URBAN REAL ESTATE
RESEARCH UNIT

URERU SMART CITY SERIES PART 3:
IDENTIFYING THE OPPURTUNITIES AND CHALLENGES THAT EXIST FOR CAPE TOWN'S SMART CITY DEVELOPMENT

URBAN REAL ESTATE RESEARCH UNIT

THE OPPORTUNITIES AND CHALLENGES OF SMART CITY DEVELOPMENT IN CAPE TOWN

Authors: Luke Boyle

The Urban Real Estate Research Unit would like to thank the City of Cape Town for the time, cooperation and support they provided in order for this research to take place.

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

Published by:
Urban Real Estate Research Unit
Department Construction Economics and Management
University of Cape Town
Private Bag X3 Rondebosch 7701
South Africa
Tel: +27 (21) 650 3443
Email: julie.thompsett@uct.ac.za
URL: www.ureru.uct.ac.za

Table of Contents

Concepts/Terminology 3
1. Introduction 5
2. Methodology 7
3. Oppurtunities 9
3.1 Ability to Leapfrog 10
3.2 Open Innovation Platform 12
3.3 Data and *The City* 14
Open Data 14
Data Analytics 16
3.4 Tap into Cape Town's Existing Ecoytem 18
The City of Cape Town's Ecosystem 18
Cape Town's Digital Economy Ecosystem 19
4. Challenges 20
4.1 The Digital Divide 21
Lack of Affordable Digital Infrastrucutre 21
Disparities in Digital Skills 22
The Technological Divide - The Unequal Access to Technology 23
4.2 Institutional Limitations 24
The Challenges of Internal and External Collaboration 25
Skills Within the City of Cape Town 26
4.3 Lack of Leadership 28
No Smart City Leader at the Political Level 29
4.4 The Political Complexities of Local Government 30
5. Discussion & Conclusion 33
Bibliography 35

source: https://www.weforum.org

CONCEPTS/TERMINOLOGY

Application Programme Interface:

An Application Program Interface (API) is a set of routines, protocols, and tools for building software applications. Essentially, an API specifies how software components should interact. A good API makes it easier to develop a program by providing all the building blocks. A programmer then puts the blocks together.

Information and Communication Technology:

Information and Communication Technology (ICT) refers to technologies that provides access to information through telecommunications. It is similar to Information Technology (IT), but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication mediums.

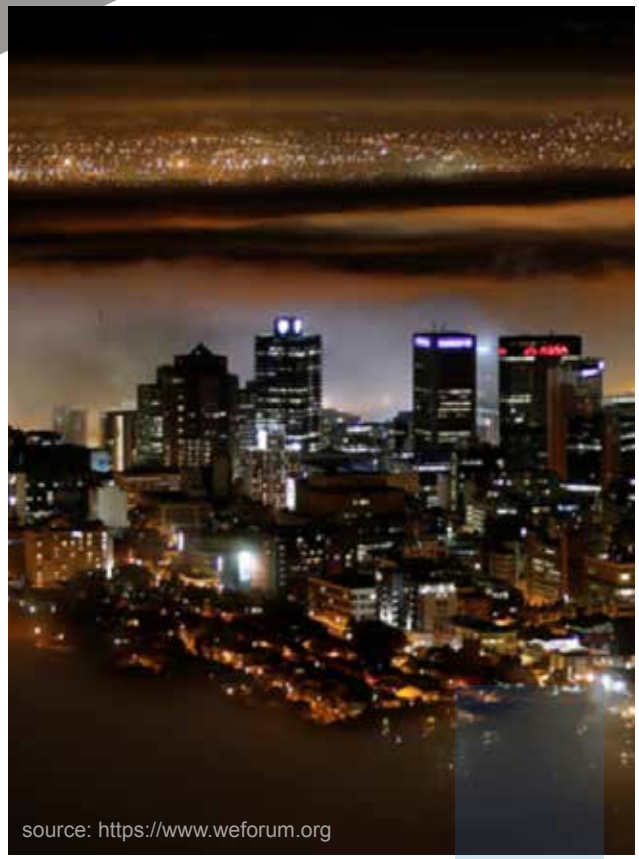
Enterprise Resource Planning:

Enterprise Resource Planning (ERP) refers to business process management software that allows an organisation to use a system of integrated applications to manage the business and automate many back office functions related to technology, services and human resources.
ERP software typically integrates all facets of an operation (including product/service planning, development, manufacturing, sales and marketing) into a single database, application and user interface.

Fourth Industrial Revolution:

The Fourth Industrial Revolution (4IR) is characterised by a fusion of technologies that is blurring the lines between the physical, digital and biological spheres. It is characterised by the exponential proliferation of emerging technological breakthroughs in fields such as artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing.
The 4IR is characterised by a much more ubiquitous and mobile Internet, accessed by smaller sensors that have become cheaper and have more processing power due to artificial intelligence and machine learning (Schwab, 2016). One of the key pillars of this revolution is connectivity supported by increased computing abilities.


source: https://www.radissonhotels.com


source: https://www.weforum.org

Fibre:

Fibre refers to a specific type of high-speed internet that, unlike other mediums of internet, transmits data through light signals along glass cabling. This makes connectivity significantly quicker and more reliable than LTE and ADSL. Fibre also requires less maintenance and offers opportunities for its capabilities to be improved as fibre technology advances.

Internet Service Providers:

An Internet Service Provider (ISP) is a business that provides services for accessing, using, or participating in the Internet.

Open Data:

Open data is data that can be used, re-used and redistributed by anyone without restriction. Open data is easily accessible and compatible with a variety of machines and applications. Open datasets must also be able to be easily inter-mixed and added upon (Open Knowledge Foundation, 2019).

1. INTRODUCTION

Over the past few years smart city development in Africa has become an increasingly topical field and many African cities have embarked on exciting digital journeys in pursuit of grand visions of urban futures. Politically, the term 'smart city' has also begun to attract attention as evidenced by the recent State of the Nation Address in South Africa where the president emphasised the role of new 'smart' cities in addressing many of the urban challenges faced in the country. Moreover many South African municipalities are now beginning to market themselves as smart cities with elaborate plans of harnessing technology to stimulate innovative solutions to improve urban systems. Nevertheless, there is still very little understanding of how the smart city concept is emerging in South Africa and this needs further exploration. Gaining a deeper understanding of this concept as it develops in an African context is vital in devising appropriate and considered smart city initiatives that drives development that adequately responds to the challenges faced by African cities.

The Urban Real Estate Research Unit (URERU) has embarked on a pioneering research project that seeks to understand the role of smart city development in South Africa. The research draws upon an exploration of active and ongoing projects revolving around The City of Cape Town's smart city journey. The research aims to start bridging the gap between smart city literature and applications on the ground in South Africa by investigating the contextual considerations required to apply smart city principles. A potential outcome could be that more effective policies and strategies can be formulated to help guide smart city development in South Africa. On a broader level, this project also seeks to stimulate a discussion around what smart urbanism means in an African context.

[1] The term 'The City' for the purposes of this research series refers to The City of Cape Town municipality that carries out the administrative functions and service delivery of government and is also seen as the central driver of a smart city strategy for Cape Town. Thus, the terms the City and The City of Cape Town, are used interchangeably. The word 'city' refers to an urban hub where a large number of people live and work, namely: Cape Town..

Cape Town is largely considered to be leading attempts to interpret the emerging concepts of smart urbanism into urban realities and The City of Cape Town has established some ambitious smart city aspirations and is positioning itself to become Africa's first truly digital city. The City of Cape Town (*The City*[1]) started on this exciting quest in the early 2000s with the establishment of its first smart city strategy. Since then the strategy has evolved and developed to provide an example to other African municipalities of the type of leadership and skills required to progress along the path of smart city development.

The first report provided an overview and critical analysis of *The City's* Digital City Strategy; the guiding framework for smart city development for The City of Cape Town. This report found that the Digital City Strategy exhibited some of the pioneering thinking behind Cape Town's ambitious plans that have placed *The City* in pole position in the race to becoming the 'smartest' city in Africa. However, the strategy lacked substance and was not grounded upon smart models of operation. It is argued that merely adding a digital layer to conventional models of operation, like many of the initiatives in the strategy do, doesn't make a city 'smart' and that smart city development requires embedding innovative practices (which are supported by technology) into the organisation to address structural problems and drive development.

The second report uses the analysis of the Digital City Strategy and interview data to develop an understanding of where *The City* currently is in terms of its smart city development, and the characteristics that have defined the advancement of *The City's* smart city ambitions to date. Following that, the report discussed how the current state and characteristics relate to the Digital City Strategy outlined in the first report before providing some insight into what this reveals about *The City's* approach to smart city development.

This report is the third instalment of a four-part research series. Using interviews with stakeholders in different government and corporate spheres, this report serves as a reflection to unpack some of the key opportunities and challenges that Cape Town faces in terms of unlocking the potential of a smarter, more sustainable urban future. Following that, the report reflects on the opportunities and challenges and provides some insight to what it means on a broader level for smart city development in Cape Town.

The structure of the report series is outlined below:

- Report 1: Critical Analysis of Cape Town's Digital City Strategy.
- Report 2: The Current State and Characteristics of Cape Town's Smart City Implementation.
- Report 3: Identifying the Opportunities and Challenges that Exist for Cape Town as it Embarks on its Smart City Journey.
- Report 4: The Way Forward for Cape Town's Smart City Agenda and What it Means to be 'Smart' in Africa.

This report is divided into five sections. Following the introduction, the methodological approach to the research is briefly discussed before a detailed outline of the opportunities pertaining to Cape Town's smart city development is presented. Subsequently, the challenges associated with smart city development are identified and explored. Lastly, a discussion and conclusion section attempts to provide some insight to the findings and attempts to locate the opportunities and challenges in terms of more commonly understood government and structural dynamics reflective of the South African urban context.

2. METHODOLOGY

This research adopted a single case study methodology using Cape Town as the case. Cape Town was chosen as the case for this research, not because it exhibits what is typically being implemented in the smart city space in Africa, but because Cape Town currently demonstrates a level of thought leadership and progress (in terms of formulating meaningful plans for smart city development) that could serve as an example to other municipalities across South Africa and Africa. Whilst other municipalities across South Africa and Africa do have smart city plans, it is argued that most do not engage with the smart city concept with the same level of depth as Cape Town has. Many smart city strategies that exist in Africa lack coordination and substance. They are typically represented by isolated technocratic interventions that do not attempt to meaningfully address urban issues. Whilst the previous reports allude to the fact that Cape Town suffers from similar shortcomings, *The City*, to some degree, has meaningfully engaged with aligning key urban objectives with smart city principles and has linked implementation strategies to these overarching objectives in a manner which sets the city apart from other cities in Africa. Therefore, it stands as a useful case to attempt to understand how the smart city concept can play out within a more local context.

The inquiry that underpins the report series was built around a suite of stakeholders and factors expected to shape the smart city trajectory of Cape Town. As such, the generalisability of this study is limited, however, the study has the potential to provide valuable insights into smart city agendas for cities across Africa.

Data collected for this project was primarily based on semi-structured interviews with key stakeholders involved in smart city development in Cape Town. These involved ICT consultants, city officials[2], city politicians, members of industry forums, NGOs and members of Western Cape government. Interview participants were selected using expert sampling which was followed by snowball sampling. The selection of respondents was ended when no new names were mentioned in interviews. There was a total of 12 respondents that were interviewed for this study. Secondary data in the form of policy documents and presentations were used to complement the interview data. NVivo was used for the qualitative analysis of the data to identify emergent themes. The anecdotes provided in this report are taken directly from the interviews. The names and titles of the interviewers have not been disclosed to keep the sources of the information anonymous.

Finally, it is important to note that the views that emerged from the interviews do not necessarily represent the views of The City of Cape Town or the Urban Real Estate Research Unit.

Source: Darren Francis

[2] City officials are essentially civil servants who work in the 11 directorates that make up *The City*'s Executive Management Team. They are the workers within the departments and directorates and are not viewed as political figures. City politicians refers the political heads of the directorates which make up the Mayoral Committee (MayCo). The Mayco is overseen by the Executive Mayor.

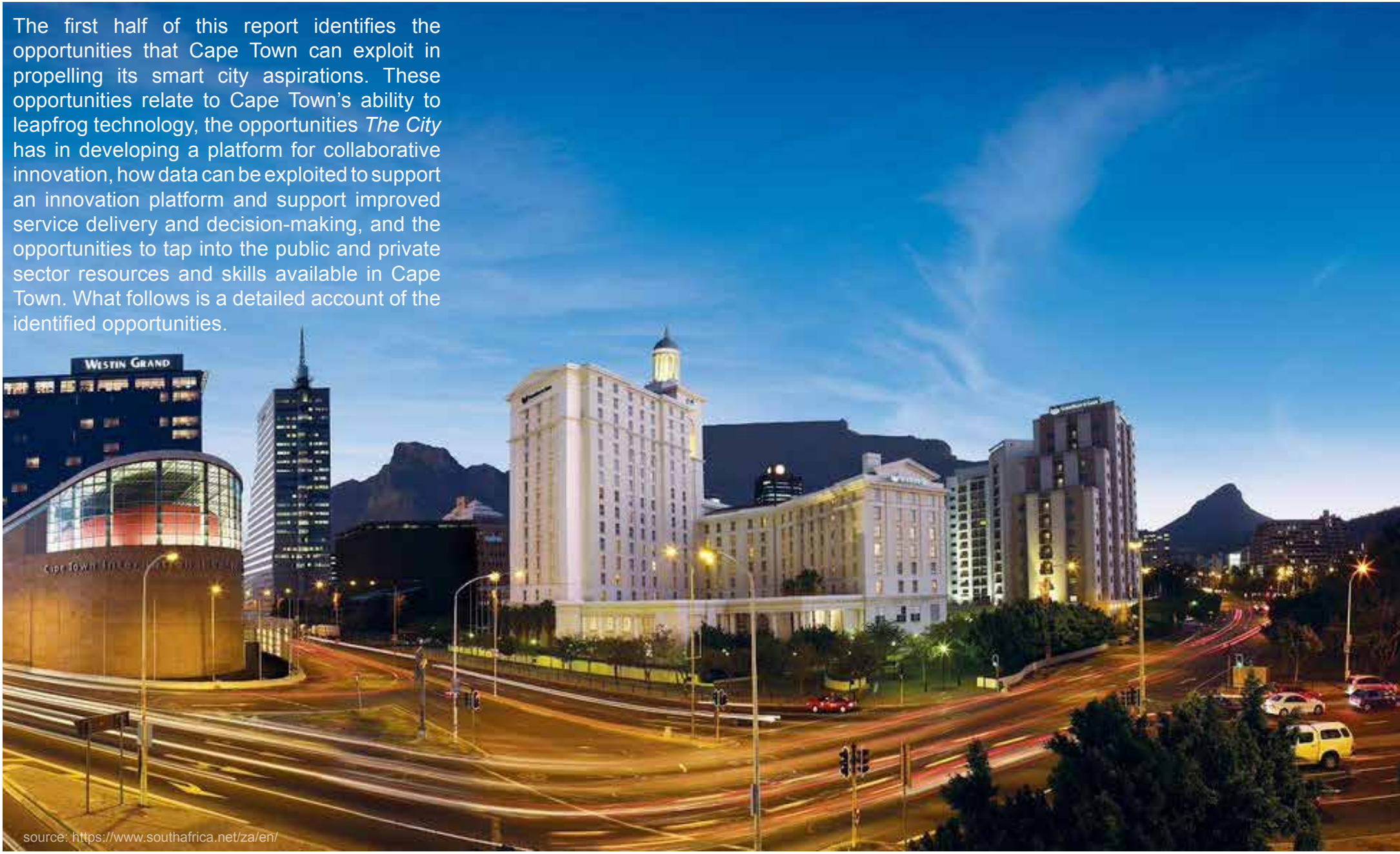
In the first reports we outlined our interpretation of the distinction between a digital city and a smart city. This understanding is carried through the research series and will be outlined again for clarity.

A digital city is understood as the deployment of ICT solutions to drive and improve public service provision and create efficiencies through digitising the various functions of a city. ICT is the core component of a digital city and the focus is on investing in distributed sensors and digital technologies and their corresponding solutions (Barns, 2018). Thus, the notions behind this conceptualization of a digital city is that new technologies can be utilised to optimise the way cities are managed.

The concept of a smart city is argued to be more encompassing and is more synonymous with the strategic use of enabling technologies to support key objectives of a city. Thus, a smart city cannot simply be realised by investing in distributed sensors and digital technologies. It requires a reinvention of urban governance which ultimately involves transforming the way local governments work internally and how they partner with citizens and other stakeholders (Cosgrave, Doody, & Walt, 2014; Barns, 2018). It is important to note that currently no city on Earth comprehensively demonstrates this conceptualization of a smart city, yet many cities exhibit various aspects of what a smart city could look like. Thus, it is useful to understand the notion of a smart city as a concept and not an end state– a journey rather than a destination. Despite this, the term smart city is commonly used to describe various cities in the Global North or expansive property developments in Africa. This labelling is problematic and is often misused, thus it is important to interrogate claims and labels of ‘smartness’ as they are often appropriated to serve other agendas.

3. OPPORTUNITIES

The first half of this report identifies the opportunities that Cape Town can exploit in propelling its smart city aspirations. These opportunities relate to Cape Town's ability to leapfrog technology, the opportunities *The City* has in developing a platform for collaborative innovation, how data can be exploited to support an innovation platform and support improved service delivery and decision-making, and the opportunities to tap into the public and private sector resources and skills available in Cape Town. What follows is a detailed account of the identified opportunities.



source: https://www.southafrica.net/za/en/

3.1 OPPORTUNITIES TO LEAPFROG

Most respondents highlighted the opportunities afforded to African nations that can leapfrog traditional trajectories of technological advancement. This means that cities like Cape Town can invest in cutting edge telecommunications and bypass investments in older technologies. A classic example of this is the landline. Most African nations have not had to make extensive investments in telephone landlines and will likely go straight to newer mediums of connectivity such as fibre internet or 5G. Being able to bypass investment in obsolete technology means that resources can be saved and focussed on more relevant technology. The ability to leapfrog, particularly in terms of telecommunications, has offered a huge benefit in connecting Africa. Mobile telephony has unleashed many innovative solutions for impoverished and previously disconnected Africans.

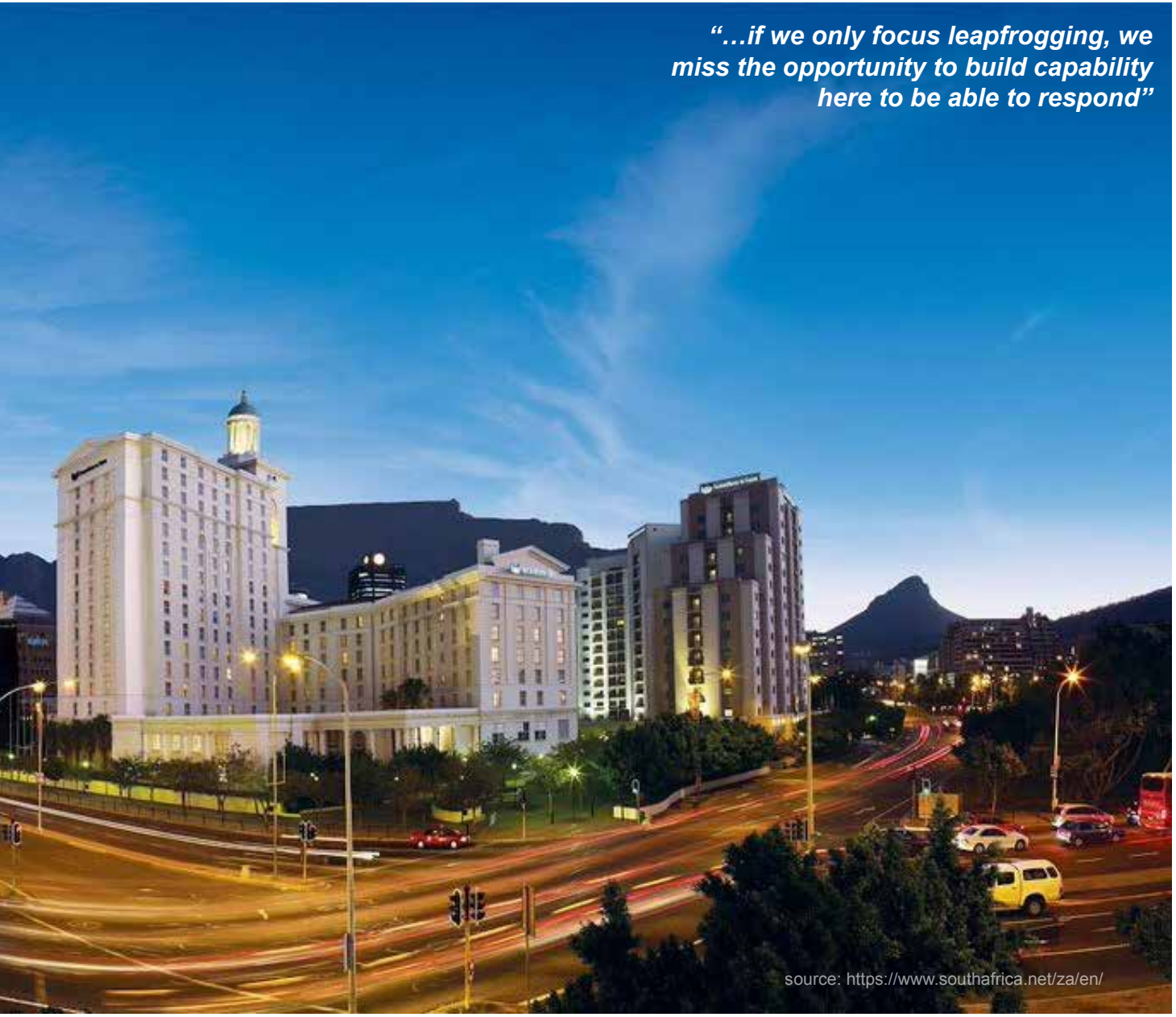
"…smartphones have actually connected those networks and enabled economic activity and the like. And they didn't have to go through the journey that the first world went through which is first cable on analogue, then go ADSL digital, then go smartphone. The benefit that IT has is you can leapfrog some of those things"

Leapfrogging does not exclusively apply to technological applications but also to innovative practices of city governments. In essence, this means that Cape Town can bypass many of the mistakes made, and the lessons learnt, by pioneering cities who are further along their smart city journey. Global leaders in smart city development have gained experience and, to some degree, have figured out what works and what doesn't when it comes to applying smart city applications. Cape Town has also played in this space in terms of their ERP implementation[3], but for many other aspects their entrance into smart city practices can be established much further down the path of development than some pioneering cities of the Global North.

Despite the obvious benefits of leapfrogging, it is important to highlight the caveats that must be considered when looking to get ahead and bypass older techniques and practices. Cities must be cognisant of the fact that if they place too much emphasis on leapfrogging they limit their ability to build their own capabilities around technology and smart city development. Additionally, cities often underestimate the value of having experience of working with a particular technology, or working in a particular way. This underlines the importance of skills and education in leapfrogging. The matter of leapfrogging skills is far more complex and follows a more linear path.

"It's [leapfrogging] downside, you don't have any experience at doing this, so it's likely to fail. Upside, very few impediments, lots of lessons to learn from other people and you can start anew and leapfrog into the future"

[3] Enterprise Resource Planning (ERP) refers to business process management software that allows an organisation to use a system of integrated applications to manage the business and automate many back office functions related to technology, services and human resources. ERP software typically integrates all facets of an operation (including product/service planning, development, manufacturing, sales and marketing) into a single database, application and user interface. The City of Cape Town established there ERP system to digital their back office using German software company, SAP in 2000. At the time it was the largest municipal implementation of an ERP system.



For example, being able to invest in the digital infrastructure that can facilitate machine learning and other types of advanced data analytics loses meaning without having data scientists to support the use of these technologies. Another consideration is how the efficacy of leapfrogging is impacted by the availability of technology to citizens. Many advanced local governments have applications which provide a useful vehicle of engagement and information sharing, but these interventions are ineffective in a context where citizens do not have access to smartphones. Therefore, *The City* needs to be strategic in the technologies that it decides to invest in and make sure they can develop the capabilities to best harness the potential of the technology without excluding anyone.

What this highlights is that there is a fine balance that needs to be reached in saving money and time by not investing in obsolete technologies and focussing on developing the skills and capacity required to unlock the potential of those technologies when they do become available. Additionally, it is about finding the balance of capturing those opportunities to leapfrog when they arise whilst also not creating an environment where innovation is limited by a reliance on technologies and innovations made elsewhere. Thus, cultivating an environment where local solutions and innovations can emerge is important. This entails a conjoined effort of investing in the right technologies but also building capacity on the ground.

3.2 OPEN INNOVATION PLATFORM

Previous reports in this series have illustrated a vision for a smart city that provides an ecosystem/platform for various urban actors to engage. This provides a number of opportunities to collaboratively solve urban issues that can promote an improved and more just experience for urban populations. Local government's role in this vision is to set up the platforms, plans, policies and procedures to enable the city, as a collective, to solve problems and function efficiently (The Innovator's Forum, 2019). Most of the respondents, indirectly or directly, mentioned the opportunity for Cape Town to be more citizen-centric in their smart city development. *The City*'s main focus in terms of smart city development over the past two decades has largely centred around establishing an e-government system which they have successfully achieved. What this means is that *The City* has the digital structures in place to effectively manage its business processes. This provides a base from which to launch more externally focused platforms that facilitate an open exchange with various non-state urban actors such as NGOs, businesses, academic institutions, or individual citizens.

"…if we can crack that problem of how to create an open framework that clearly shows how you can plug in and how we can make use of your [citizens'] assistance we'll get to the future much faster."

Having a platform that can facilitate collaborative innovation will, in theory, unlock the resources and skills outside of public sector organisations and combine them with *The City*'s efforts to tackle a variety of urban issues. The involvement of citizens or businesses to channel specific skills and resources to address certain challenges or provide services empowers and enables them to take some ownership and responsibility to address some of the issues that they experience, or to play a role in realising the improvements that they would like to see. Central to this is the notion of empowering and providing channels to mobilise citizens and other actors who are willing and able to provide innovative solutions to a myriad of urban dilemmas. This will also afford opportunities for citizens and other urban actors to be better integrated into decision-making processes as they are actively involved.

"If you think about the CCTV network that the city itself, on its own budget, are struggling to roll out. Yet communities are putting up CCTV network and all they're asking is for those networks to be connected into our central control centre. They're almost willing to volunteer them"

"There is this issue of smart communities and intelligent communities and caring communities. A whole lot of concepts which really mean trying to build an ecosystem which brings your citizen into the smart city concept"

Theoretically, having this platform can free up city resources to focus on certain priority areas than can be seen as core administrative functions of a smart city. These could be: the provision of public goods that the market and broader society can't or won't provide; providing vital services to vulnerable citizens; providing the administrative functions and a legal framework for urban development and management; and updating and facilitating the platform for interactions between various urban actors in order to meet city objectives. Naturally, citizen involvement can take place in all of the above 'core' functions, however, these functions are best overseen by a recognised democratic institution who is held accountable by citizens. Ultimately, this brings into question the need for a designated government authority and alludes to a truly democratic future of having no formal government where cities are governed in a truly democratic sense enabled by technology, but that is not within the scope of this research.

"So, the framework we have defined is that we identified that we need to have guiding principles, then we have to define this vision. It must be citizen centric, digital and open and collaborative"

Evidence from the interviews supports the finding that various officials from *The City* are aware of this opportunity and efforts are being made to steer the direction of Cape Town's smart city development to embrace more open collaboration with external actors. *The City* does have the digital backbone to be able to start experimenting with this type of urban governance, and to some degree they already have. Most African cities looking to implement smart city strategies do not have this foundation layer. The Emergency Policing and Incident Command (EPIC)[4] system mentioned in the previous report shows promise by integrating privately owned CCTV cameras and neighbourhood watch applications into *The City*'s central database. However, this initiative, whilst pioneering and successful, is more analogous of bringing non-state resources into city services rather than openly collaborating and sharing responsibility. Thus, it is suggested that there is a significant opportunity to provide more depth to the kinds of systems like EPIC and apply them more comprehensively to include services outside safety and security. This necessitates a transformation of *The City*'s e-government capabilities into e-governance capabilities which requires a shift in the way *The City* views its citizens.

The above identifies a key opportunity that The City of Cape Town can tap into as it continues of its digital journey. This opportunity is largely dependent on the ability to effectively share reliable information between government and society. This is explored in more detail in the next section.

[4] The Emergency Policing and Incident Command (EPIC) system provides an integrated and multi-disciplinary real-time response system to matters relating to public safety across the city. It links into *The City*'s ERP platform.

3.3 DATA AND THE CITY

Data and the opportunities that data provide are becoming increasingly recognised by cities and companies across the world. Furthermore, data is central to smart city development. Many of the research respondents echoed this sentiment and exploiting data for sharing and analytics was outlined as a key opportunity for *The City*. Moreover, having reliable and up-to-date data improves efficiencies in various urban systems. Not only is this important for improving service provision and decision-making but it is also important for creating market efficiencies as it opens up opportunities for economic growth and development in cities.

In terms of smart city development, data provides opportunities for Cape Town for two main reasons: firstly, open data is central to the notion of an open platform for innovation as it empowers citizens by providing them with the resources and information to assist in developing solutions to a particular issues. Secondly, it provides facilities for *The City* to make better, more informed decisions about where to allocate resources and improve their service delivery. These two aspects are explored in more detail below.

[5] Open data is data that can be freely used, shared and built-on by anyone, for any purpose, and at no cost. Open data drives the interoperability of a diverse mix of organisations and systems to solve problems or improve services (Open Knowledge Foundation, 2019).

Open Data

The term 'open data[5]' when referring to city governments is city data that is made openly available to the general public. Cities sit on vast pools of data which, if correctly managed and analysed, can convey incredibly valuable insights into how to improve, identify weaknesses, and better inform decisions around service delivery and managing a city. They also provide valuable inputs for goods and services outside of government. Permitting public access to city data can unleash opportunities for non-state actors to use their particular knowledge and skillsets to offer solutions to service delivery and other issues. Additionally, open data allows opportunities for citizens, governments, academic institutions and businesses to build onto the data to improve it, fill in gaps in datasets or provide useful insights and analysis into the data. This is the essence of an open innovation platform described in the previous section; a two-way exchange of information between *The City* and citizens. The example below helps provide a real-world application of this idea.

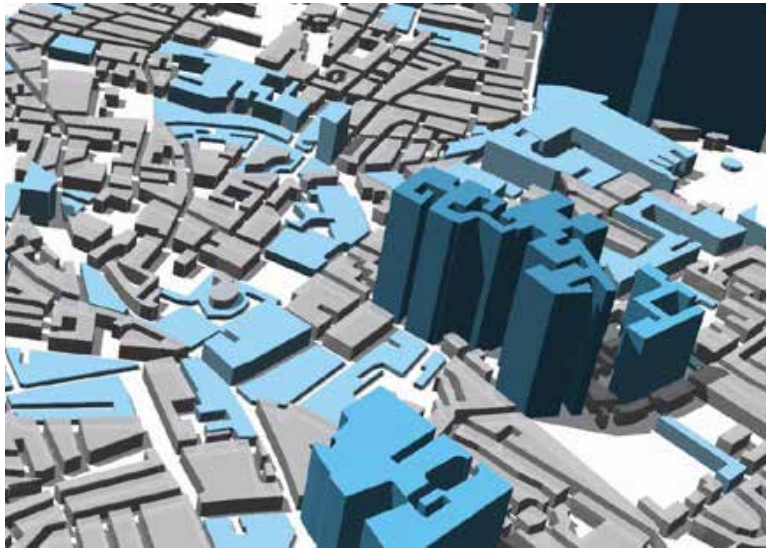
"The thing that we need to get to is a place, a market place where an environment is available for people to develop and publish and consume that information"

In order for an application (app) to be developed that provides a commuter with the best options to get across the city using *The City*'s various transit operators, the app developers would need detailed and up-to-date information regarding the various transit operators in Cape Town. Correspondingly, the app could provide *The City* with valuable insights relating to how to improve the transit services they offer. In this hypothetical situation, citizens (or anyone) can plug into *The City*'s information to develop apps and the information generated by the apps can be plugged back into *The City*'s data network. Most cities around the world achieve this through an open data platform. The City of Cape Town currently has an open data portal which is a repository of valuable city information, but it does not have an API which would allow outsiders to plug into that information and feed information back into the system or change or build upon the data. Developing an API that can allow for this would create a lot of opportunities for *The City* and massively propel a more open and collaborative form of smart governance.

However, before this can be in place the data needs to be reliable and in a format that enables collaboration with a variety of different actors. Interoperability is absolutely key to realizing the main practical benefit of "openness" which is the ability to combine different datasets together and develop more and better products and services (Open Knowledge Foundation, 2019). In other words, there is very little value in providing the public with access to an open data platform with incoherent data that is in an unusable format. Thus, what is required to effectively unlock the potential of an open data platform is an ecosystem of well-curated, accessible and high quality data.

"Internally we've got lots of data, it's just trying to get the data to talk to each other"

The open data portal is in ways emblematic of *The City*'s attempts to drive smart city development; well-intentioned and on the surface well-formulated, but lacking an acknowledgement of the institutional requirements of effective implementation. For now, the open data portal appears to be a classic example of a city in an emerging economy applying an initiative that is trending in other parts of the world without greater consideration for how this would work within its context.



The City, as pointed out by the respondents, has identified the potential benefits of conducting in-depth analysis on their data to improve service delivery and decision-making. Until recently, very little meaningful analysis was completed on *The City*'s data.

The City has the IT backbone to collect data into a single integrated database that can be used for analysis and they have established a data science team tasked with revealing deeper insights from data. This, in many respects sets Cape Town apart from many other African cities. However, one can only draw reasonable inferences from complete and reliable data. Thus, *The City* requires that its datasets are reliable, complete and up-to-date. *The City* must build up that data resource before getting to a place where advanced analyse can be systemically executed. There are a number of barriers that are preventing this from happening across the organisation which are related to the institutional barriers of *The City* and its practices.

Typically, municipal departments work independently of one another. A result of this is that there is little coordination and consistency in the way data is collected and stored, or data is collected to serve a specific function within a specific department. Additionally, data has not historically been viewed in local government as a resource for analysis and therefore little consideration is extended towards accurate and up-to-date collection of high-quality data. Consequently, there is little consistency in the way data is collected and managed across *The City* which has significant impacts on the interoperability of the data. A further concern is the lack of basic data skills across *The City* which highlights many of the dichotomies that exist in the organisation where there are simultaneously thought leaders formulating pioneering smart city initiatives without a critical mass of skills to support the implementation of these initiatives across *The City.*

What is required is a clear urban data governance framework like what is illustrated in Figure 1. This is a citywide framework that outlines specific protocols and procedures around a city's data and would clearly identify what *The City* would aim to achieve with its data resources. Currently, The City of Cape Town does not have such a framework outside of the data science unit and it is limiting its ability to exploit data opportunities.

FIGURE 1 A CONCEPT FOR URBAN DATA GOVERNANCE

(Source: von Radecki, Bradley & Tommis, 2018)

The City has certainly shifted towards being more data savvy and has started to develop the institutional capabilities to unlock the value of data, but it is argued that this needs to be done on a broader scale within the organisation. This would require a broad understanding of the value of data both horizontally and vertically within the organisation and developing general skills that would support that understanding. What is needed is a data culture within *The City* where there is an intrinsic understanding of the value of data and how it needs to be collected and stored so that various agencies (both internal and external) can use it. This needs to happen before advanced data analysis can take place on a broader scale.

As mentioned earlier, *The City* has recently established the first citywide data science team in South Africa who has been, among other duties, assigned the massive task of embedding the principles of data collection and analysis across the entire organisation. They have already experienced some success but in an organisation of over 20 000 officials managing wholesale institutional change is a long journey. At the same time, the unit has also begun experimenting with advanced data analytical methods such as machine learning, though it is argued that right now the focus should be on developing ways in which to organise and consolidate existing datasets. Nevertheless, it is worth noting that those capabilities exist within *The City*.

An additional concern that has not been addressed directly is *The City*'s approach to cybersecurity, protecting data and making it anonymous. This is becoming increasingly important as evidenced by the recent ransomware attack on the City of Johannesburg government which forced *The City* to shut down its online services and call centre.

Essentially, what the data opportunity comes down to is developing the institutional capacity to collect, store and share data in a way that citizens and city officials can access and interpret it for specific uses across departments and disciplines. This doesn't necessarily mean conducting large scale machine learning analytics on a comprehensive scale across *The City*, but can more simply be creating standards for the accurate, up-to-date, and consistent collection of data that can be broadly accessed across *The City* as an organisation and across the city as a geographical area made up of various stakeholders. This is the first necessary step of unlocking advanced data analytics. The following section discusses the current smart city ecosystem in Cape Town.

3.4 TAP INTO CAPE TOWN'S EXISTING ECOSYSTEM

What is meant when making reference to tapping into Cape Town's existing ecosystem is the opportunities that exist for Cape Town in exploiting the technological ecosystem of *The City* in terms of its IT backbone and skills, in addition to the broader tech ecosystem created by Cape Town's well-established IT sector which houses skills that are directly applicable to the development of smart city solutions. These two aspects are discussed briefly below.

The City of Cape Town Ecosystem

The City has a relatively long history of investing in technological interventions to drive innovative solutions for their operations. As outlined in earlier reports, The City of Cape Town has, for the past two decades, been looking at how they can harness technology to improve the way Cape Town is managed. As a result, they are further down the road on their digital journey than most African cities. They have managed to amass a certain level of skill and experience in applying certain technological solutions to urban issues and have a very well-functioning back office platform that integrates all of *The City*'s business processes. This also provides the platform to launch more comprehensive smart city visions that are citizen-centric and are closer aligned with the definition of a smart city which URERU subscribes to. Furthermore, the development of skills and experience with technology provides fertile ground for innovation to take root and there are many officials within *The City* that have developed thought-leading insights into smart city development and many opportunities lie in the pioneering visions and practical ideas devised by these officials.

Another innovative way that government can stimulate smart city practices is by using its 'procurement muscle' to pave the way for private sector to enter into the market and provide services. Local and regional government have been able to leverage their spending power to do this in the smart city space. This is exemplified by the Broadband Project (mentioned in the previous reports) that sought to bring connectivity to under-serviced communities.

The next part of this section discusses the opportunities primarily afforded by private sector.

Source: Darren Francis

Cape Town's Active Private Sector and Digital Economy Ecosystem

Whilst smart city development ideally needs to be driven by local government, this by no means should diminish the critical role that non-government actors play in contributing to the smart city. Cities which play are most successful at driving smart city development have very strong links between private sector and local government and often form coalitions to drive interventions that add value to both citizens and businesses. Thus, this is a key opportunity for *The City* to unlock.

"It was quite interesting that you were starting to see this public-private partnership coming to life as both private sector and The City started defining what they should take the lead on respectively and there were certain areas where you could clearly see that The City should take the leadership in that at least we [as private sector] know you're going in that direction so we can do what we can to support you (invest) to get there and vice versa"

It is well publicised that Cape Town is a regional tech hub with a large number of tech-related industries agglomerating in the Cape Town and Stellenbosch region. As highlighted in the last report, this offers a number of opportunities for *The City* in driving a smart city strategy. *The City* does not have to look far to procure the services of tech consultants and vendors and there a number of opportunities to develop partnerships with private sector organisations. Ultimately, there is a large pool of tech-related skills concentrated in Cape Town and tapping into that human capital provides a massive opportunity for *The City* in driving smart city development. After all, smart city development is heavily dependent on collaboration and partnerships across all urban actors. Additionally, respondents identified the willingness of private sector and other actors in contributing to smart city development through their ability to identify opportunities and challenges (and subsequently offer market-driven solutions) that *The City* may be unable to identify. Further, interviews unearthed evidence which suggests the corporate community is prepared to contribute resources and skills to solve urban issues or to drive certain smart city developments.

From an institutional perspective having a number of private sector tech organisations presents an opportunity for *The City* in the sense that government institutions often do not provide an environment that is conducive for experimentation and innovation. Resultantly, they are often slow to react to emerging technologies as they have to balance political responsibilities against exploring a smart city opportunity for instance. Private sector is more able to be innovative and bring new ideas to the market as they have focused skills and are not pressured by providing social services and other public obligations.

It is clear that there are a number of exciting opportunities that exist for Cape Town to leap forward on its smart city journey. However, it is necessary to consider the institutional mechanisms within *The City* and understand what capabilities are required to optimally take advantage of these opportunities.

The next part of the report investigates the various challenges that stand in the way of smart city development in Cape Town.

"So, what we did is we rallied the corporates and we looked at what can we, as the corporate community, do in the short-term that can alleviate the traffic congestion and are there technologies that we can apply"

4. CHALLENGES

Despite the promise of the numerous opportunities that are available for Cape Town to exploit to improve the incorporation of technological solutions for the future development of the city, there are a number of significant challenges that Cape Town faces in realising its grand visions of a smart city. These inhibitors relate to the digital divide, the current institutional and leadership limitations of The City of Cape Town, and the political complexities of local government in South Africa. This part of the report expresses these challenges in more detail.

4.1 THE DIGITAL DIVIDE

The digital divide has come up consistently throughout this research report series. Reconciling the issues relating to the digital divide is central to ensuring that smart city development does not further exclude vulnerable citizens. It is for this reason that it is considered to be the biggest challenge facing Cape Town as it attempts to steward its development to incorporate concepts of smart urbanism.

"One of the biggest challenges we have as a city is how do we cross the digital divide…it doesn't matter how much digital literacy you push into the city and through the city systems whether it's a local government, provincial government etc. The digital literacy programmes will fail because there is no sustainability in respect of access to internet"

The digital divide represents a number of complex structural issues that are well understood in the South African context and essentially relates to affordability and provision of services such as connectivity, unequal opportunities for education, and unequal access to physical technology. These challenges will be discussed in more detail below.

Lack of Digital Infrastructure

Importantly, the implications of smart city development that does not adequately consider the role of the digital divide could be that instead of smart city development promoting more just and equitable urban societies, it could further entrench current spatial and economic inequities that are pervasive in South Africa. Therefore, central to driving equitable and just smart city development is the provision of affordable connectivity that is delivered ubiquitously across the city as this is arguably the fundamental first step in addressing this divide.

Essentially, connectivity in terms of mobile telephony and internet relies on digital infrastructure which is the networks, data centres and servers required to support IT capabilities. Digital infrastructure forms a base layer for any smart city in the sense that it provides the network for devices and information to flow.

The City has, for the most part, recognised the significance of this challenge and has made attempts to drive the provision of digital infrastructure. This has been demonstrated by the Broadband Project where *The City* connected its municipal buildings with fibre with additional capacity to entice ISPs to enter poorer markets where they ordinarily would not have been financially viable. Due to the high capital outlay required to establish a fibre network it is unlikely that private sector ISPs would be able to provide a fibre service affordable for people earning below a certain threshold, particularly in impoverished areas in the urban periphery. This highlights one of the biggest problems of providing digital infrastructure– it is very costly. Additionally, local and national government in South Africa do not have the resources (both financial and technical) to provide digital infrastructure at the scale required. Therefore, as identified by *The City*'s Digital City Strategy, the provision of digital infrastructure will have to hinge on partnerships and collaboration between private sector, public sector and NGOs. Some examples of this have begun to emerge– Too Much Wi-Fi is an example of one such successful collaboration in Imizamo Yetho– however, this needs to occur on a far greater scale to make a more meaningful impact.

Whilst *The City* is aware of the scale of digital divide and the partnerships required to address the provision of digital infrastructure, their efforts have yet to catalyse private sector interest in marginalised areas of the city.

Disparities in Digital Skills

"…we are not ready for the Fourth Industrial Revolution from a skills perspective. In that lies an opportunity, but also lies a serious threat"

Whilst having ubiquitous and affordable connectivity is the first crucial step in addressing the digital divide, there are other layers that need to be focused on to comprehensively narrow this gap. This refers to the skills required to truly empower citizens to enter into the smart city. After all, the role of connectivity in urban governance is limited if there is a dearth of skills required to unlock the potentialities of that connectivity.

In terms of skills, it was apparent from the research interviews that there was enough digital skills to drive smart city development and a digital economy in Cape Town. But these skills are not equally distributed across Cape Town's population and are rather concentrated within more affluent groups. Whilst this doesn't mean that the technical capability to drive a smart city is absent in Cape Town, it means that that smart city development will be one-dimensional and ignore smart citizen aspects of smart urbanism. As a result, poorer citizens, who often have limited digital skills, will largely be excluded from opportunities to effectively engage and have an involvement in the governance of a smart city.

Looking beyond urban governance towards economic development, the fact that a large portion of Cape Town's population do not have basic digital literacy skills is likely to have serious implications for economic development and employment as we move further into the Fourth Industrial Revolution.

"To support jobs in the future, people need capability– 90% of all jobs will require some level of digital skills… How do we scale the rest of the skills requirements? Because we want the jobs of the future to be here. And those are digitally enabled jobs"

"A lot of work we're doing is on skills, so basic digital literacy… Yes, we might have bigger internet penetration but our levels…People are still coming out of high school with no understanding of how to use a computer. And that's fundamentally a problem"

Source: multichannelmerchant.com

The Technological Divide – The Unequal Access to Technology

Like the role of digital skills, having access to technology is an important component of narrowing the digital divide. Even if the above two criteria were met in terms of providing ubiquitous and affordable/free connectivity supported by expansive digital skills, poorer citizens may still be hindered by the prohibitive costs of accessing technology. For instance, it is virtually impossible to complete homework or develop an application off a mobile phone, regardless of your technical skill or internet connectivity.

The increasing affordability of the mobile phone has provided massive opportunities to bring more equitable access to services and connectivity in Africa. According to a research respondent, mobile phone penetration in Khayelitsha is reported to be 200% (Respondent, 2018). However, mobile phones are just one example of the technological tools needed to ensure entrance of smart citizens into cities of the future. Furthermore, mobile phones have significant limitations in the sense that they are fundamentally used for communication between two users. This is the case even for smart phones.

The City has attempted to address issues of access to digital skills and technology through projects like the SmartCape programme. This initiative provides free access to Wi-Fi in public buildings and free use of computers in City libraries. The programme also offers a range of skills development and digital literacy courses, free of charge. However, this is not enough to address the severe shortage of skills and access to technology that persists in Cape Town. What was uncovered from this research is the sheer scale and depth of the digital divide in Cape Town. Until Cape Town and other African cities figure out a model of providing affordable connectivity at scale, smart cities will always be for the elite. Moreover, until we develop widespread access to technology and digital skills development opportunities, not only will the voice of the poor will be drowned out by the wealthy, but the city's most vulnerable citizens will be left behind and potentially subject to even fewer options for upward mobility. *The City* has recognised the importance and scale of this issue but have not done enough to address it across the multiple layers that this issue presents itself. Many of the underlying issues are structural and it will require take a lot more than what a city government can do and they have limitations as an institution. These are explored in the next section.

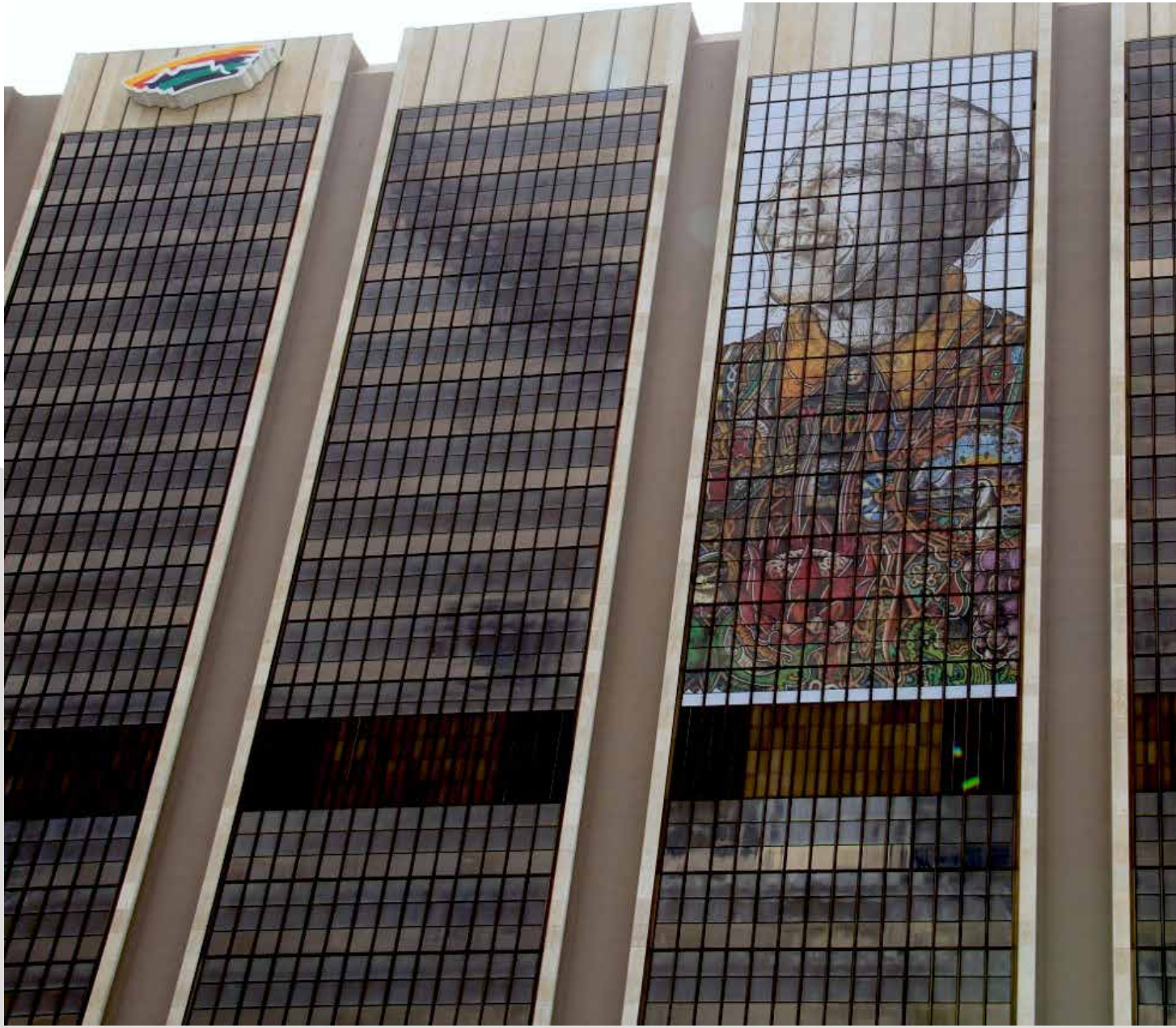
"But it doesn't mean that through a phone you can do absolutely everything. I think that's part of the problem; we think too much that these kinds of digital dividends will be reached because you have this device. But, actually, you still need to put some of the fundamental basic building blocks in place, which is what has not happened, which is why we are in the problem we have"

4.2 INSTITUTIONAL LIMITATIONS

.

An essential requirement of any city looking to drive a smart city vision is having a capable local government that can formulate the institutional framework to support the achievement of a that vision. Having a clear vision is one thing, but a city cannot meaningfully engage with it unless it is embedded and implemented within the municipal system. Many respondents raised concerns about the institutional limitations of *The City* in driving smart city development. These concerns were centred around two key themes: firstly, the difficulties *The City*, as an organisation, has when collaborating, both internally (between various departments) and externally (with other spheres on government and non-state actors). Secondly, the challenges around not having a critical mass of appropriate skills to drive institutional capabilities around smart city development.

.



The Challenges of Internal and External Collaboration

.

Respondents frequently mentioned their frustrations regarding the lack of collaboration across *The City*'s departments and their difficulties in forging partnerships with outside organisations. Whilst this is a complex challenge and cannot be attributed to a single factor it emerged that collaboration was largely hindered by the institutional governance of local government. *The City* consists of a number of fragmented departments with strict mandates that are occupied by people familiar with working in silos. Respondents revealed that many smart city initiatives required the input of various departments but did not fall under one departments' mandate, which in effect, leaves no one responsible for the initiative. Smart city development requires a holistic approach that spans the entire organisation, thus requiring coordination between various departments.

"…coordination amongst our various departments is key. I think that's probably our single biggest problem… much of what you need to do is actually integrated amongst a number of units. It's that planning and coordination that's our dilemma"

"Procurement and supply management is probably going to be the biggest challenge. Because we're in a city and government where there is supply chain regulation, so that's why we we've been asking now more than the better part of four months for our officials to give us a framework of what is a private-public partnership"

Challenges around collaboration also extends to outside actors, including regional and national government, as well as businesses and citizens. Respondents identified the important role of combining the efforts of other forms of government to drive smart city development in Cape Town, but for various reasons this rarely took place. The same applies for businesses and NGOs. A lot of the difficulties *The City* has engaging with outside organisations relates to the procurement procedures that *The City* has to comply with when engaging with private sector. The procurement system makes it very difficult to accommodate unsolicited bids which means that a start-up or company with an innovative smart city solution cannot directly approach *The City* with a solution without going through an open tender process.

Breaking down the institutional barriers is critical, but equally important is making sure the institution is occupied with skilled workers capable of actioning smart city plans. The next section discusses the skills required to meaningfully drive a comprehensive smart city strategy.

Skills within The City of Cape Town

"…And most importantly, we are short on skilled digital staff that have the knowledge"

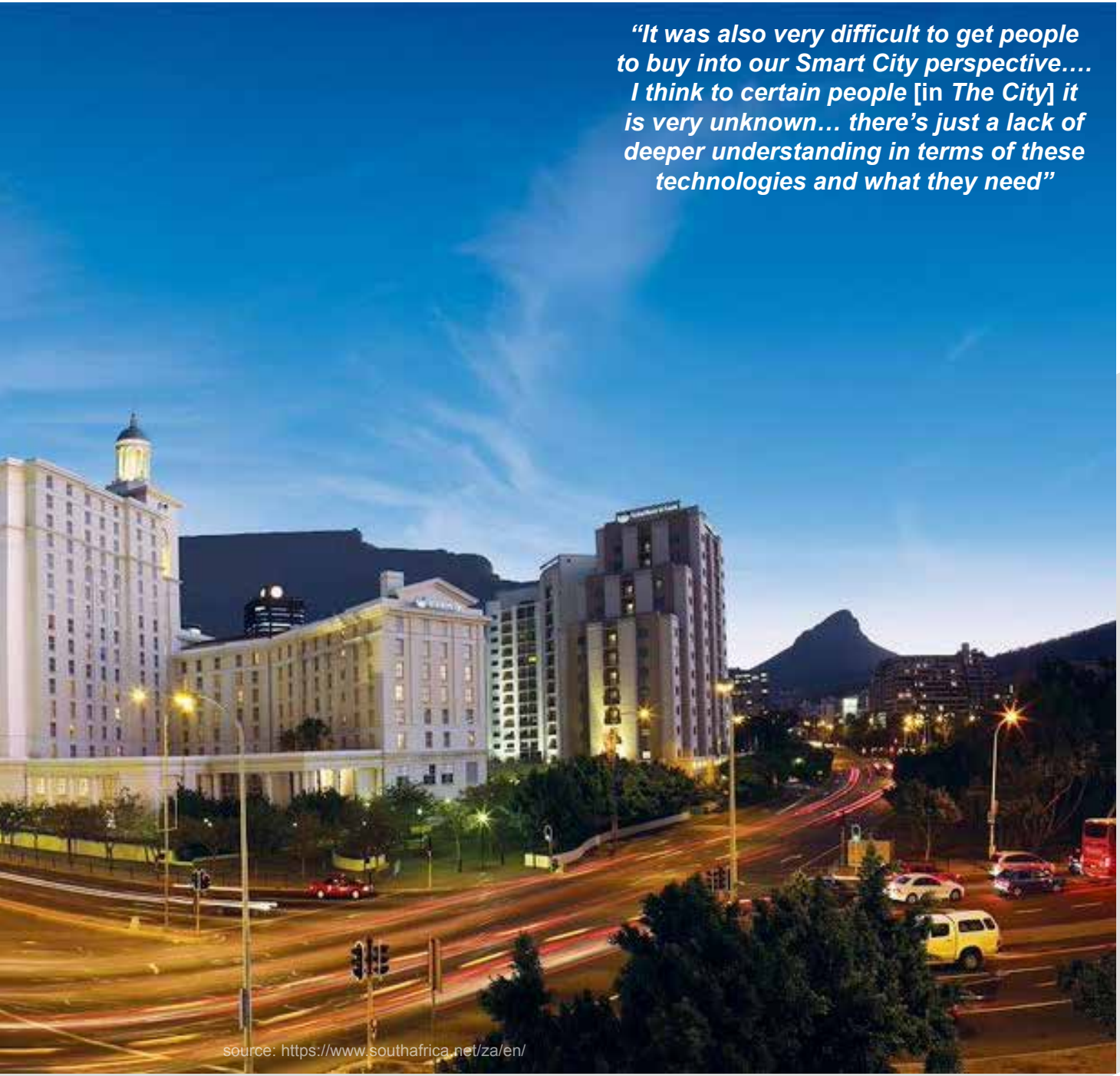
There is a sense of irony when it comes to the opportunities and challenges of Cape Town's smart city development. What has set *The City* apart from other local governments in Africa is the thought leadership they have demonstrated in terms of smart city development. Key city officials have facilitated the development and realisation of innovative visions for Cape Town in terms of various technological interventions. However, at the same time there is a lack of skills in the broader sense at *The City* which is partly responsible for why they have struggled to implement their strategy (as highlighted by the second report). In essence, *The City* has thought leaders, but few implementers. For the innovative ideas of the thought leaders in *The City* to take root there needs to be a collective push supported by an army of skilled workers across the entire organisation. Research respondents underlined that this is currently not present.

The City's approach to data is a useful example which nicely illustrates the issue regarding skills in *The City*. The City of Cape Town is the first municipality in the country to establish a citywide data science team. This team has begun doing some pioneering work in terms of data analytics, however, *The City* on a broader level lacks the basic data skills to effectively collect, store and manage the data they have. The skills and ideas around the value of data have not been adopted across the organisation. Ultimately, the efficacy of the data science team is limited by the institution. There are numerous similar examples across *The City* that highlight the dichotomy of the differing skill levels within the organisation and how this becomes problematic when trying to implement a strategy that requires the collective efforts of the organisations as a whole.

Source: African News Agency (ANA)

"If they get the right people to try and explain this. Not just an individual, it can never be an individual. It's a collective effort with an appreciation for what we are trying to achieve."

source: https://sabrangindia.in



source: https://www.southafrica.net/za/en/

Additionally, there is a lack of an understanding of the concepts of smart city development across the various directorates and departments of *The City*. Consequently, many city officials do not see the value in changing their current practices to align with 'smarter' ways of operating. Again, this links back to not having a critical mass of skills across the organisation to instil a sense of deep understanding. It is believed that embedding digital skills and a deeper understanding of smart city concepts across the organisation would likely support broader institutional buy-in for smart city projects which could unlock some barriers to collaboration and disjointed implementation.

The challenge in an organisation of over 20 000 employees who are responsible for such a vast number and variety of tasks, is how to develop the right mix of skills and collaboration across departments to align with a smart city strategy. Institutions like city governments are always going to struggle with these institutional limitations, however, many of these challenges can be mitigated by a sense of strong leadership that can drive a clear and coordinated vision for smart city development. Such leadership will be able to improve efforts to bridge the gap of institutional silos, develop a pipeline of skills that support various aspects of smart urbanism, and creating institutional buy-in through demonstrating the value of smart city principles. The challenges associated with the absence of smart city leadership at The City of Cape Town are detailed in the next section.

4.3 LACK OF LEADERSHIP

The previous section emphasised the importance of having an institutional framework from which to implement smart city development. There is little use having a comprehensive guiding policy for smart city development if the institutional mechanisms are not in place to drive it. Furthermore, due to the nature and resource constraints of local governments, it is likely that skills shortages and institutional silos will be an ever-present challenge. However, having effective leadership plays an influential role in mitigating the types of institutional limitations outlined above. By correlation, the absence of such leadership is likely to exacerbate those same limitations. Thus, it is argued that, to a large degree, the institutional challenges in driving smart city development in Cape Town are directly and indirectly linked to a lack of leadership. Whilst it is true that a lack of leadership can be viewed as an institutional limitation, due to the depth and far-reaching consequences of this issue it has been presented as a separate challenge to the institutional limitations referred to earlier.

"The leadership space, I think, that's a fundamentally a problem we have. We don't have strong leaders in government who are willing to risk and find new ways of doing it"

The lack of leadership relating to smart city development was consistently touted by respondents as one of the biggest challenges for The City of Cape Town in realising their smart city aspirations. This was also mentioned in the second report where it emerged that many of the officials that were instrumental in driving the early smart city strategy left *The City* leaving a leadership void. In a sense, this left the smart city strategy rudderless and without a clear direction or vision. In an organisation as big as *The City* it takes a lot of effort and motivation to get new ideas off the ground and if ideas aren't tied into a broader vision it is difficult for city officials to remain motivated to ensure that they gain traction. Some respondents stressed that there needs to be political buy-in at some level in order for smart city initiatives to get off the ground.

Additionally, respondents explained that in the absence of a broader vision, smart city development is not coordinated across city departments and efforts are disjointed and lack coherency. Therefore, having a strong vision for smart city development that is driven strongly across the institution will have a significant impact in propelling smart city development forward. The vast majority of the respondents indicated that in order to do this there needs to be political buy-in for smart city concepts at the top tier of *The City*'s management. Once there is political will/buy-in there needs to be someone who owns the strategy and drives it forward; a champion or a leader who will persist and push through the walls of bureaucracy and institutional ambivalence.

"You need strong leadership who are going to be able to interface and engage across all the silos in the city to give life to this stuff"


Source: © Provided by Daily Maverick

No Smart City Leader at the Political Level

"I think, in terms of The City, the top priority, would be to, actually at a very high level, adopt a strategy or a policy. Because that then drives everything below and what you do have, at the moment, is individuals fighting the good fight but it's fighting the organization, basically"

"The City needs to ensure that the next generation of city leadership understands the value and importance of continuing to invest in systems which have created the success to

"The problem is IT sits two levels down in the organization so if they develop a solution, it's not a citywide solution, it's an IT solution. And think a smart city strategy needs to really sit at the top"

A number of respondents highlighted that there is currently no one driving the smart city strategy from the executive management of the organisation. Additionally, many argued that smart city development needs to be implemented of a citywide scale. Most global leaders in smart city development have some form of chief digital officer or chief information officer that drives these strategies from a high level. Furthermore, these officials receive significant support from the mayor and the rest of the executive leadership. The City of Cape Town currently does not have a champion within the leadership that owns or is driving smart city development in a comprehensive sense and this has shown to create challenges when implementing the strategy.

Whilst there are some departments and directorates within *The City* that are playing a leadership role in the smart city space, they are unable to do so in a comprehensive sense. This is because leadership at the department or directorate level lacks the institutional reach to be able to action change across the organisation. They are also limited by their mandates. The result is pockets of innovation that are not coordinated. A clear leader, driving a smart city agenda comprehensively across the city is believed to be able to coordinate the smart city initiatives into a more effective strategy.

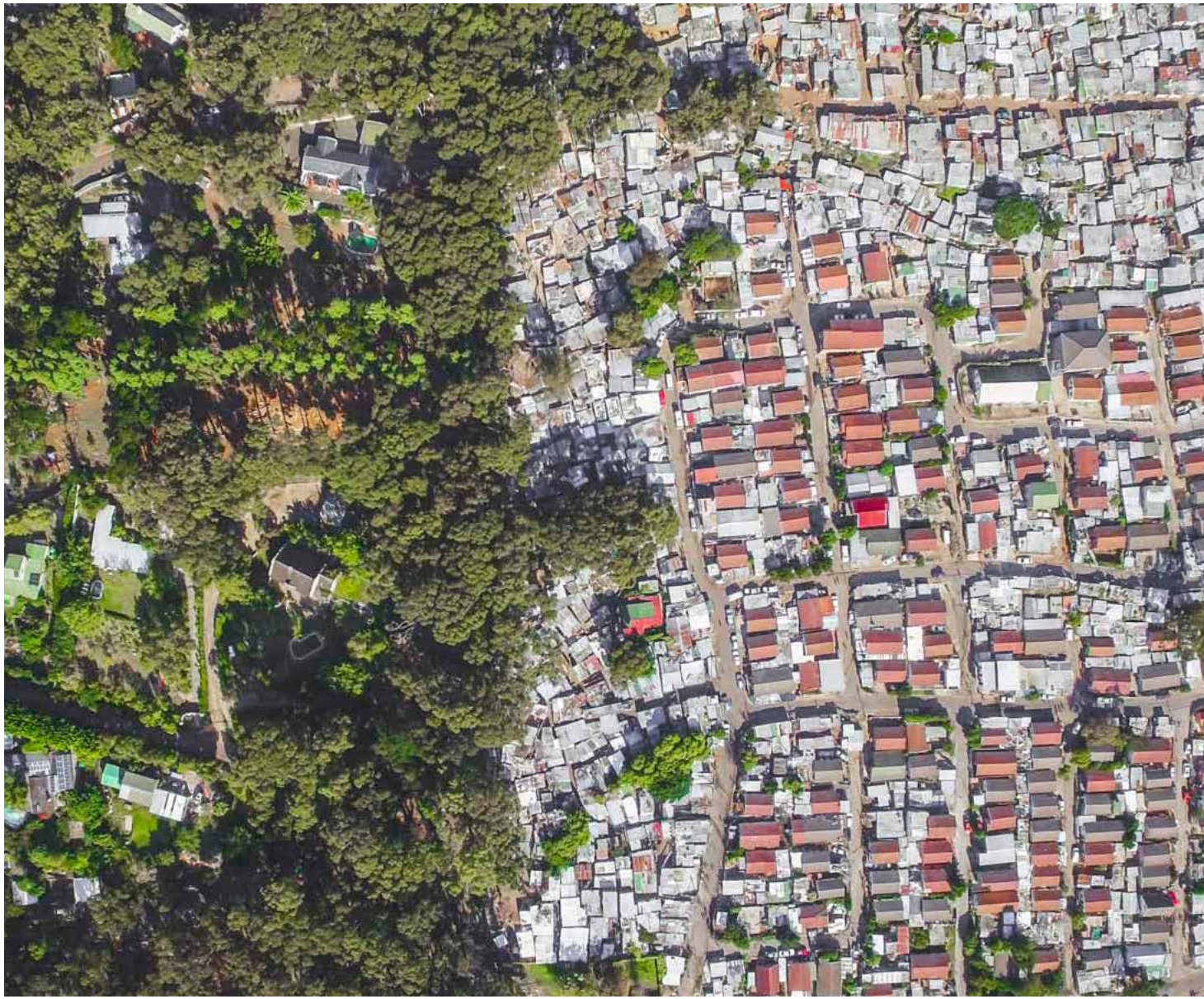
It is not exactly clear why no one in the political leadership has driven the smart city concept out across *The City*, but from analysis of the respondents' sentiments it is suggested that smart city development is largely not viewed by the leadership as a political priority and is an investment that would compete with more immediate needs such as providing basic service to the city's most vulnerable. Further, it is argued that the need to make investments in delivering traditional infrastructure makes it difficult to look at new technologies for urban development in Cape Town. This perception relates to a lack of knowledge and understanding of the concepts and principles surrounding smart city development. A deeper understanding from the political leaders regarding the value add of smart city development might help embed an idea across The City that these strategies do not compete with service provision and other political priorities, but actually play a critical role in supporting these priority services.

A lack of leadership, and the associated challenges with this have consistently emerged out of this research project and is argued to be one of the main factors inhibiting the further development of smart city development in Cape Town. The next section looks at the various political challenges that exist for The City of Cape Town that acts as a barrier to smart city development.

4.4 THE POLITICAL COMPLEXITIES OF LOCAL GOVERNMENT

It is clear from the analysis of the interview data that there are officials and politicians within *The City* that have a comprehensive understanding of what is needed to drive smart city development, but what is less clear are the complexities and challenges of working in local government. Whilst this is not the most significant challenge relating directly to Cape Town's smart city aspirations, it is worth noting as it provides greater insight for the reader as to the political climate of local government in South Africa.

"The vast majority of people don't have the beginnings of a clue of how difficult and challenging these spaces are"



Firstly, it is worth underlining the sheer complexities of local government in South Africa. From a resource perspective municipalities are operating in a context of decreased revenue and grants from national government, whilst simultaneously having expanding mandates as a result of political decentralisation. From a responsibility perspective, in terms of their role and function, local governments have massive mandates with a limited resource base from which to address them, often leaving city departments under-resourced and overstretched. Consequently, *The City* has

a limited amount of resources to address the realities of massive and increasing backlogs in basic services and dignified housing whilst also having to attract investment and identify opportunities for economic development. Put in perhaps an over-simplified way, South African cities are caught between two (often) competing interests; providing basic services and reversing the inequities of our past, and providing the vehicles to drive economic development to support upward mobility and poverty reduction. What this means is that there are a large number of priorities that need to be addressed without the resources to effectively address them. Thus, the implementation of strategies, smart city related or otherwise, is always going to involve difficult trade-offs that may leave certain people feeling marginalised.

"You have to prioritise. When we started the Smart City concept, the council said to me: 'How much for computers?' They thought that is what the smart city concept is about, spending money on computers when people don't have houses, roads"

On top of the issues outlined above sits the political and legislative layers which creates further complexities. All of this can create substantial challenges when trying to institute large scale transformative programmes; a requirement for smart city development. More detail pertaining to these political challenges is provided in the following paragraphs.

Many of the respondents discussed *The City's* recent political restructuring and the impact it has had on smart city development. The fall out of this process is still very much apparent at *The City* and there have been a host of resignations, shuffling of officials and internal political battles. This has had an impact on the implementation of smart city development, but on a deeper level it has created a culture of mistrust and fear within *The City* which ultimately limits collaboration and innovation as officials appear to be hesitant to experiment. This is exacerbated by the intense rifts between political parties that exist in South Africa. As a result, every move made by local government is subject to intense scrutiny by the political opposition which cultivates a culture of risk aversion and it is suggested that politicians may be hesitant to embrace smart city development wholeheartedly as they may be criticised for being pro-rich and ignoring the needs of the poor. This is exacerbated by the immediate need to address traditional infrastructure backlogs making it difficult for cities to consider new technologies which could drive smart city development.

"It's also a distorted mentality of politicians. The system is in certain time spans and they don't think that the city operates in 15/20/30-year cycle, because politicians operate in a term of office cycle. They are not interested in testing"

It was further highlighted by the respondents that political short-termism has impacted on *The City*'s efforts to drive more meaningful smart city developments. Politic short-termism refers to the short-sighted decisions which are typically made based on re-election and show a short-term tangible outcome. The result is that more long-term, and arguably more transformative solutions, with timeframes that extend far beyond election cycles often do not receive enough consideration. Additionally, attempts to drive smart city development have at times been hi-jacked to gain political leverage rather than to drive long-lasting transformation by dedicating the necessary skills and resources to develop a meaningful smart city intervention. An example of this is the failed MyCiti Wi-Fi programme where free Wi-Fi was provided on MyCiti buses at great cost with very little impact. However, politically this was seen as a way to demonstrate that *The City* was at the cutting edge of urban innovation. Whilst this is commonplace in various aspects of government, and it could be argued that well-formulated strategies can plan around this, it is worth noting the additional complexities it introduces to implementing more effective smart city development.

"We still sit with a lot of risk aversion and 'wait and see' mentality in decision makers which is why we don't necessarily have massive adoption of big scale transformative programmes"

In response to issues relating to endemic corruption in local government in South Africa, *The City*'s legislative environment is very corruption averse. This is particularly the case around supply chain management and procurement. The compliance requirements of procurement policies make it difficult for *The City* to quickly adopt new technologies. This stringent legislative environment also makes experimentation and partnerships across disciplines difficult. These are essential aspects around fostering the innovations required for smart city development. Further issues relating to experimentation and innovation is the general risk averse nature of local governments, as mentioned above. *The City* plays a very important function in supporting the most vulnerable in our society. Unlike businesses, they are obligated to support these citizens. Consequently, they do not have the luxury of largescale experimentation if it means drawing resources away from people in need. They also have to be responsible/accountable with how they choose to deploy resources and they are unlikely to experiment with new technologies unless they are confident of their ability to pull it off. All of the above means that decisions to invest in smart city interventions need to be very strongly justified and championed.

Overall there is a deep understanding of the smart city concept at both local and provincial level, as well as a clear idea of what needs to be done to achieve this in an African context. The issue is around implementing these ideas in a very complex political environment that often acts as an obstacle to getting things done.

This second half of the report underlined some of the significant challenges that face Cape Town as it attempts to become 'smart'. Much of the challenges are associated with the internal workings of local government and the political challenges associated with driving a comprehensive smart city strategy. In addition to this is the considerable challenge of addressing the vast digital divide in the city which speaks to more structural issues of inequality and service provision that are persistent in the South African context. Tackling this challenge will require a coordinated effort between the various spheres of government, private sector and civil society. The next and final section provides some more insight into the opportunities and challenges presented in this report.

5. DISCUSSION AND CONCLUSION

As underlined in previous reports, *The City* demonstrates a firm understanding of the opportunities and challenges they face. This reiterates a consistent theme emerging out of this research project that key officials in *The City* understand the requirements of implementing a comprehensive smart city strategy in Cape Town. However, the issue lies in the complexities of formulating the delivery mechanisms to realise those strategies.

In terms of Cape Town's opportunities, there are a number of exciting opportunities that Cape Town can exploit to propel the city forward in terms of smart urbanism. *The City* has started to tap into these opportunities as evidenced by the EPIC system and the data science unit. However, there are certain prerequisites that are required to be met for *The City* to be able to effectively exploit these opportunities. These mostly relate to institutional capabilities regarding the way *The City* operates and collaborates, internally and externally. In addition, there are also caveats pertaining to opportunities. A prior investigation into what is required and what is hoped to be achieved by investing resources into a smart city initiative needs to be conducted to gain a deeper understanding of how to unlock certain smart city opportunities before implementation.

Despite the significant challenges identified in this report it is worth mentioning that there are many positives regarding how *The City* is attempting to address these challenges. For example, The City of Cape Town has taken some bold and innovative actions to address the digital divide. Moreover, there are some globally innovative initiatives that are taking place in Cape Town and *The City* is working hard to address their shortcomings so that it can further support smart city development. What does remain clear is *The City*'s challenges in terms of updating there models of governance to better reflect the requirements of smart city development. This entails overcoming their institutional barriers and embedding smart city practices into the organisation. Further, it requires a changing view of citizens and how *The City* engages with outside actors so that collaborative problem solving can properly take root.

One might assume that cost barriers would present a significant challenge for driving smart urbanism in Cape Town, yet interestingly, respondents rarely mentioned this as a direct challenge. To this end it is argued that whilst the cost of technology certainly serves as a barrier to smart city development, there are other issues that are far more influential in challenging Cape Town's smart city aspirations. These have been highlighted in the second half of this report. This also supports the notion that the core issues relating to smart city development in Cape Town are not technological in nature, but rather relate more to the institutional capabilities and models of operating that must be developed to effectively incorporate technology into urban governance.

Additionally, among the significant institutional barriers that need to be overcome to drive smart urbanism in Cape Town, there are also structural problems linked to intractable challenges around inequality which are of such a scale that a city government alone cannot address. Therefore, what has emerged from a reflection of the opportunities and challenge outlined in this report is that the challenges and opportunities relating to smart city development in Cape Town can be categorised as contextual and institutional in nature. Contextual in the sense that the Cape Town context provides both opportunities and challenges to smart city development. For example, the successful IT sector in Cape Town provides opportunities whilst the digital divide and the contextual realities of South African cities create significant barriers. Similarly, the institutional arrangements relating to *The City*'s stable IT backbone has provided a number of opportunities for Cape Town to excel. But on the other hand there are also institutional limitations in terms of leadership and departmental silos that hinder smart city development.

In conclusion, it is critical that Cape Town does not view smart city development in isolation of the contextual and institutional issues that persist in our cities and local government. Perhaps paradoxically, addressing the less contemporary and better known issues South African cities face is critical in unlocking the technologically inspired future opportunities that smart city development has the potential to offer Cape Town.

BIBLIOGRAPHY

Barns, S. (2018). Smart cities and urban data platforms: Designing interfaces for smart governance. City, Culture and Society, 12, 5-12.

Cosgrave, E., Doody, L., & Walt, N. (2014). Delivering the Smart City: Governing Cities in the Digital Age. . London: Arup, Liveable Cities.

The Innovator's Forum. (2019). Smart Cities Innovation Accelerator: Global Strategies for 2020. Harrvard University, Technology and Entrepreneurship Center, Boston, Ma.

Open Knowledge Foundation. (2019, October 28th). What is Open Data? Retrieved from Open Data Handbook: https://opendatahandbook.org/guide/en/what-is-open-data/

Schwab, K. (2016). The fourth industrial revolution: what it means, how to respond. Davos: World Economic Forum.

von Radecki, A., Bradley, G., Tommis, M. (2018). Management & Governance of Urban Data. Manchester: SmartImpact.

Respondent. (2018, October 23). Accelerate Cape Town. (L. Boyle, Interviewer)