city refers to a modern urban city that uses technologies such as AI, IoT, Big Data and Cloud Computing to solve cities problems such as traffic, waste management, energy management among others."

As per the interview with respondent four, they expressed that technology may serve as a tool to solve well understood issues as opposed to looking to solve an issue that is defined by technology. The definition given by respondent five in contrast to respondent four's observation alludes to the scrutiny that smart cities have faced when determining their true vision and goals. When the allure of technological implementation is at the forefront of development, there may often be overlooked factors and risks. This was acknowledged by respondent five as they identified that the digital divide and inequality are perceived risks for Konza City. The digital divide is defined as the disparities that exist

between rich and poor concerning access to, distribution of and the use of technology and connectivity (Boyle, 2019).

The City of Cape Town's strategy is said to have acknowledged the country and city's history and sought to instil political reform and governance. Technology was used a vessel to implement structures and systems that would help overcome the inherent challenges dealt by the previous systems and structures. One of the risks and considerations in the development of the smart city strategy of Cape Town, was the digital divide. Affordability, income, and geographic distance from economic hubs impact the digital divide and solicited initiatives to mitigate the issue such as the SmartCape and Broadband project , (Boyle, 2019).

The city was recognised as a frontrunner for the smart city concept on the continent and globally and the bulk of this was attributed to early and active leadership that understood the concept and had the expertise to execute the concept competently.

4.4.2 Governance

Prior research by Oke et al (2020) indicated that the term "smart governance" can be considered the consideration of transparency, sound political strategy and citizen decision making. Smart governance is a fundamental factor of the smart city concept, providing the framework that allows technology to effectively be integrated to address urban challenges. It ensures that innovations are integrated rather than rather than in silos. This integration is two-fold as it incorporates the cohesion of stakeholder needs and the eventual solutions working in harmony. Smart governance also creates measures that cater for the future by incorporating adaptability and responsiveness due to the nature of the dynamism of urban spaces.

Question three sought to understand what the current pressing needs are for the respondents urban space or city. Respondent three detailed that governance is an important factor to progress urban spaces specifically:

"You simply have to rely on a functioning, political and municipal and provincial infrastructure in order to create a demand a property demand in any event."

From the respondent one's perspective as a property developer, they noted that one of the primary barriers is that town planning applications are being processed slowly and legislation does not cater for progression. The lead time from submitting applications to receiving a response, for example, was suboptimal for developers, this was a similar sentiment expressed by respondent three in relation to the Oxford Parks development. This reduces the incentive to develop property, contributing to negative growth and worsening the urban housing gap, as urbanization outpaces housing provision. This relates to the importance of transparent governance, efficient and transparent administration of the governance systems as the core of what is required in governance system is access to information that pertains to

the public in addition to using transparency as a mechanism to incentivize progress and productivity of the systems in place (Mozūriūnaitė & Sabaitytė, 2021).

The influence of good political leadership is that you are able to support the growth that urban space requires by ensuring that those in charge of making important decisions and ensuring that growth can take place are also fully aligned to some of the endeavors and initiatives that developers are seeking to promote and undertake.

As the desire to develop property decreases for developers, the demand for residential infrastructure will continue to increase. The effect that this has is that municipalities must increase municipal taxes to increase their revenue. This is a counterproductive measure as increasing municipal taxes in a socioeconomic area such as Johannesburg would reduce affordability for taxpayers looking to invest in property development.

Where governance has been brought into question regarding Johannesburg, Bifulco et al (2014: 31) developed a bottom-up approach that may be of significance to enact positive change which determined that the different stakeholders involved in smart initiatives possess diverse needs and there is a need to cater for all the needs where possible. Once an analysis of the capacity of the various parties to fulfil the needs as well as the resources has been performed, they must integrate the analysis into the ability that they possess to provide the needs.

There is a need for emphasising smart governance practices that account for all the actors and requirements in a manner that accommodates for the inherent dynamic nature of the risk and problems that may arise from this level of complexity (Bifulco et al., 2014: 28).

The inclination to adopt technologically driven solutions is an issue that has been faced in the progression of smart solutions in the African context. This was acknowledged by respondent five as they noted that the Kenyan context of pressing needs is currently faced with barriers to implementing smart solutions that involve privacy concerns and political challenges. The aversion to deviation from previously accepted best practices has prohibited potential growth. Thus, respondent two's assertion that there is an inclination from the corporate governance body of Century City to implement smart solutions goes against what literature has suggested regarding the reluctance previously expressed and is refreshing when considering future growth and the differing stances that exist. The nature of NGO's is that they may often be under-resourced regarding the research and development they are able to perform when undertaking their endeavors. Consequently, their reliance lies in collaboration with service providers who can apply their expertise to the relevant services they deem necessary.

Additionally, respondent two noted that the lack of precedent provides the incentive to go against the adoption of smart solutions. The consequences of failure are often at the forefront of the endeavor and are often looked at as the deciding factor to not implement solutions rather than the benefit of successful

implementation. In conjunction to the familiarity of the concept, the African continent has not seen a big magnitude of solutions that would assumedly give assurance to new investors to be inclined to proceed with such an endeavor.

Lytras & Visvizi (2018) noted in their research that concerns of citizens and end-users was a limiting factor that they were able to measure when long-term planning of smart city services was concerned. The following six factors were determined as limiting factors and psychological factors of smart city services by end users; security and protection (45%), data privacy (25%), transparency of services (8%), ethical concerns (6%), required soft skills (5%), third party awareness (5%) and the complexity of services (4%). Although this data from literature is not specific to the Century City precinct, one may be able to triangulate the relevance to this example and draw generalizations as the philosophy expressed by respondent two is that the solutions implemented are people centric.

Like respondent two, respondent three emphasized the requirement of good governance and leadership and how it has influenced development. Melrose Arch and Oxford Parks are two privately owned precincts that have developed similar concepts. Further to this, they are near each other in the Rosebank Area in Johannesburg. This is an important context as they fall under the same umbrella of leadership from the municipality and government. Both respondents of this research noted how suboptimal leadership and systems incentivized private development and management.

Outside of processing lead time for town planning processes, respondent three went further to detail how the developmental regulations do not align with progressive urban solutions. A heavy load of legislative restrictions and “red tape” were cited as considerations that have a negative effect on developments such as Oxford Parks, specifically.

“Bit of red tape. The biggest barrier to development and creative cities is the town planning land use scheme. I think that land use management is old school. It's very American, it was incorporated into the South African cities.”

Contextual sensitivity was discussed in the literature review as a factor to consider regarding stakeholder engagement and development. However, this theme can be looked at from the perspective of the application of smart solutions and what may be contextually relevant to Africa and its cities. The global north can implement solutions relevant to their context and the resources they must do so. This must be understood in the African context when looking at the inspiration for these urban developments but also the regulations that govern them.

The inclination to develop such solutions stems from a shared balance of understanding what can result from progressive solution and a greater notion that the regulations and overseeing and/or related bodies to development can allow for creativity.

“I think we should go towards more form-based codes rather than a very rigid land use management scene. I think it's very exclusionary and it doesn't support the spirit and purpose of all the other land.”

Form-based codes are defined as “Specification of what uses are permitted in a building or place, but focus on the physical character of development, particularly how it relates to the public realm that everyone shares.” (Parolek et al., 2013: 7).

The design considerations section will discuss how Melrose arch has implemented this dynamism that form-based codes use as a foundation for the leeway of development that can be allowed. Regarding Oxford Parks, respondent three noted that they have developed their own codes within the boundaries of what the overseeing bodies allow to mimic and adopt some of the principles of the form-based code system.

The form-based code system can be related to the goal of the IBM smarter cities challenge which aimed to “offer digitally enabled solutions in diverse areas of citizen engagement, public-safety, transportation, sustainability, economic development, social services, and land-use planning.” (Alizadeh, 2017). All these factors were introduced as the pillars of the concept as their combination would lead to pushing the narrative and shifting current practices to produce more progressive solutions.

It was previously mentioned that leadership structures have failed to fulfil their roles and caused inefficiencies in the systems that should be pushing the smart solution narrative forward. The root cause of this is difficult to determine but respondent four noted what may be one of the causes. This is as follows:

“I don't think it's purely ignorance. I think it's also that they are over-capacitated and under-resourced and a lot of the time these tech companies come with a solution that promises to solve a lot of the issues that they have, and their focus is on that. And that's where the solutions get implemented.”

The pressing needs of urban spaces in Africa are such that resource allocation has always been a strenuous point of focus when analysing developing African countries and cities. There is a battle between progressive solutions and foundational systems and solutions that have always been problematic. Respondent three noted that “So I think it's important that we don't disregard it and say, well, Africa, well, we've got so many other issues. We don't need this. We definitely do need this.”. This issue and battle affect the buy-in of progressive ideas, their planning and implementation and this issue can be mitigated by education of the delegations that will be tasked with the solution to increase the justification of this specific route of development as a more beneficial solution compared to solutions that have previously been applied and accepted.

4.4.3 Urban densification

The theme of urban densification relates to Giffinger's characteristic of smart living with the focused intent of providing for quality housing. Vaonolo (2014) defined the smart living characteristic as "Involving the quality of life, imagined and measured in terms of availability of cultural and educational services, tourist attractions, social cohesion, healthy environment, personal safety and housing ". Regarding this issue, one of the driving nodes for smart cities and one of the generalized incentives for smart cities has been urbanization. When smart cities have been proposed, the question that has been asked is whether these developments are as inclusive as advertised or if there is an underlying incentive to overlook certain issues to provide for other groups.

Question six of the interview asked the respondents what their proposed solution to urbanization was. This formed part of the general questions section of the interview that aims to determine the respondent's knowledge and frame of thinking regarding urban spaces, their current standing in general and their specific socio-economic contexts and the concept of smart cities. Respondent one stated that integrated housing is the idea that they have considered. Integrated housing, from their perspective, is an initiative where you create affordable solutions for people that account for their total pay in addition to a specific percentage of their pay that can be charged to them as rent to pay for the housing solution that they will be using. Important to note in their response was that consideration towards the historical context of South Africa and its history and the effect that it still has to this day regarding the housing crisis and provision for housing when it comes to the citizens of cities and consequently the country.

Respondent one noted that part of solving the rapid urbanization crisis is an acknowledgment of some of the initiatives that have been used to remedy this issue previously and understanding that the strenuous measures put on the initiatives hinder the growth and the demand that developers have regarding developing integrated housing solutions. In an ideal situation, Respondent 1 noted that stimulating the demand for development would usher developers into a direction where they are more willing and able to design and develop integrated housing solutions in a bid to help solve rapid urbanization. This of course would occur on a smaller scale but would be part of a bigger shift in the development direction and desire that is currently possessed with a new positive result in mind.

When responding to question 6, respondent two noted that the philosophy for Century City is two-fold. They indicated that it is "an application of strategic technology in order to enhance the benefit or to manage the shortcomings to urbanization." This is a crucial point of interest where the smart city concept is concerned because of the previously mentioned notions that have been expressed regarding smart cities and their ability to aid in the bid to solve urban densification and mitigating its effects.

The South African Smart Cities Framework (2021) noted that nuclear zones that typically provide more jobs and economic activity are easily accessible to the affluent who live in much closer proximity than the underprivileged who tend to be in the peripheries that are of higher density and poorly serviced. In

this notion is the acknowledgement that these nuclear zones provide more jobs and possess economic activity and can be deducted to be the perceived benefit of the concept. In relation to the response given by respondent two, one can deduce that these are one of the benefits of the concept that they are trying to realize and maximize. As will be detailed in the design considerations section, the decisions made regarding the Century City precinct follow as a logical progression of the benefits made and the contextual needs for the area of study.

The effect of urbanization is not only the requirement for housing and accommodation for people travelling into the nuclear zones, but also accommodation for the commuting processes in addition to the utilization of those zones outside of housing. The South African context of development will have to account for the apartheid regime and the effects that are experienced today, and this entails the economic standpoint of most people of colour in the country. Century City has developed a system that increases efficiency and the robustness of the taxi services that are widely used by those commuting in and out of the precinct. Although the MyCiti and Golden Arrow systems exist, they provide for different brackets and target markets, and this leaves a gap. The minibus taxi system is a point of interception that Century City management identified and have developed. The system decreases the usage and distribution of physical money and increases efficiency by decreasing time spent in the precinct. The latter is a critical issue to solve where traffic has often been noted as a negative effect of the insurgence of nuclear zones. The centralized and digitized system culminates in the following benefits (Century City, 2024).

- Increased Traffic Flow
- Increased Revenue
- Reduce Risk from Cash Management
- Reduce Operational Costs
- Optimised Data Collection

In analysing the driver of the smart concept previously, it was queried whether urbanisation is a main driver of the concept or if there are other motives that have propelled the concept into the notoriety it is currently experiencing. One such driver was the determination that the emerging new middle class on the continent of Africa will solicit the need for IT-driven solutions and smart cities emerging proportionately to accommodate for the trend (Splinter & Van Leynseele, 2019b).

The implementation of the digitised transport system implemented in Century City relates to this notion as the noted housing demand and supply discrepancy that has moved to the forefront of issues to solve in urban spaces has also spread itself to other sectors of urban spaces and smart cities that need solving. When analysing project success at a later stage, the holistic approach to the issues smart cities solve will be another point of inquiry. This is grounded in the definition of smart cities and the characteristics that they consider important to the concept.

Respondent three recognised the requirement of cities to focus on urbanisation and prioritise resources to help solve the issue. The prioritisation of the issue paired with adequate awareness would be an appropriate method to solve the issue. Respondent three made the point that urbanisation may be solved by using existing infrastructure and developing it as per the needs of the space that they exist in.

The perceived benefits are that the time-value of money is considered, and efficiency is increased by repurposing existing infrastructure. The Nodal review of 2018 by the City of Johannesburg cited one of the five developmental principles from the Spatial Planning and Land-Use Management (SPLUMA); efficiency. They defined this as “land development must optimise the use of existing resources and accompanying infrastructure”.

This was corroborated by respondent five in relation to Konza city as the noted that one of the short-term solutions to urban densification can be found in using existing infrastructure. Konza City also equally illustrated tangible actions in line with this notion by dualling the Nairobi highway corridor to connect the Konza City site to the A109 road which is a main route connecting Nairobi and Mombasa. Additionally, this provision includes plans to implement intelligent transport systems, a rapid bus transit corridor and modernised streetscapes. The alignment of the positive effect that these solutions can have in different applications alludes to the bigger theme that improving existing infrastructure can minimise the need for construction projects while ultimately improving quality of life (Harrison & Donnelly, n.d.).

Additionally, respondent three noted that reframing apartheid cities is a pressing need for urban spaces today as the ramifications of the spatial planning from that era still affects citizens today. The solution to this is not solely based on moving infrastructure but making inquiries into how people interact with the city and designing public environments that provide facilities for the greater community to interact with.

The South African Smart Cities Framework (2021) stated that that “Nuclear zones that typically provide more jobs and economic activity are easily accessible to the affluent who live in much closer proximity than the underprivileged who tend to be in the peripheries that are of higher density and poorly serviced”. This was the design of the previous regime, and a new, free South Africa should intercept this strategy, dismantle it and provide equity in the new solutions that are developed.

Oxford Park’s efforts to understand the improvements that can be made to spatial planning are detailed in the design considerations section.

4.4.4 Project success

In conjunction to gaining an understanding of how smart cities are defined by the respondents, the interview also sought to gauge if the respondent felt as though their project was successful and the reasoning behind their answer when asked question four during the project-specific portion of the interview.

Respondent one noted that:

“Yeah. Absolutely. Fundamentally, yes. At the at the time, it was a bold and creative initiative to put a mixed-use precinct into the heart of Johannesburg.

People didn't really understand what this new urbanism concept was about, but it's grown over time. And, you know, it's been replicated in in in just about every city now from a from a mixed-use precinct.”

This answer alludes to one of the highlighted points of inquiry of this research and that is where influence is drawn from. It would be hard to ascertain whether there have been direct influences from Melrose Arch when analysing other mixed-use or smart developments that have been implemented since Melrose Arch ascended. However, relationships can be drawn using the precedent and the effect of the influence can be analysed. Existing literature regarding success criteria in addition to the framework of what constitutes a smart development can be used to determine the degree of success or lack thereof of a development.

As mentioned, respondent one works for a property development company and that company has developed both Melrose arch in Johannesburg and Harbour Arch in Cape Town. Similar concepts have been adopted, examples of this are the location as Harbour Arch is also located near a freeway and in close vicinity to other transport mode nodes, similar sizing and mixed-use nature of the buildings has been adopted, the precinct is also in a very active economic zone in the city.

The previously discussed notion of underlying competitiveness speaks to the point raised by respondent one. The consequence of developing a project that was progressive for its time, implemented systems and infrastructure that has been beneficial for the intended users is that developments of similar nature begin to adopt adjacent solutions in a bid to develop their own territorial capital of their own. What must be rooted in the developmental plans of inhabitants is the provision for the target group (Giffinger et al., 2010).

Zavedeev et al. (n.d.-b) also noted in their research that the implementation of smart city solutions should also account for the future regarding performance and impact. When respondent one was asked questions regarding whether they deem Melrose Arch successful and if there are plans to develop of the precinct, they gave indications that alluded to meeting the success criteria.

During the development of Melrose Arch, respondent one noted that:

“The planning process was what you call a mixed-use logic, which means you do not predetermine what development is going to go on which erf within the development. You create a subdivided portion of land which supports a new urbanism environment, which we've done. So, you've got your backbone of roads and infrastructure. And then you've got a set of subdivided, properties within that within that framework. But each of those doesn't have a predetermined use. So, we're not going to say, well, that's

residential and that's hotel and that's retail. You know, the beauty of a of a scheme like Melrose Arch and the scale of it is that you can morph your decisions as you go.”

As presented by Zavedeevet al., n.d.-a, foresight is key to ensuring that smart initiatives are not short-lived solutions that fulfil a purpose once implemented but sustain service and dynamically shift to accommodate for changing needs. Melrose Arch is an illustration of the result of good preparedness and foresight as the development is still in progress but is currently in use and fulfilling the intended purpose.

This type of dynamic design consideration provides an answer to question 9. The question sought to understand how change and risk is managed throughout the lifetime of the project. Demand for different land uses may vary throughout a given time-period and analysing these changes and allowing them to be made they are feasible is a key consideration as opposed to allocating land for certain use and not allowing for changes to be made. Considering Melrose Arch's context, the project is roughly 20 years old and still developing. Thus, the dynamic approach taken is appropriate due to socio-economic changes that have taken place and will take place and the result of this can be seen in the development continuing to function successfully, stay relevant and stay competitive against other developments that are being developed with the same ethos. Over the 20-year period, 320, 000 of the 500, 000 sqm of developable land has been developed.

Respondent two alluded to how they perceive their success and what might form their criteria. As noted earlier, respondent two's involvement in Century City is predominantly in safety and security. Thus, their assessment of project success is biased to how that sector performs. The uptake and usage of the precinct from notable stakeholders is where Century City receives validation that the project is successful, at least in the safety and security sector.

When analysing project success criteria, literature has suggested that propagation is an overarching theme to use for the analysis of smart city projects. Within this category are further indicators of success, market demand and smart city project visitors. These indicators of success are defined as “The extent to which there is a general market demand for the solution and “The number of visitors to the physical project site or to the website hosting the smart city project” (CITYkeys Indicators for Smart City Projects and Smart Cities, 2017).

The definitions are useful to analyse when interpreting the response given by respondent 2. The question sought to find out the technology the precinct has implemented. In answering the question, the respondent shared information that corroborates that they have met two indicators of the propagation criteria of project success.

Respondent three's indication of their method of development was that form-based codes are not widely used and accepted, and they have, in turn developed their own codes that mimic the concept in their

own application that is allowed in the context of the regulations the council and municipality. As noted earlier, end user satisfaction is an important factor in smart city project success evaluation. Regarding form-based codes, they do not only satisfy the request for leeway and dynamism for developers but also allow for spaces to develop in a direction more conducive for the inhabitants of the space. Additionally, project success is also judged by the ability to equip the project and the overall space for the future by understanding the dynamic nature of requirements and the changes that will solicit adaptability (Zavedeev et al., n.d.-b).

The commonality of the interviews for Melrose Arch and Oxford Parks is that their assessment of project success is centred around the end user in the present and future. The dynamic nature of the Melrose Arch design which is altered dependent on demand and needs as well as the framework developed by Oxford Parks that is akin to form-based codes illustrate congruency in the philosophy of how progressive developments should be managed.

Additionally, the validation received by the staff involved with Century City by the usage and attraction to their precinct amass in a deduction that end user satisfaction is a high-priority criteria in the determination of project success.

In the design considerations section, respondent four noted some of the choices made regarding the development and these speak to project success. What will be elaborated on at a later stage is that human-centric design is a point of emphasis in executing projects such as this to avoid the loss of focus and staying on the desired path of development that will pay dividends to all the affected parties. Key performance indicators (KPI's) and numerical indicators are often cited as the success criteria for projects and that can be seen as the focal point of success that may overlook the interactions and satisfaction of the end-user. It was previously discussed that the development of Konza City overlooked citizen engagement due to their communications over the buffer zone that they had planned to implement. The effects of this oversight spread to more than just what was developed and how it was developed but additionally to the underlying thoughts on the development that was taking shape (Johari & Johari Mohamud Jama Director Athman Lali Omar, n.d.).

This notion does not suggest that key performance indicators are not important, but rather that there are important insights that can be gained from looking outside the ordinary. This is emphasised from a quote from respondent four stating "I feel like the things that are most important to measure are the things that aren't easily applied or measured by indicators."

In line with this notion, the interview regarding Konza City expressed different sentiments to the three previous respondents that were interviewed prior. Their measure of success was found in measurable metrics. This is not entirely negative as they can be interpreted to understand the positive effect that they have had. Urbanisation has often been cited as an issue that requires the housing crises that exist

and the effect of the growth that may take place. Respondent five expressed that Konza City has provided 17 000 jobs thus far and that this only during the first phase of the project plan. This, in addition to other metrics, led to the development's recognition locally and internationally regarding ICT solutions and projects in addition to creating an attractive investment opportunity for the future of the development. This is another valuable idea to consider when evaluating project success and that is the attractiveness and credibility of a development to continue to grow in the future, as mentioned prior in this section (Zavedeev et al., n.d.-b).

4.4.5 Design Considerations

The South African context of development requires that some of the basic services are provided as well, considering the electricity crisis in addition to some of the water issues in the Johannesburg Metropole. As such, the Melrose Arch development provides alternative measures to ensure that end users have these basic needs such as water and electricity.

In addition to the consideration of water and electricity, Respondent one also noted that some other developments tend to create buildings that are only single-use, and as such, their usage can sometimes peak at certain hours while plateauing and reaching lows at other hours. This pattern is suboptimal for energy use. So, in their consideration of designing Melrose Arch and Harbour Arch, the developers tried to ensure that buildings are mixed-use and thus would be in use for more hours throughout the day. This would also stabilize energy usage and ensure that there is no redundancy in some of the developments.

The development of smart cities in Africa requires contextual analyses into what the pressing needs of the space and its people require for the development to be successful. Water and electricity are resources that have been scarce at times in South Africa and their provision in areas of different socio-economic statuses has continued to be a pressing need. Melrose Arch has accounted for this in numerous ways. Respondent one stated that the precinct has “about 3 megawatts of solar panels and inverter systems”. In addition, the precinct has a centralized cooler plant that delivers chilled water to each of the seven buildings currently in the precinct. This is something that was implemented at the beginning of the project that has continued to operate to date. The Melrose Arch precinct also possesses a building management system (BMS) that can control each environment and operation in the separate buildings in conjunction to a precinct integrated system (PISENS) that controls the digital technology (that includes access, security cameras, infrastructure data) of the precinct. Regarding water, a 2-day redundancy has been created should water from the municipality/city not be available.

Question 13 sought to understand some of the important considerations that developing companies account for when developing smart cities initiatives. Respondent one stated that in the projects that they have been involved in, which are Melrose Arch and Harbour Arch, some of the things they considered were how close the precinct is to specific nodes in addition to its proximity to freeways. The Melrose Arch precinct is bordered by Corlett drive and Athol Oaklands and has access to the highway. This

improves the mobility of the city in a bid to make it walkable and easily accessible in addition to providing a node where there are multiple services that the end user can utilize. This formed one of the driving points for the location of the precinct.

The main theme of these developments was creating new urbanist environments which are akin to the concept of being multi-purpose developments that are walkable. As mentioned previously, the developments of the Rea Vaya and the Gautrain system emanated from the needs to decrease private car use in urban areas. Melrose Arch utilised these modes of transport and developed in a direction that maximised them and aligned to the need to provide smart mobility.

Mobility has been seen as a challenge to address in urban spaces for multiple reasons. The smart city characteristics do not work in isolation and are interconnected. Smart mobility can be used as the root characteristic to emphasise the importance of design considerations. It is connected to the smart living and smart environment characteristics. The former considers health conditions while the latter considers environmental conditions and air quality. Thus, it can be deduced that when designing smart cities, a design consideration that must be made is to decrease the use of private vehicles within the development and to incentivise non-motorised transport and close-knit accessibility. Melrose Arch is such an example that has maintained this by creating a mixed-use precinct with a plethora of facilities that will limit users' need to travel extensively. Additionally, as mentioned, the Gautrain and minibus taxis are in proximity as alternatives. This was an intentional consideration as illustrated by respondent one's remarks:

“So, before we do a big scale development, we look at the accessibility, not only from vehicular, but also from a mobility perspective. Then from a vehicular perspective, we look at how easy accessibility is from, you know, from freeways and from nodes.

So, if you if you look at Melrose Arch in Johannesburg and Harbour Arch in Cape Town and the various other schemes that we've done. You'll note that they are quite close to freeways, and they and they sit snugly in the mobility corridors of the city. Okay? So that's, the so that's the that's the first thing that we that we satisfy ourselves that there's that we can create ease easy access.”

Urban spaces experience an influx of people for various reasons; this was an important design consideration identified by respondent two when detailing the Century City precinct's design influence. Respondent two indicated that “We've got 1.7 million visitors coming into the precinct per month, and about 30% of that is workforce related.” This, they found, was a point of inquiry into developing systems that allow people to travel in and out of the precinct by developing robust system that allow for travel and sound management of transport in and out of the precinct. One can deduct from this assertion that a people-centric approach has been taken when considering this approach to the implementation of smart solutions.

Contextual sensitivity was noted as criteria that would be used to assess the suitability of smart city solutions and act as an indicator of performance (Sharifi, 2019). This is due to the notion that smart solutions cannot be an imitation of solutions that have been applied elsewhere that do not have relevance to the application they are being utilised in. When bespoke indicators and local benchmarks are utilised in the conceptual ideation stage of developing solutions, the realisation may summate to context-sensitive tools that aid in the solving of solutions (Sharifi, 2019).

In relation to this theme, there are still difficulties in this regard as procuring the relevant service provider that can provide the contextually relevant solution is not an easy task for those responsible for implementation of smart city solutions. As noted by respondent two:

“Our biggest barrier that we found is to find the correct technology service provider that you can partner up in the long term because it's a long-term relationship. Because these technologies are not cheap. It's not something that., if that company would exit the country or there's a problem that they could foreclose. Or something like that, then you're going to struggle. It's very difficult to get back.”

The Century City development has taken this into account as expressed by respondent two on the interview. Respondent two expressed that:

“80% of the deployments we've got in Century City is not something that is something you can buy out the shop you got to develop. It's got this research development component in there, which is costing a lot of money for the service provider, but at the end of the day, what helps for them as well is that we give them constant feedback on that product which is now a new product. It's an ideal environment to launch a product and resell it somewhere else because it's gone through the whole process of vetting through.”

Oxford Parks have also tried to understand the taxi industry as they understand the importance of the system on the functionality of the space. Their perspective has been that it is a vital system to prioritise and that it has often been overlooked by council.

Outside of an analysis of who uses the system, there have been effort to develop systems that maximise taxi operating staff and assets' idle time. Education of taxi operators is a point of inquiry that has been considered. Additionally, there are vulnerable groups such as women and children that use taxis. To ensure their safety, the system must be optimised and improved to increase the usage of the system. This has benefits for multiple groups including the retail industry. Respondent three noted that “75% of the people coming through here, 8000 people a day, are women now. There's a massive opportunity for you, and immediately that group.” When referring to stakeholders involved in retail. This increases the buy-in of developing the systems that exist in the space as it will increase the understanding that nuclear zones are integrated and do not work in silos.

Reframing narratives is an important factor to use in this realm. Reframing old ideologies and creating a path to think towards the evolution of a city often accelerates development by minimising the proposition phase. Further to the theme of reframing, respondent three noted that Africa could progress with the smart city concept if there is an analysis into the context in which the concept can be applied.

Oxford Parks have considered the smart environment characteristic in the design of the precinct and have used the Green Star criteria and environmental sustainability goals to track their progress and rating. Every building they have developed is green star rated, and this is an international recognised rating system that takes a robust and versatile approach that is holistic in the comprehensive manner that benchmarks sustainability efforts (GBCSA, 2024).

This achievement from Oxford Parks has been created by the incentives brought on by the “green lease” initiative. Oxford Parks has collaborated with banks to create the monetary incentive (which is used for development) to ensure that tenants who successfully participate in conservation and sustainability efforts are rewarded with compensation. This has resulted in:

- Minimal stormwater
- Gray water systems
- Electrical consumption efforts

What is key to these systems running optimally and being rateable is that all the data related to them is tracked and monitored against the standards to ensure that the precinct is running as intended.

Intaka island is part of the Century City precinct and is another important example to cite when considering smart environment as a characteristic in smart cities. This portion of the Century City precinct is a conservation effort that speaks to the “smart environment” characteristic that Giffinger (2010) considered important to defining a solution as smart. The Century City precinct uses Intaka island for conservation, as an attraction point, an educative vessel for the youth, and have connected it to their telemetry system to regulate the climate of the precinct by using the data that they collect in real-time.

During the interview with respondent two, they noted that resilience is their focus for the next five years and that the management of climate change is an additional priority they have identified. The implementation of a weather station on site is one such endeavour that illustrates their prioritisation. Further to this, the education component is valuable as the youth are educated on sustainability using Intaka island as a vessel to do so by facilitating trips and teaching experiments. Intaka island is used to educate learners about renewable energy sources, recycling systems and all the lessons are based on the Natural Science Caps Curriculum that South African Schools tend to use (Century City, 2024).

This corroborates Zavedeev et al. (n.d.-b) who noted that the implementation of smart cities should account for the future regarding their performance and impact. Intaka island illustrates both positive performance and impact by allowing the management to use it for performance metrics and improvement in addition to the impact of using it as an educative vessel.

4.5 Summary

The analysis confirmed that Africa's socioeconomics pose challenges to smart city implementation, often resulting in suboptimal outcomes. Despite differing contexts, interviewees shared similar views regarding the recurring barriers and success factors to smart city application. While literature described smart cities as multifaceted responses to urban densification, the interviews expressed mixed views on their effectiveness, specifically in housing and transport. Technological solutions alone were seen as adequate as projects need to holistically enhance urban spaces. Governance emerged as a key obstacle, with restrictive regulations and outdated systems hindering innovation. A proposition was made to use progressive tools like form-based codes, though these would require contextual adaptation. Success criteria varied, ranging from numerical data to user satisfaction. Additionally, interviewees saw longevity and replication of ideas as signs of success. While some critique focused on excessive attention to foreign investment, benefits to local citizens were also noted. Overall, the findings addressed the study's key themes and supported its core proposition.

5 Conclusion

5.1 Research Question

The research question asked: What do developing countries consider to be smart cities and what are the barriers and contributing factors to implementing smart cities in Africa?

The research determined how different smart city in applications in Kenya and South Africa define smart cities broadly but with some congruency. When defining what a smart city was, there were varied definitions provided. The research noted Giffinger's (2007) definition of "A Smart City is a well performing city built on the 'smart' combination of endowments and activities of self-decisive, independent and aware citizens." and alignment was seen with this as respondents acknowledged the multi-faceted nature that these developments need to encompass. Additionally, the varied definitions acknowledged that the end user should be at the centre of the vision when improving the accessibility and usability that they have when interacting with the smart solution or environment.

Creating a grounding of how smart cities and solutions was a valuable foundation to understand how the solutions were approached and how the priorities within were determined and executed. The usage of technology as a tool to solve well-understood issues rather than the main proponent that's unguided implementation would solve all issues was an important revelation of this research. This determination differed to prior research and was a testament to the individual precinct's approaches but ultimately served to the bigger notion surrounding smart cities.

5.2 Research Aim

The aim of the research was: Determine the barriers and contributing factors to smart city implementation in the selected African cities.

Using this grounding and from further research from literature and the interviews, themes were derived that answered the remainder of the research question which served as the aim of the research, determining the barriers and contributing factors to smart city implementation.

Smart cities are integrated solutions that are applied in their own contexts. Understanding the context of the environment creates a platform for the solution to take shape as it develops a direction of development, this relates to the running theme of contextual sensitivity as solutions that has been discussed in this research and the oversight of context that has often been experienced. This is an important barrier that transcends all the themes that will be discussed as barriers and contributing factors.

The theme requires solutions to be specifically applied to the context they will exist in. The conflict that was said to exist was that solutions were adopted and inspired from the global north applications of the smart ideology that worked in their own context and were assumed to be able to work in various African contexts. The interviewees interviewed expressed contrasting views as the logic were to initially identify the issues that the areas experience (such as lack of provision for housing, transport, energy and an integrated solution that stimulates economic growth), analyse the capacity that is available to solve the issue and to apply smart solutions in line with the previous factors that will be beneficial to the end-user.

The research also expressed a positive sentiment to prepare for the future and develop a dynamic framework that allows for change as projects evolve as stated in prior research from (Zavedeev et al., n.d.-b). The inclination to develop an innovate is positive as it is the first step that must be taken before divulging in the methods that can be used and how they will fair in the environments they will be used in.

The responsibility of successful implementation depends on the governing bodies and those in leadership roles that are tasked with the management and development of the solutions. The common themes expressed from the respondents was that transparency and efficiency are points of improvement that will produce results that satisfy the visionaries and the end user of smart solutions.

The South African context of smart cities and solutions appropriately understood the ramifications of spatial planning during apartheid and illustrated the intent and tangible actions towards mitigating these effects. Alignment was determined between the definition of smart cities from Giffinger and the solutions that have been implemented by Melrose Arch and Oxford Parks. However, the scrutiny that smart cities have faced is that they provide for the elite, and this was corroborated by the housing opportunities provided for inhabitants. In the same breath, there was acknowledgement that to further optimise and improve the model, more inclusive and integrated housing solutions can be implemented that account for the different income levels and social brackets that exist. In relation to governance, the housing provision was also regulated by framework and legislation that is restrictive.

The issue of urbanisation was also recognised from a perspective of more than just housing provision but the sheer number of users interacting with the respective precincts by means of transporting in and out of them. Site selection was an important factor for Oxford Parks in relation to the Gautrain, the optimisation of the taxi system by Oxford Parks and Century City and their relation to the theme of the usage of existing infrastructure emphasised the importance of understanding how integrated all the smart city characteristics are (whether it be the six noted by Giffinger or the contextual segments identified by all the projects themselves).

The success of these projects used different metrics. The insights gained from the interviews allude to the difference in project success criteria and the effects these have on development. An over-emphasis

on key performance indicators yielded solutions that were less community-oriented than what would be ideal for the inhabitants of the urban spaces. Consequently, the long-term sustainability of the projects also comes into question as factors such as the cohesiveness of the projects may suffer in the long term without the previously discussed stakeholder engagement being considered. The improvement of stakeholder engagement can be recommended for this issue as valuing stakeholders' perspectives would reveal what they deem to be success. Using this information and the appropriate expertise, balanced project success criteria can be developed.

Although this was an issue, the data collection determined that success was achieved by the projects. This success was a function of the improvement of previously existing systems and newly introduced systems whose integration yielded positive results.

The unfamiliarity of the smart city concept in the African context was also an important factor to consider when analysing project success. Pioneering or introductory ideas often phase the fact that a lack of precedent may have an influence on how the idea is materialised given there is no prior contextual knowledge to utilise. This factor was overcome and the consensus from the data collected was that the projects were seen as successful. Furthermore, as mentioned prior, literature noted propagation was a valuable measure of project success as one may deductively infer that successful projects become inspiration and a guideline for future projects to utilise when developing. The Konza City project and the insight as to the inspiration of Global North projects provided makes this point. Additionally, one may be able to implicitly conclude that the earlier implementation date of the Melrose Arch precinct compared to the later implementation date of the Oxford Parks development in close geographical implementation, with similar concepts is an illustrator of these sub-theme of the project success criteria.

Further to this, the design considerations made in Melrose Arch, Century City and Oxford Parks all showed commonalities when using existing infrastructure and site selection in relation to transport nodes and the perceived benefit thereof. Finally, the precinct illustrated the effort and consideration to develop sustainable systems that are environmentally forward.

5.3 Research Proposition

The research proposition stated that: The implementation of smart cities in the selected African cities is affected by challenges associated to socioeconomic issues which impact the success and sustainability of these initiatives.

Consequently, these challenges result in suboptimal solutions of implemented projects. As has been discussed thus far in this chapter, the effects of socio-economic issues do not only pose a problem for inhabitants of the different countries but also on the problem-solving methods that have been used. Thus, this proves the proposition true as connections were drawn between the literature and experienced from the selected group of interviewees that were interviewed. This is in line with the pattern matching

approach outlined in the research methodology. The accounts from the interviewees and the congruency between the entire data pool (literature and the interviews) further strengthens the claim made in the proposition. The intertwined nature of the themes and their effect on each other further strengthens the claim made in the proposition.

5.4 Research Objectives

The research objectives outlined that conducting interviews with staff involved with or knowledgeable about the smart city concept would intuitively serve to initially understand how certain applications of smart initiatives in Africa define smart cities in their context, uncover the barriers that hinder the successful implementation of smart city projects, the contributing factors to both successful and unsuccessful smart city implementation. The research achieved these objectives as can be seen in the analysis and in the remainder of this subsection which will provide recommendations as an extension of the achievement of uncovering the information.

Stakeholder engagement can be recommended as an important factor to emphasise in future and current projects as disconnects between implemented solutions and what may be ideal for all the stakeholders involved stands the chance of jeopardising project success.

The inefficiencies of old systems continue to influence current day procedures and prohibit growth. The involvement of stakeholders and a greater understanding of their requirements would improve these back-office processes by not only improving factors such as lead-time and processing time but also implementing innovative regulatory framework that is future and people-centric such as the form codes system. Additionally, the recommendation that can be made regarding governance is that the initial step is to analyse the current systems in use. This analysis would help uncover points of improvement and when paired with an understanding or analysis of what smart cities require to be governed properly for success, would yield satisfactory results that achieve the essence of what smart solutions seek to achieve.

As discussed before, the progression of these regulations would allow developers to implement and suggest more progressive ideas to solve the issues that have been said to be growing. This provision for progressive ideas would need to be regulated and understood well but incremental implementation and experimentation would be ideal in the early stages.

The recommendation that can be made in this regard would be to couple the emphasis on contextual sensitivity with the importance of education of what constitutes a smart city. Understanding contextual sensitivity will create more palatable and realistic solutions in an environment that will truly require the solutions that are being proposed and implemented. This would assist in resource wastage which often leads to future reluctance or inclination to provide due to negative precedent.

What can be said is that the research uncovered that staff that are inclined to use progressive solutions and that understand the concept of smart solutions are positive actors in the progression of smart cities. By defying what is considered the normal way of infrastructural development, positive solutions have been implemented and can serve as precedent for similar initiatives to be implemented in the future. By increasing the pool of people with the same progressive ideals and strengthening the power and knowledge they have in relation to smart cities, the concept may see more success in adoption rate and performance.

5.5 Limitations

The limitations of this study were analysed to ensure that where possible, mitigation measures were put in place. During the data collection and analysis, the sample size of interviews and cases became an increasingly difficult factor to control. The result of this was a limited number of cases (three) and interviews (five). The recommendation from this revelation is that more interviews and cases would have been ideal to increase the credibility and sample size of the insights gathered from the research.

Additionally, the different stages of the projects were pre-emptively assumed to be a limitation. After completing the analysis, this issue was not as significant as initially speculated. All the projects analysed were at sufficiently developed stages that meant the analysis and insights drawn would illustrate the vision, paradigm of thinking and design and assessment of the concept and the project itself.

An additional limitation of the project was determined at a later stage was that more perspectives could have been gained by conducting more interviews from different positions and involvement in the identified projects. Four of the five interviews involved senior managerial professionals, and their perceptions may differ from the people operationally involved in the execution and their perception of the roles they play and effects those roles have. As a recommendation, end users of these developments would have been beneficial parties to interview in addition to those interviewed. This is due to the connection and translation of plans to reality being a valuable insight for the research and an additional theme that was discussed under the umbrella of stakeholder engagement and its importance in smart city projects.

The culmination of these themes and their insights is that design considerations must be taken seriously and in a calculated manner to ensure that the solutions that are being developed are optimal and relevant for the current and future context. The notion that African smart cities lack contextual sensitivity was refuted by evidence provided from the data collection. Analyses were done for each project to understand the needs and possibilities with the available resources and the solutions were implemented.

5.6 Summary

Ultimately, the research achieved its aim. It investigated the smart city concept in africa from an angle of seeking to understand what factors promote successful implementation and what hindering factors and barriers to the opposite. The proposition stated that the socioeconomic characteristics of africa served as a root cause of the diverse sub-issues that exist, and this was determined to be true from the investigation.

The interviews with staff from different smart initiatives on the continent uncovered congruency in the fact that their socioeconomic issues have prohibited their ability to apply certain solutions or to maximise the solutions they have implemented. Misalignment between the contextual sensitivity needed and what was applied correlated with the lack of stakeholder engagement value that was implemented on the respective interviews in addition to the projects analysed in the literature review. Governance illustrated itself as the determining factor of these two themes and actors in the smart city realm.

The research used these determinations as information to develop recommendations from and collated these to be the following:

- Valuing stakeholder management and increasing the spectrum of those considered to be stakeholder to align with end-user satisfaction and fulfilment.
- The use of progressive developmental framework in alignment to end-user requirements.
- Holistically improve education on the smart city concept to allow decision makers to make more informed decisions and to allow end-users to maximise infrastructure.
- Emphasise innovation in sizable increments to continue to evolve the idea of smart initiatives in the contexts they exist in.

The research limitations experienced in this research do not dilute the value of the determinations made but rather serve as opportunities for further research to elevate itself. The increased awareness of the smart city concept in africa has hopefully been achieved in this research and the aim is to have the recommendations this research has made be taken on further to future attempts and used as a directive guide for existing attempts.

6 References

- A SOUTH AFRICAN SMART CITIES FRAMEWORK A decision-making framework to guide the development of smart cities in South Africa. (2021).
<https://unsplash.com/photos/WFI8vmzXsP4>
- Alharahsheh, H. H., & Pius, A. (2020). A Review of key paradigms: positivism VS interpretivism. *Global Academic Journal of Humanities and Social Sciences*, 2(3), 39–43.
<https://doi.org/10.36348/gajhss.2020.v02i03.001>
- Alizadeh, T. (2017). An investigation of IBM's Smarter Cites Challenge: What do participating cities want? *Cities*, 63, 70–80. <https://doi.org/10.1016/j.cities.2016.12.009>
- Ammara, U., Rasheed, K., Mansoor, A., Al-Fuqaha, A., & Qadir, J. (2022). Smart Cities from the Perspective of Systems. *Systems*, 10(3). <https://doi.org/10.3390/systems10030077>
- Apanaviciene, R., Urbonas, R., & Fokaides, P. A. (2020). Smart building integration into a smart city: Comparative study of real estate development. *Sustainability (Switzerland)*, 12(22), 1–22.
<https://doi.org/10.3390/su12229376>
- Bernadette, R., Mattimoe, T., Hayden, M., Murphy, B., Ballantine, J., Mattimoe, R., & Hayden, M. T. (2021). Approaches to Analysis of Qualitative Research Data: A Reflection on the Manual and Technological Approaches. *Finance, & Governance Review*, 27, 2021.
<https://doi.org/10.52399/001c.22026>
- Bifulco, F., Tregua, M., & Amitrano, C. C. (n.d.). *Smart Cities and Innovation: a multi-stakeholder perspective*. www.sci-pub.com
- Bouncken, R. B., Qiu, Y., Sinkovics, N., & Kürsten, W. (2021). Qualitative research: extending the range with flexible pattern matching. *Review of Managerial Science*, 15(2), 251–273.
<https://doi.org/10.1007/s11846-021-00451-2>
- Camagni, R., & Capello, R. (2013). La compétitivité régionale et le capital territorial: une approche conceptuelle et des preuves empiriques provenant de l'Union européenne. *Regional Studies*, 47(9), 1383–1402. <https://doi.org/10.1080/00343404.2012.681640>
- Camboim, G. F., Zawislak, P. A., & Pufal, N. A. (2019). Driving elements to make cities smarter: Evidences from European projects. *Technological Forecasting and Social Change*, 142, 154–167.
<https://doi.org/10.1016/j.techfore.2018.09.014>
- Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing*, 25(8), 652–661. <https://doi.org/10.1177/1744987120927206>
- Cape Town. (n.d.). www.pwc.co.za/cities
- Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J. R., Mellouli, S., Nahon, K., Pardo, T. A., & Scholl, H. J. (2012). Understanding smart cities: An integrative framework. *Proceedings of the Annual Hawaii International Conference on System Sciences*, 2289–2297.
<https://doi.org/10.1109/HICSS.2012.615>
- CITYkeys CITYkeys indicators for smart city projects and smart cities. (n.d.).

- Côté-Roy, L., & Moser, S. (2019). 'Does Africa not deserve shiny new cities?' The power of seductive rhetoric around new cities in Africa. *Urban Studies*, 56(12), 2391–2407. <https://doi.org/10.1177/0042098018793032>
- EKO ATLANTIC NIGERIA'S NEW GLOBAL CITY ISSUE 1. (n.d.). www.ekoatlantic.com
- Giffinger, R., Gudrun, H., & Haindlmaier, G. (2010). ACE 12 SMART CITIES RANKING: AN EFFECTIVE INSTRUMENT FOR THE POSITIONING OF CITIES? ACE: Architecture, City and Environment = Arquitectura, Ciudad y Entorno [en línea SMART CITIES RANKING: AN EFFECTIVE INSTRUMENT FOR THE POSITIONING OF CITIES? Año IV, 7–25. http://www-cpsv.upc.es/ace/Articles_n10/Articles_pdf/ACE_12_SA_10.pdf AccessUPCommons:<http://hdl.handle.net/2099/8550>
- Gupta, A. K. (n.d.). *Creating the smart cities of the future A three-tier development model for digital transformation of citizen services.*
- Harrison, C., & Donnelly, I. A. (n.d.). *A THEORY OF SMART CITIES.*
- Johari, A., & Johari Mohamud Jama Director Athman Lali Omar, A. (n.d.). *KENYA'S KONZA TECHNO CITY: UTOPIAN VISION MEETS SOCIAL REALITY SOCIAL REALITY.* https://digitalcollections.sit.edu/isp_collection
- Kaushik, V., & Walsh, C. A. (2019). Pragmatism as a research paradigm and its implications for Social Work research. *Social Sciences*, 8(9). <https://doi.org/10.3390/socsci8090255>
- Kiger, M. E., & Varpio, L. (2020). Thematic analysis of qualitative data: AMEE Guide No. 131. *Medical Teacher*, 42(8), 846–854. <https://doi.org/10.1080/0142159X.2020.1755030>
- Kolandaisami, G. (2020). *Drivers and barriers to the adoption of the smart city paradigm in developing countries: A South African perspective.*
- Kummitha, R. K. R., & Crutzen, N. (2017). How do we understand smart cities? An evolutionary perspective. *Cities*, 67, 43–52. <https://doi.org/10.1016/J.CITIES.2017.04.010>
- Lindell, I., Norström, J., & Byerley, A. (n.d.). *New City visions and the politics of redevelopment in Dar es Salaam. NAI Working Paper 2017:2.*
- Lytras, M. D., & Visvizi, A. (2018). Who uses smart city services and what to make of it: Toward interdisciplinary smart cities research. *Sustainability (Switzerland)*, 10(6). <https://doi.org/10.3390/su10061998>
- Mishra, S., & Dey, A. K. (2022). Understanding and Identifying 'Themes' in Qualitative Case Study Research. In *South Asian Journal of Business and Management Cases* (Vol. 11, Issue 3, pp. 187–192). SAGE Publications Ltd. <https://doi.org/10.1177/22779779221134659>
- Muhammad, S., & Kabir, S. (2016). *METHODS OF DATA COLLECTION.* <https://www.researchgate.net/publication/325846997>
- Musakwa, W., Mokoena, B. T., & Mokoena, B. T. (n.d.). *Smart cities in South Africa! A case of misplaced priorities?*
- NIGERIA AGENDA 2050. (n.d.).
- NUA-English. (n.d.).

- Parolek, K., Brady, J., Gay, B., Magnum, S., Mekarski, D., & Nilsen, D. (2013). *Form-Based Codes: A Step-by-Step Guide for Communities Acknowledgements Special thanks to.* www.formbasedcodes.org
- Patrão, C., Moura, P., & de Almeida, A. T. (2020). Review of smart city assessment tools. In *Smart Cities* (Vol. 3, Issue 4, pp. 1117–1132). MDPI. <https://doi.org/10.3390/smartcities3040055>
- Rosati, U., & Conti, S. (2016). What is a Smart City Project? An Urban Model or A Corporate Business Plan? *Procedia - Social and Behavioral Sciences*, 223, 968–973. <https://doi.org/10.1016/j.sbspro.2016.05.332>
- Sadowski, J., & Pasquale, F. (2015). The Spectrum of Control: A Social Theory of the Smart City. In *First Monday* (Vol. 20, Issue 7).
- Sharifi, A. (2019). A critical review of selected smart city assessment tools and indicator sets. *Journal of Cleaner Production*, 233, 1269–1283. <https://doi.org/10.1016/j.jclepro.2019.06.172>
- Slavova, M., & Okwechime, E. (2016). African Smart Cities Strategies for Agenda 2063. *Africa Journal of Management*, 2(2), 210–229. <https://doi.org/10.1080/23322373.2016.1175266>
- Splinter, E., & Van Leynseele, Y. (2019a). The conditional city: emerging properties of Kenya's satellite cities. *International Planning Studies*, 24(3–4), 308–324. <https://doi.org/10.1080/13563475.2019.1661831>
- Splinter, E., & Van Leynseele, Y. (2019b). The conditional city: emerging properties of Kenya's satellite cities. *International Planning Studies*, 24(3–4), 308–324. <https://doi.org/10.1080/13563475.2019.1661831>
- Taherdoost, H. (2021). Data Collection Methods and Tools for Research; A Step-by-Step Guide to Choose Data Collection Technique for Academic and Business Research Projects Hamed Taherdoost. Data Collection Methods and Tools for Research; A Step-by-Step Guide to Choose Data Collection Technique for Academic Data Collection Methods and Tools for Research; A Step-by-Step Guide to Choose Data Collection Technique for Academic and Business Research Projects. In *International Journal of Academic Research in Management (IJARM)* (Vol. 2021, Issue 1). <https://hal.science/hal-03741847>
- The Strategic Urban Development Plan of Greater Cairo Region.* (n.d.).
- URERU SMART CITY SERIES PART 1: OVERVIEW AND ANALYSIS OF CAPE TOWN'S DIGITAL CITY STRATEGY. (2019). www.ureru.uct.ac.za
- Vaismoradi, M., Jones, J., Turunen, H., & Snelgrove, S. (2016). Theme development in qualitative content analysis and thematic analysis. *Journal of Nursing Education and Practice*, 6(5). <https://doi.org/10.5430/jnep.v6n5p100>
- World Inclusive Cities Approach Paper.* (n.d.).
- Zavedeev, E. V, Sergeeva, I. V, Fedorov, D. A., Voronina, E. V, & Milchakova, N. N. (n.d.-a). PÁGINA |1 KEY SUCCESS FACTORS OF SMART CITY PROJECTS: METHODS AND ALGO-RITHMS FOR PERFORMANCE EVALUTION. <http://natal.uern.br/periodicos/index.php/RTEP/index>
- Zavedeev, E. V, Sergeeva, I. V, Fedorov, D. A., Voronina, E. V, & Milchakova, N. N. (n.d.-b). PÁGINA |1 KEY SUCCESS FACTORS OF SMART CITY PROJECTS: METHODS AND ALGO-

RITHMS FOR PERFORMACE EVALUTION.

<http://natal.uern.br/periodicos/index.php/RTEP/index>

7 Appendices

7.1 Appendix 1: Konza City interview plan

General Questions

1. Have you participated in smart city projects/initiatives before, or do you plan on partaking in them in the future?
2. What does the term “smart city” mean to you and your organization as a whole?
3. Why are smart cities being undertaken, who do they aim to serve and what are the perceived risks and opportunities, in your opinion, which exist?
4. What are the current pressing needs for your urban space/city?
5. What are the barriers to providing solutions for these needs?
6. What recommendations can you give to overcome these barriers?
7. Do you believe that smart cities are an effective solution to urban densification?
8. What is your proposed solution to rapid urbanization in your city/country’s context?
9. As time progresses throughout a smart city project, how do projects ensure that they will be relevant and appropriate in the future?

KONZA CITY QUESTIONS

1. When did the project start or begin its origin?
2. What technologies and solutions are you implementing and how do they aim to support the broader goals of Konza City, and the pressing needs identified?
3. Can the project be considered successful and what are the project’s success criteria?
4. What are the key challenges to implementing smart cities in Africa, and how is Konza City addressing these obstacles for its own context?
5. How does Konza Techno City plan to address the issue of commuting and transportation for its residents and workforce?
6. What roles do public-private partnerships play in the development of Konza Techno City, and how does this compare to other smart city initiatives of which you are aware?
7. Stakeholder engagement, governance and inclusivity are crucial factors in developing smart cities. How have these been considered and practiced during the development of Konza city and for the long-term future of the project?
8. Can you elaborate on the concept of the “silicon savannah” regarding who it will benefit and how this will be executed?
9. The official website stated that “Konza will learn from global cities that have successfully incorporated smart city frameworks,” what have these learning produced, and have they contextually been applied to Konza?

10. How does the design of Konza City prioritize sustainability considering developing sustainable environment initiatives is a stated strategic goal?

7.2 Appendix 2: Century City interview plan

General Questions

1. Have you partaken in smart city projects/initiatives before, or do you plan on partaking in them in the future?
2. What does the term “smart city” mean to you and your organization as a whole?
3. What are the current pressing needs for your urban space/city?
4. What are the barriers to providing solutions for these needs?
5. What recommendations can you give to overcome these barriers?
6. What is your proposed solution to rapid urbanization in your city/country’s context?
7. Is the smart city concept feasible in your context?
8. If yes or no, what is the rationale?
9. As time progresses throughout a smart city project and as the socio-economic context of cities evolve naturally, how do the roles of officials change and how is that pre-empted and catered for to fulfil the goals of a smart city initiative?
10. What do you consider the barriers to smart city implementation in your context?
11. Why are smart cities being undertaken, who do they aim to serve and what are the perceived risks and opportunities, in your opinion, that exist?
12. Can you determine whether the smart city concept has worked in African applications? Whether the answer is yes or no, what do you think should be approached differently for the success or improvement of the concept?
13. What is of most importance to account for in a smart city project, in your opinion?

Century City Questions

1. When did the project start or begin its origin?

2. What is the project's background, and can you give any insight as to why it was started and its aim?
3. What technologies and solutions are you implementing?
4. How has the project fared? Can it be considered successful and what would you change to make it successful or simply improve it?
5. Giffinger's research (which has been said to form the foundation of the smart city concept) consists of six categories (smart economy, environment, governance, mobility, people, living) while century city considers itself to have 5 segments. What motivated the segment selection and does that encompass what a smart city is, from your understanding?
6. What future development plans have been proposed for Century city?
7. Has Century City gone to plan, were there any design considerations made for the specific project?
8. What have the biggest challenges been for this development?
9. Given "smart community" is one of the segments, did this include stakeholder engagement of various groups to determine a direction for the development and the effects the development would have from a broader perspective?

7.3 Appendix 3: Melrose Arch interview plan

General Questions

1. Have you partaken in smart city projects/initiatives before, or do you plan on partaking in them in the future?
2. What does the term "smart city" mean to you and your organization as a whole?
3. What are the current pressing needs for your urban space/city?
4. What are the barriers to providing solutions for these needs?
5. What recommendations can you give to overcome these barriers?
6. What is your proposed solution to rapid urbanization in your city/country's context?
7. Is the smart city concept feasible in your context?
8. If yes or no, what is the rationale?

9. As time progresses throughout a smart city project and as the socio-economic context of cities evolve naturally, how do the roles of officials change and how is that pre-empted and catered for to fulfil the goals of a smart city initiative?
10. What do you consider the barriers to smart city implementation in your context?
11. Why are smart cities being undertaken, who do they aim to serve and what are the perceived risks and opportunities, in your opinion, that exist?
12. Can you determine whether the smart city concept has worked in African applications? Whether the answer is yes or no, what do you think should be approached differently for the success or improvement of the concept?
13. What is of most importance to account for in a smart city project, in your opinion?

Melrose Arch Questions

1. When did the project start or begin its origin?
2. What is the project's background, and can you give any insight as to why it was started and its aim?
3. What technologies and solutions are you implementing?
4. How has the project fared? Can it be considered successful and what would you change to make it successful or simply improve it?
5. One of the aims of Melrose Arch is said to be the goal to “align with the new trend of urbanism”? Can you expand on what you understand that to be?
6. How will Melrose Arch continue to maintain this aim/goal?
7. Melrose Arch has impressive connectivity and multi-use facilities. Outside of that, what constitutes it as a smart city development?
8. Amdec group stated that they have produced 240 837 m² of commercial space, 416 apartments and 750 hotel rooms and Melrose Arch and One on Whitley (a new residential development) has produced 241 Apartments and 4344 m² of commercial space.
 - a. One of the driving factors for smart cities is the realization that urbanization is occurring at a rapid rate and urban spaces need to cater for this. Do you think Melrose Arch is one such development that is helping solve that issue?

7.4 Appendix 4: Oxford Parks interview plan

General Questions

1. Have you partaken in smart city projects/initiatives before, or do you plan on partaking in them in the future?
2. What does the term “smart city” mean to you and your organization as a whole?
3. Why are smart cities being undertaken, who do they aim to serve and what are the perceived risks and opportunities, in your opinion, which exist?
4. What are the current pressing needs for your urban space/city?
5. What are the barriers to providing solutions for these needs?
6. What recommendations can you give to overcome these barriers?
7. Do you believe that smart cities are an effective solution to urban densification?
8. What is your proposed solution to rapid urbanization in your city/country’s context?
9. As time progresses throughout an urban project, how do projects ensure that they will be relevant and appropriate in the future?

Oxford Parks Questions

1. When did the project start or begin its origin?
2. The project is described as an extension of the Rosebank node, what were the driving points for selecting the location?
3. What future developments have been planned and what are the driving points for them?
4. Can the project be considered successful and what is the project’s success criteria?
5. What are the advantages of the precinct being privately managed?
6. What environmental standards have been implemented to ensure sustainability in the precinct?
7. What roles do public-private partnerships play in the development of Oxford Parks?
8. Stakeholder engagement, governance and inclusivity are important factors in developing smart cities. How have these been considered and practiced during the development of Oxford Parks and for the long-term future of the project?

7.5 Appendix 5: Researcher interview plan

Questions

1. Have you participated in smart city projects/initiatives before, or do you plan on partaking in them in the future?
2. What does the term “smart city” mean to you?
3. Why are smart cities being undertaken, who do they aim to serve and what are the perceived risks and opportunities, in your opinion, which exist?
4. What are the current pressing needs for urban spaces/cities?
5. What are the barriers to providing solutions for these needs?
6. What recommendations can you give to overcome these barriers?
7. Do you believe that smart cities are an effective solution to urban densification?
8. What is your proposed solution to rapid urbanization in your city/country’s context?
9. As time progresses throughout a smart city project, how do projects ensure that they will be relevant and appropriate in the future?
10. Since its initiation in 2000, how do you view the progression of the CoCT’s ‘Smart City Strategy’?
11. Soon, what technologies soon are critical to implement in Cape Town to make the city smart/smarter?
12. How does Cape Town's approach to smart city implementation differ from typical strategies in the Global North?
13. How can Cape Town focus on citizen and stakeholder engagement to develop smart solutions?
14. How do you view the importance of governance and what must be implemented in Cape Town’s context to ensure robust governance when considering smart solutions?
15. How does the city prioritize resource allocation for smart city projects amidst competing urban needs?
16. What indicators would you use to determine the success of smart solutions for Cape Town?
17. How do you think leadership and governing bodies can be directed towards understanding and implementing smart solutions?