URBAN REAL ESTATE
RESEARCH UNIT

URERU SMART CITY SERIES PART 2:
THE CURRENT STATE AND CHARACTERISTICS OF CAPE TOWN'S SMART CITY DEVELOPMENT

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THE CURRENT STATE AND CHARACTERISTICS OF CAPE TOWN'S SMART CITY DEVELOPMENT

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source: https://www.weforum.org

CONCEPTS/TERMINOLOGY:

Digital Infrastructure:

Refers to the cables, switching facilities, and equipment needed to create and support telecommunication networks and services, computing facilities, computers and devices that connect to these networks (City of Cape Town, 2016).

Enterprise Resource Planning:

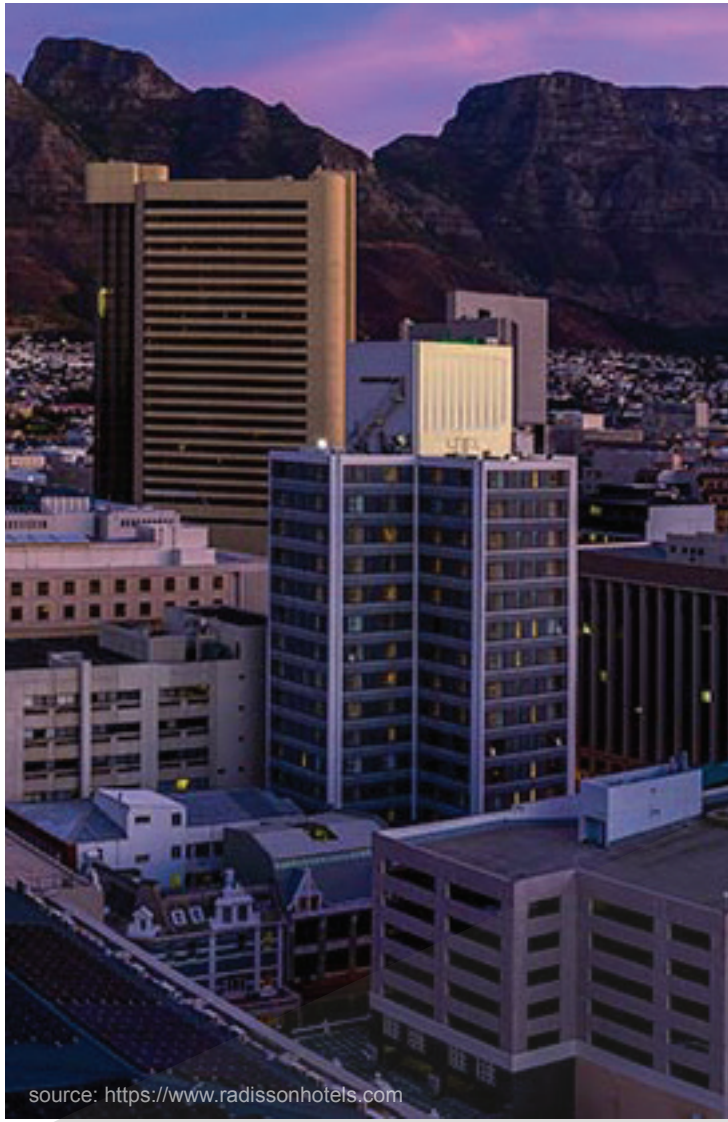
Enterprise Resource Planning (ERP) refers to business process management software that allows an organisation to use a system of integrated applications to manage the business and automate many back office functions related to technology, services and human resources.
ERP software typically integrates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

SAP:

SAP stands for Systems, Applications, and Products in Data Processing. SAP is a German software company most commonly known for their Enterprise and Resource Planning (ERP) software. SAP was the vendor chosen by The City of Cape Town to implement their ERP system and have been using this system for nearly 20 years.

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.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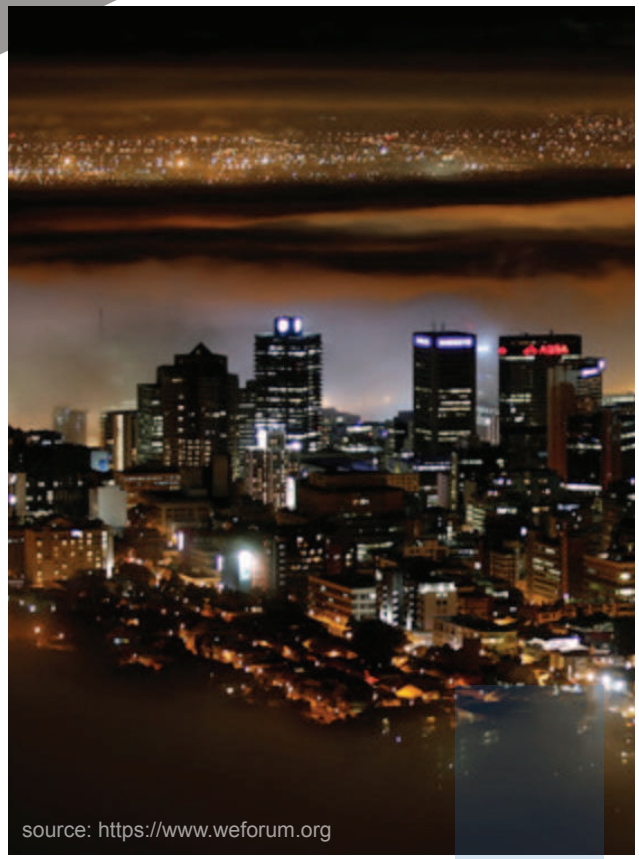


source: https://www.weforum.org

Telecom:

A Telecom is a telecommunications company that provides infrastructure and offers connectivity services to households and businesses. The services of a Telecom or Telcos refers to all types of voice, data and video transmission and the internet.

Last Mile Access:

Last Mile Access is a term used in telecommunications to refer to the final leg of the telecommunications networks that delivers connectivity to retail end-users. Thus, Last Mile Access is the telecommunications infrastructure (in this case digital infrastructure) that links homes, offices and other users to the backbone of the telecommunications network. Essentially, it refers to the telecommunications infrastructure at the neighbourhood level.

Broadband Network:

A Broadband Network refers to the network of digital infrastructure that supports high-speed internet connectivity in an area.

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.

1. INTRODUCTION

In Africa, the concept of smart urbanism is still relatively new and needs further exploration. However, there are a number of African cities that have already begun their digital journey towards becoming a smart city. The City of Cape Town has established some ambitious aspirations in terms of smart urbanism and is poised to be '*Africa's first truly digital city*' (City of Cape Town, 2016). The City of Cape Town started engaging in this exciting quest in the early 2000s with the establishment of *the City's* 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.

This report is the second instalment of a four-part research series carried out by the Urban Real Estate Research Unit (URERU) that investigates smart city development in Cape Town. The series aims to gain a deeper understanding of what smart urbanism means in an African context by exploring Cape Town's smart city journey.

The first report provided an overview and critical analysis of *the City's*[1] Digital City Strategy; the guiding framework for smart city development for The City of Cape Town. The previous 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 Africa's first smart city. 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, does not 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 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 discusses 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.

[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.

The structure of the report series is outlined below:

- **Report 1:** Overview and 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:** What it Means to be 'Smart' in Africa and the Way Forward for Cape Town's Smart City agenda.

Due to the radical evolution of the planning, design and delivery of cities, it has never been more crucial that *the City's* strategy sets Cape Town on the most effective path to smart urbanism. The relationship between bottom up and top down is evolving and as roles change, so must the strategy, especially if Cape Town is to maintain its goal of leading the digital race on the continent. With the understanding of *the City's* original vision, it is time to examine whether this vision has come to fruition in Cape Town before deciding the best way forward.

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 smart urbanism in Africa, but because Cape Town demonstrates best practice in Africa in terms of the thought leadership and progress of implementation around smart city development. Whilst other municipalities across South Africa and Africa do have smart city plans it is argued that they do not engage with the smart city concept in the same way that Cape Town has. Many smart city strategies that exist in Africa are not citywide strategies and lack any kind of substance. They are typically represented by isolated technocratic interventions. Whilst the previous report alluded to the fact that Cape Town does suffer 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.

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 the study was primarily based on semi-structured interviews with key stakeholders involved in smart city development in Cape Town, these involved ICT consultants, city officials, 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 supplement the interview data. The analysis for the remainder of the reports in this research series will be based primarily on interview data but *the City's* Digital City Strategy will serve as a point of reference for the interview analysis. 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 are not 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.

In the first report, 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 and their corresponding solutions (Barns, 2018). It requires a reinvention of

governance that involves transforming the way local governments work internally and how they partner with citizens and other partners (Cosgrave, Doody, & Walt, 2014). 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. The notion of a smart city is a concept and not an end state. Thus, much like other politically fashionable concepts such as 'sustainability', the smart city should be viewed as a journey and not 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.

The City of Cape Town's first internal policy document for smart urbanism was the Smart City Strategy, which emerged in the early 2000s. Various iterations of this document have taken place in the nearly two decades that have followed, and the current guiding document has been labelled the Digital City Strategy. However, there are many plans within *the City's* Digital City Strategy that could be interpreted as 'smart' in the sense that they are developing innovative solutions to urban challenges that are enabled by some technological aspect. Furthermore, the document provides the only guiding principles for ICT and urban development within *the City*. Thus, for the purposes of this research we assume that the Digital City Strategy is what guides smart city development in Cape Town, despite how it may be labelled. It is suggested that the labelling of the strategy as 'digital' is a political motivated decision as the strategy perhaps lacks the maturity and substance to be labelled 'smart' without opening up the City to scrutiny. The term 'digital' is believed to be less politically contentious.

3. CURRENT STATUS OF CAPE TOWN'S SMART CITY DEVELOPMENT: WHERE ARE WE NOW?

This section serves to offer a brief overview of the progress of Cape Town on its smart city journey, from inception to where it currently stands, and the key factors that have influenced this expedition. The section highlights that Cape Town is a leader of smart urbanism in Africa. However, whilst this is still the case, smart city development has lost traction in Cape Town over recent years. Thus, whilst the two themes appear contrasting, it is important to note that Cape Town is both pioneering yet has also lost momentum in terms of its smart city development.

"I think, in the city, generally, there's an acceptance that the technology push can be used beneficially provided you do it in a way that makes sense. And that you can use technology to bring about the social bit and developmental impact"

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

3.1. CAPE TOWN IS AHEAD OF THE CURVE IN TERMS OF SMART URBANISM IN AFRICA

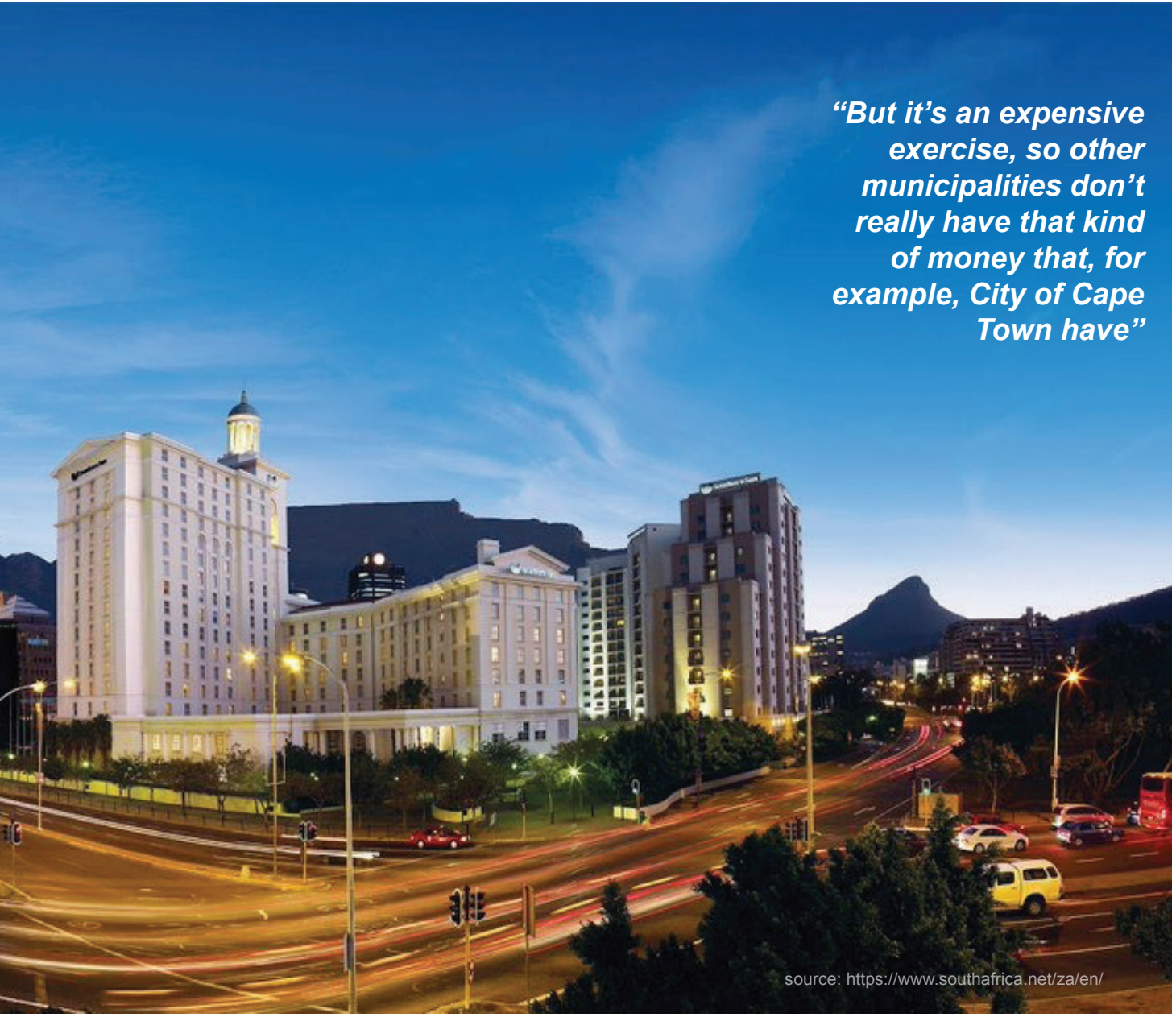
The majority of respondents confirmed that a decade ago *the City* was far ahead of other African cities in terms of their smart city plans. Cape Town is still largely considered to be leading this race on the continent, although other cities (such as Nairobi and Kigali) have begun to catch up. There are a number of factors that have contributed to *the City's* status as a leader of this space. These are outlined below.

Early Leadership in Smart Urbanism

At the genesis of Cape Town's smart city journey there was very strong leadership regarding the implementation of various technologies in improving the administrative functions of *the City*. As mentioned in the first report, this primarily spawned out of the Unicity initiative that consolidated the seven municipalities that fell within Cape Town's borders into a single overarching municipality now known as The City of Cape Town. The monumental task of merging the municipalities opened the door for innovative ideas around how best to achieve such a task. This created the political will and leadership to emerge around the use of technology, thereby enabling substantial investments into new technologies and ways of operating. What's more is that city officials that championed the creation of the Smart City Strategy (now known as the Digital City Strategy) had a wealth of experience regarding appropriate technologies for public sector use. They were therefore able to sell their vision to the political leaders by clearly articulating the benefits of ICT in delivering administrative efficiencies as well as socio-economic development. *The City* is still reaping the rewards of the strong leadership that led to early investments in technologies which were previously untested in South African municipalities. This created the foundation for subsequent smart city development. Another key factor that set The City of Cape Town apart from many other municipalities in Africa is that it has a strong city government which is able to support leadership in untested territories.

"At the time, when we did the SAP project, everybody said we were crazy…And it was for Cape Town, at that time, to have made that investment that was R300 million…That's how huge that investment was then, that took huge leadership but that leadership has now paid off in the last ten, twenty years"

Source: Darren Francis



The City of Cape Town has the Financial Resources to Invest in ICT

An additional contributing factor to Cape Town’s relative success in smart city development is the financial resources that *the City* has at its disposal to implement large-scale technological interventions. At the time of implementing the ERP system, it cost R300 million, making it the biggest capital investment by *the City* apart from the R400 million contribution to the Cape Town International Convention Centre. City officials interviewed for this research acknowledged that they had a unique advantage compared to other South African municipalities in terms of being able to finance such huge investments into ICT at a time where it was untested in the municipal context of South Africa. Whilst this was a significant risk for *the City* to invest such a vast amount on a new system, it is argued that there are few other municipalities in Africa who have the financial resources to invest in such a costly system. Again, this risk was calculated as behind it was a very clear understanding of what was needed to be achieved and how to achieve it. As a result of the strong display of leadership around smart urbanism, many of *the City’s* directorates understood the benefits of introducing ICT and were willing to invest more into emerging technologies. Additionally, *the City’s* ambitions were aided by the supportive role of the Western Cape Government.

Skills and Investment in Emerging Technologies

Cape Town and Stellenbosch are Africa's best performing tech hubs. As a result, there is a vast pool of tech-enabled skills that sits within Cape Town and its surrounds. This means that the investment mechanisms that drive tech-related industries are established and there is a significant amount of Foreign Direct Investment (FDI) that Cape Town receives in technology and web-based industries. Consequently, there are the skills and financial resources to support experimentation and innovation in tech-related sectors in Cape Town, which provides vast benefits for smart city development. The City of Cape Town government has done a lot to support the tech industry which, in turn, has an impact on city officials as there is an exchange of ideas between public and private sector. This has led to *the City* having a relatively robust understanding and acceptance that technology can be leveraged to drive urban development. Additionally, and unlike many other municipalities in South Africa, The City of Cape Town is able to attract talent as it is widely viewed as the best run municipality in the country. The above two factors have meant that *the City* can be less risk averse when it comes to innovating with new technologies as there is a confidence in their own understanding of the technological interventions that they aim to introduce. Subsequently there are a number of innovative initiatives that are germinating from *the City*, some of which are not only pioneering at a regional scale, but also at a global scale.

source: https://sabrangindia.in

3.2. THE CITY HAS LOST MOMENTUM IN TERMS OF SMART CITY DEVELOPMENT


Source: Humanrightswarrior.com

Despite Cape Town still being a leader in terms of smart city development in Africa, much of the early ground made by *the City* has been lost in recent years as the implementation of the strategy has experienced diminishing momentum. There are a number of reasons for this, some of which will be outlined below.

Political Restructuring of The City of Cape Town

"....and then what happened was the city went through their own kind of redesign and they had lots of leadership battles. And IT shifted from like one head of something to another, and so in that process you lose a lot of momentum"

The recent political restructuring that took place at The City of Cape Town in 2016 has had a significant impact on Cape Town's smart city development and it is posited that this is the overarching factor that has fortified this loss of momentum.

From an operational perspective, the restructuring consumed a lot of institutional capacity, thereby diverting resources away from many aspects of *the City* that weren't considered to be an immediate priority. This has been confirmed by both media reports and the sentiments of the respondents. Moreover, respondents outlined that there was also a great deal of uncertainty and many city officials lost enthusiasm or the will to drive a strategy that had no assurance regarding its future direction. Political leaders who bought into smart city initiatives were often not permanent enough role-players or would prioritise their survival in the organisation rather than driving innovation in smart urbanism. During this period *the City* was characterised by a sense of uncertainty and constant flux. Respondents alluded to a number of leadership battles, resignations and redeployments, resulting in plans being re-evaluated, changed or even dismantled completely with each replacement of a new political member or city official. This meant that a lot of initiatives within *the City* failed to gain traction, and the ones that did often lost impetus when the responsibility shifted, or departments were restructured. Nearly all respondents emphasised that the reshuffling of *the City's* organisational structure was a major barrier to the further evolution of the smart city strategy.

"…just over the last period of the ex-Mayor we were speaking to her about the digital strategy on a bi-monthly basis, telling her what the strategy is about, getting her buy-in, getting her support. And then, new Mayor…Now we have to start with the new leadership again"

The Smart City Vision has not Evolved

The political restructuring has also impacted the vision underpinning the smart city strategy as focus shifted from the further development of the strategy and things were put on hold pending the outcome of the political uncertainty. This refers to both expanding on current initiatives and furthering their development, and also incorporating new ideas and initiatives into the strategy.

A key factor for the success of any organisation in the tech space is being able to quickly adapt and adjust their strategy along with changing technologies. The same applies to Cape Town and its smart city agenda. New technologies and ways of operating are continuously emerging and this demands that city governments choose how to engage with these innovations. For example, two decades ago ERP was the big new idea, now fields such as cloud computing, advanced data analytics and machine learning are regarded as more relevant. *The City* has been slow to respond to these new innovations and the opportunities that can be developed out of them. Furthermore, *The City's* Digital City Strategy has not been updated in over three years, which is a significant amount of time when viewed in terms of recent technological advancements, particularly around smart urbanism.

"After our SAP implementation and the like– we've plateaued out. Other municipalities that were watching us have now surpassed us"

In addition to the above, *the City's* strategy for smart city development should not only evolve to reflect the latest technology, but also incorporate new ways of thinking and new ideas around smart urbanism. The field of smart urbanism is still relatively young and the foundation of knowledge that underpins it is constantly changing and updating. If Cape Town wants to remain ahead of the rest in terms of smart city development in Africa then *the City's* strategies must be built upon a solid foundation of knowledge, which requires keeping pace with cutting edge thought leadership that is taking place in smart city discourse. Presently, the smart city development of Cape Town reflects a business as usual mentality where they are still riding the wave of success emanating from the ERP implementation. As a result, the early innovative ripples have stagnated, and *the City* has lost ground in terms of being at the forefront of implementing smart city concepts.


Source: African News Agency (ANA)


Source: © Provided by Daily Maverick

"…they* [The City of Cape Town] *were really like the flagship in the country. I think they've stagnated because they haven't adjusted their plan. Because the thing around this kind of new volatile world is you continuously have to adjust"

Early Leadership is no Longer There

As stated previously in this section, the beginning of Cape Town's smart city journey saw a very strong sense of leadership on both a political level and from city officials pushing for the introduction of technology to drive and support core city functions. For the most part, this set Cape Town on a trajectory that was unparalleled in smart urbanism in Africa. However, there has been a waning of such leadership at various levels from within *the City* over the past five to ten years. The early leadership that initiated the implementation of the SAP system was supported by a clear and common vision of what was needed and how this would be achieved. This, in turn, enabled *the City* to forge strong partnerships with private sector and other organisations to further drive smart city objectives at a broader level. In other words, having a clear vision and leadership allowed various outside organisations to buy into the principles and play a more active role in driving them out across the city. This is a crucial aspect of smart city development. The result of this waning leadership is that a clear vision for the future of Cape Town's smart city development has been unable to emerge. There was no longer a clear direction nor a clear basis on which to build partnerships and drive a coherent strategy. Additionally, the departure of key personnel meant that a comprehensive understanding of the benefits of smart urbanism largely disappeared and there was no longer anyone passionately defending smart strategies.

Essentially, the breakdown of leadership was due to a number of aspects: firstly, the political reshuffling (as mentioned above) stalled a lot of *the City's* operations. Secondly, key officials championing smart city development left leaving a vacuum of knowledge, skills and passion to lead the way forward. Thirdly, amidst other pressing priorities, political interest in smart city initiatives disappeared. Finally, the complexities of driving a smart city strategy increased as it has matured, meaning that developing a clear vision (and the leadership emanating from that) a much more challenging task than it may have been twenty years ago when the early leaders championed the initiation of the Smart City Strategy. Despite this, it is worth noting that there are certainly leaders within this space at *the City*. The challenge is that there is a lack of a coordinated vision able to link the various initiatives that are being championed into a clear and common vision that can be driven across *the City*.

"The thing is that, I think, part of the problem was there were a lot of strong leaders in IT, who were really driving the Smart City, who left."

The City of Cape Town has the structures in place to continue on its course of becoming Africa's first smart city. However, the recent political restructuring has had a stalling effect on the further improvement of smart city development and there has been a loss of momentum. *The City* is, however, very aware of this loss of impetus, as highlighted by the various respondents, and is working on making up for lost ground to get *the City* back on track in becoming a shining example of what can be achieved in the African context. This requires strong leadership that drives a clear vision that the organisation can get behind with confidence. There are a great deal of innovative and passionate minds in the city driving various pockets of innovation, and these innovations are propelled by departments that have a clear idea of their own objectives and an understanding of what technological interventions can support the achievement of those objectives. The issue is that there is nothing tying these objectives together into a coordinated strategy for *the City*, making smart city initiatives undirected and disjointed, ultimately limiting their efficacy. Despite the early successes of the strategy, a truly citywide strategy for smart city development has never been established and this is key to propelling *the City's* aspirations for the future. The following section will dissect the various characteristics that underpinned the progress of Cape Town's smart city development to date.

4. CHARACTERISTICS OF CAPE TOWN'S SMART CITY DEVELOPMENT

The following section discusses the key characteristics that supported the advancement of Cape Town's smart city development to where it is today. These characteristics relate specifically to the actions of The City of Cape Town government and how the various strategies deployed by *the City* can be characterised. Whilst this is not an exhaustive list, what follows are key themes central to how *the City* advanced smart urbanism from the genesis of the smart city strategy in the early 2000's until now.

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

4.1. THE CITY OF CAPE TOWN'S DIGITAL BACKBONE

"Cape Town was perfectly poised to be Africa's first significant smart city because of the fact that it is the world's largest municipal implementation of SAP"

Source: UTreee

From the beginning of their digital journey, *the City's* smart city objectives have been strongly characterised by their IT backbone which is, in effect, a foundational building block of smart city development. This primarily refers to the ERP implementation that used SAP software to digitise the organisation's back office. This created integration between departments, reduced processing costs, moved people to value adding activities and improved *the City's* revenue stream. The result was the establishment of a world class and very stable digital transactional platform. In many ways this embedded a different model of operation within *the City* and paved the way for Cape Town to become South Africa's best run municipality.

"So, our core systems, the stability of our core systems is the key characteristics because it works two ways. I could have everything in the ground and all of those things but if I don't have this core stable backend it means nothing to me"

Furthermore, the back-end infrastructure was powerful in that it created opportunities to develop more on-line services and other tech-related interventions to be built on top of the existing ERP system. As such, most of the research respondents spoke of the SAP implementation as the basis for many of *the City's* smart interventions. Essentially, this digital backbone allows the plug and play of other tech-related interventions, setting Cape Town apart from many other cities, not just in Africa, but across the globe. Nearly all the respondents agreed that this digital backbone put *the City* on an early path to success in terms of smart urbanism.

Because The City of Cape Town established this digital backbone at an early stage, they have been able to build up the skills and experience around the ERP platform. This has resulted in them perfecting the system and building onto it. Many cities of the Global North, with far greater connectivity and access to technology, lag behind Cape Town in terms of aspects such as back-office functions as they did not develop the back-end infrastructure from the outset. As stated previously, this affords Cape Town the unique position of having a solid foundation upon which to build on its smart city development.

Despite this, respondents also raised concerns about relying heavily on a single, monolithic system in a world where rapid technological advancement necessitates flexibility and the ability to respond quickly to opportunities that arise on the back of new technology. The ERP platform is now the single-most important database within *the City*. Another concern is that in many ways the valuable skillsets built around the ERP platform have become one-dimensional, which limits innovation in other areas. There is a strong concentration of IT skills centred around the ERP platform and over half of the 1000 strong Information Systems and Technology (IST) department[2] are deployed to manage the transactions of the ERP platform. Respondents highlighted the pros and cons of having a monolithic system that is very stable and reliable, yet difficult to change and is not responsive to altering technological conditions. However, most argue that, given the core administrative functions of a municipality, being able to depend on a very stable and reliable administrative environment is necessary, even if it is at the expense of being more innovative and receptive to change.

That being said, the functionality of the ERP platform has been improved with the development of skills around the system. Back in 2003 the ERP system was running at approximately 60% of its capabilities, now it is up to 90% capability. *The City* is beginning to explore other avenues other than the ERP system moving forward.

Whilst *the City* was pragmatic in investing in digital systems such as ERP at an early stage, this platform offers little practical use unless it sits on a network that allows the various information inputs to be connected to the central ERP platform. This underlines the importance of having the requisite digital infrastructure to unlock opportunities to embed smart initiatives into the organisation.

"And sometimes having that hard-coded way of working provides the stability that the city needs during times of instability"

Source: Darren Francis

[2]The Information Systems and Technology department is also refeered to as the IT department of the City of Cape Town.

4.2. THE CITY'S FOCUS ON DIGITAL INFRASTRUCTURE

Nearly all of the research respondents highlighted the critical role of digital infrastructure in Cape Town's smart city development. Digital infrastructure[3] is essentially the base of any city's smart city pyramid. IT networks, applications and smart devices producing real-time data, are all built on top of digital infrastructure. For example, from a safety and security perspective, CCTV cameras, emergency services' applications, and Internet of Things (IoT) devices such as gunshot detectors would first need to plug into a broadband network, and secondly onto a platform like the ERP/SAP system. Thus, the infrastructure that supports the broadband networks are the first step to those smart city interventions.

A significant challenge around developing smart city capabilities is the lack of digital infrastructure and the connectivity that it provides. The City of Cape Town has recognised the connectivity constraint that exists and is pushing hard to provide some form of stimulus for connectivity across the city, particularly where there is a lack of a strong formal economic centre, such as in an area like Khayelitsha. It is important to note that connectivity is not purely important to support 'smart city' interventions like IoT and digitised service delivery. Perhaps, more importantly, it provides many socio-economic opportunities, as having internet access enables entrance to an invaluable supply of resources and services that has a critical role to play in lifting people out of poverty. Therefore, the role of digital infrastructure in Cape Town is broader than merely providing a platform for establishing digital service delivery systems.

Recognising the vital role that connectivity will play in the future development of Cape Town, *the City* developed an innovative way of catalysing connectivity in poorer areas whilst also advancing their own operational aspirations. They achieved this by building their own connectivity. Essentially, what this means is that *the City* linked all of its municipal buildings with digital infrastructure that it owns. Meaning that they did not need to procure the services of an Internet Services Provider (ISP) and plug into an existing network that did not service poor communities where it is not economically feasible for ISPs to do so. Presently over 900km of fibre has been laid down and over 200 municipal buildings are connected to this network.

[3]Digital Infrastructure refers to the cables, switching facilities, and equipment needed to create and support telecommunication networks and services, computing facilities, computers and devices that connect to these networks (City of Cape Town, 2016).

"So the broadband infrastructure is a huge opportunity for them* [The City of Cape Town] *because once you do that you suddenly can e-enable just about everything"


source: https://www.weforum.

"So, when we started Unicity it was about automated back office. A decade later, it has all been about Wi-Fi and broadband…"

The capacity on the fibre cables connecting the various clinics, libraries, and other municipal buildings was far beyond what *the City* needed for the purposes of their municipal functions. The intention was to use the spare capacity to entice ISPs to bring internet to areas where private organisations wouldn't get a return on the capital investment associated with building the network. Essentially, The City of Cape Town became a Telecom, but one with a social agenda. This meant that ISPs would not have to undergo the costly exercise of laying down a fibre network and would only need to cover the costs of last mile access.

The whole idea was to try and make a backbone of digital infrastructure (using municipal buildings) and to use the spare capacity to drive socio-economic development thereby bridging the digital divide by providing free or affordable Wi-Fi in areas such as Khayelitsha and Mitchells Plein, off the back of *the City's* fibre. At the same time this enabled *the City's* offices and clinics in these areas that previously had no connectivity, to plug into the digitised back office of *the City*.

The City had achieved great successes with the early phases of this initiative, but the project has slowed significantly due to the costs of providing fibre cable with such high capacity. This meant that there was not enough revenue from the ISPs to recapitalise the investment and expand the network. What emerges from this challenge is the importance of balancing investment decisions in an African context where municipalities are more fiscally constrained than municipalities of the Global North. Whilst the initiative was innovative and forward-thinking, it was also a very expensive task. Balancing these trade-offs is crucial to driving smart city development in an African context. Therefore, it is imperative for the smart development of African cities that the appropriate and strategic use of technology is considered before implementing smart city strategies. Despite the current uncertainty around *the City's* broadband project, they have exhibited the experience to make strategic investments in technology at the right time. This is explored in more detail below.

"Until government figures out a model of providing affordable connectivity at scale, smart cities in Africa will always be for the elite"

4.3. THE STRATEGIC USE OF VENDORS/TECHNOLOGY PROPRIETORS

A further characteristic that defined *the City's* smart city development is the strategic use of vendors or suppliers of technology. This is important to note as many have criticised the smart city concept as being a tool for tech vendors to infiltrate new markets, namely city governments, and use their brand to direct cities to invest in technologies and services that they do not necessarily need. The two previous characteristics identified in this report are examples of how *the City* was strategic in their decisions to procure (or not procure) services from outside organisations.

The decision to use SAP for the ERP platform was not led by the vendor but was a solution that was purposefully selected based on a clear understanding of what was required. At the time of deciding on an ERP system, *the City* needed a business process integration platform to consolidate the seven separate municipalities into a single entity. Until then a municipal ERP implementation of this magnitude had never been undertaken and it was a significant risk. The IT department were unwilling to take the risk on an in-house solution and opted for the tried and tested SAP platform offering a very reliable and stable ERP software. Similarly, *the City* decided to build their own network instead of approaching a Telecom so that they could have more control over the specifications and the areas in which the network extended to. It also allowed them to pursue a broader vision of partnering with ISPs to bring affordable connectivity to marginalised areas of the city.

The strategic use of tech and procuring technology also extends to decisions regarding *the City* developing its own technology in circumstances where they need something bespoke that is specific to their needs. This was the case for the Emergency Policing and Incident Command (EPIC) system, which provides an integrated and multi-disciplinary real-time response system to matters relating to public safety across the city. Safety and Security couldn't find a vendor driven platform that was flexible enough to adapt to disaster management, fire and policing, so they built their own for a fraction of the initial and cumulative subscription fees. The platform has been a huge success so far. The EPIC system links into *the City's* ERP platform.

"…We were able to say, 'The industry isn't going to bamboozle us. We know what works in large organizations'… What we're very proud about, in terms of our smart city strategy, is that we trolled and listened to the market, but we had our own strategy. Our strategy wasn't to go SAP, IBM or Huawei"

Other times, *the City* realised that dedicating resources and manpower to developing a particular technological intervention is not the most efficient use of their resources, or they might not have the requisite skills to develop a certain solution. In this case it would make more sense to procure the services/technologies of a vendor. This is the case with the metro police using Samsung tablets as their personal devices to record crimes and to issuing fines etc.

Behind *the City's* characteristic of choosing vendors strategically, for a specific task, at a specific time, is a firm understanding of what the City requires and how various technological offerings can assist in achieving these requirements. This takes a deep understanding of IT and how it impacts the city as well as the leadership and vision for driving key objectives. This indicates a level of leadership and expertise that is often missing in smart city agendas of other African cities. This leadership and skills have been primarily based in the City's Information Systems and Technology (IST) department. As a result, the strategy is largely devised and implemented by the IST department. The following subsection provides some insight into this characteristic.

source: https://www.radissonhotels.com

4.4. THE STRATEGY IS DRIVEN PRIMARILY FROM THE INFORMATION SYSTEMS AND TECHNOLOGY DEPARTMENT

Given the nature of the type of interventions that are often central to smart city initiatives, it is not surprising that the City's smart city development is regarded as driven and led by the IST department (also referred to as the IT department). From the establishment of the first smart city strategy at The City of Cape Town, the IST department has played a central role in devising and actioning the ideas and concepts around smart city development. Hence, the IST department is widely recognised across the ity as being the owner of smart city strategy. Whilst in many ways this makes sense as the vast majority of skills associated with technology and its implementation within the municipal system are likely to be concentrated in this department, there are two key concerns relating to this characteristic. Firstly, the organisational structure of *the City* is such that the IST department has limited influence on the broader organisation. Secondly, having a strategy defined primarily by the IST department results in the proposal of predominantly IT solutions as opposed to more considered and holistic solutions. These two factors will be discussed in more detail below.

In order to better understand the shortcomings of the IST department driving the smart city strategy, it is necessary to situate the department in relation to the broader city government structure. Figure 1. (Page 23) provides an overview of The City of Cape Town's Executive Structure from the various departments and directorates right up to the Mayor. From Figure 1. (Page 23) it can be seen that the IST department is housed in Corporate Services, one of the 11 directorates that make up the Executive Management Team, the section of the organisation made up of city officials[4]. Each directorate is represented by a politician/ councillor thereby forming the Mayoral Committee (Mayco). Looking at the various directorates and their departments it is clear that smart city strategies will intersect many (if not all) of the directorates across *the City's* organisational structure. However, there are many departments and directorates that do not provide input to overarching strategies relating to smart city development. All of the respondents highlighted that the smart city development must sit higher in the organisational structure so that it can be implemented as a citywide

[4]City officials are essentially civil servants who are not viewed as political figures. The Executive Management Team is made up of 11 directorates with each directorate consisting of a number of departments. The City Manager oversees the Executive Management Team. Above the Executive Management Team sits the Mayoral Committee which is made up of the political heads of each of the 11 directorates and is overseen by the Mayor.

"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. I think a smart city strategy needs to really sit at the top"

Source: multichannelmerchant.com

"I say the concern is that it becomes an IT thing which it shouldn't be. The innovation shouldn't be limited to just technology, there should be other opportunities…"

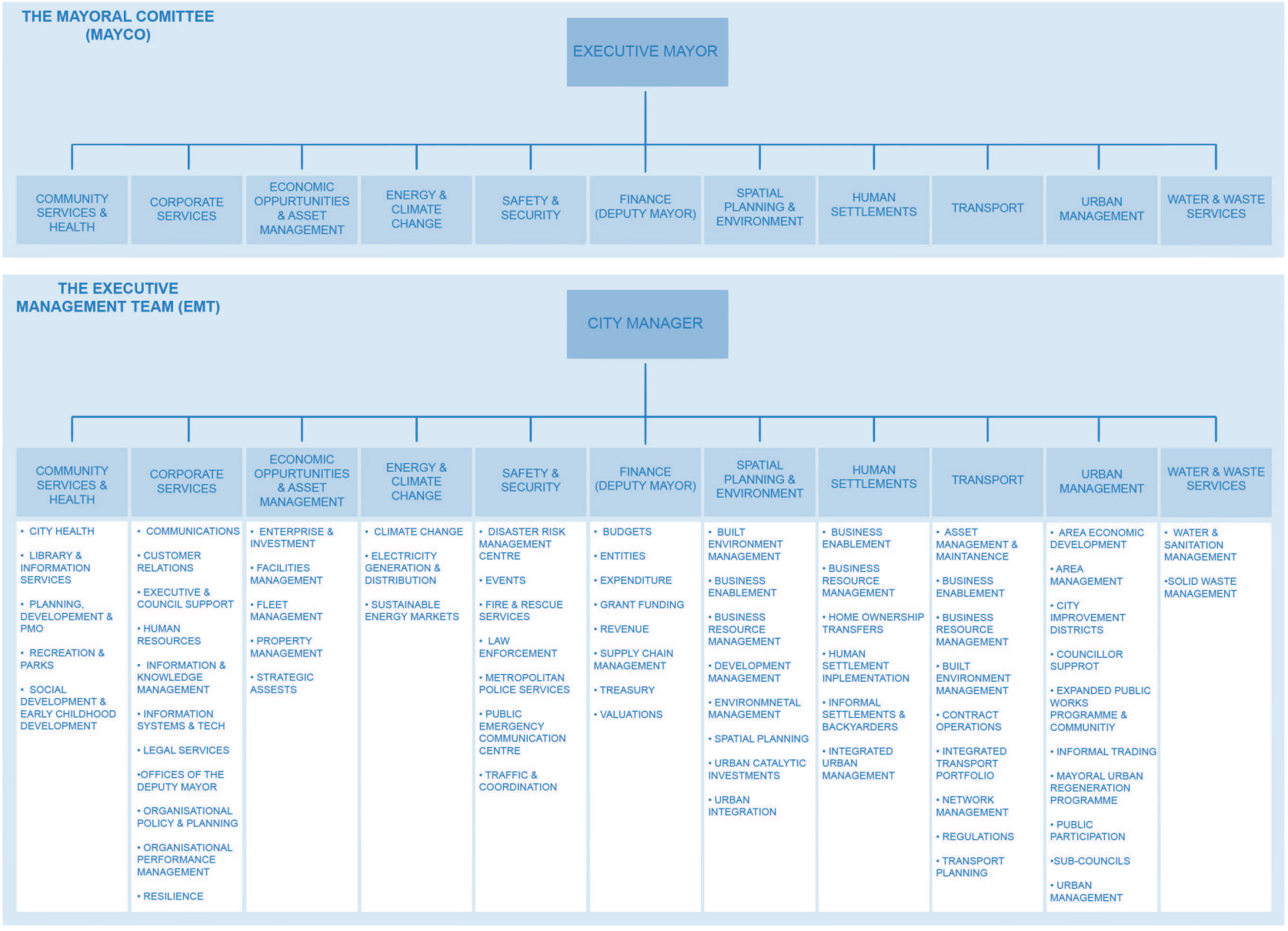


FIGURE 1: CITY OF CAPE TOWN EXECUTIVE STRUCTURE

Source: City of Cape Town (2016)

Smart city development's current position in the organisational structure indicates that it is not very high on the political agenda of *the City*, another point that was identified by respondents. Therefore, the strategy is only really driven in any sense of coherent form by a few champions at the department level which is deep below the political coalface. These champions have limited political influence and little ability to provide initiatives with the necessary traction to gain support across the organisation. The result is that there is little tying the strategy together across *the City*.

The fact that the smart city strategy has been housed and driven from the IST department has meant that the strategy tends to be more operationally focused rather than one with a broader, proactive vision. This is perhaps a legacy of the ERP implementation, which has been a central aspect to *the City's* smart city strategy since its inception. The ERP was very much an operational intervention and the majority of the skills development that has taken place around ICT in *the City* has been centred around this platform, instilling an internally-focussed and operational approach to smart city development. This is evidenced by one respondent who described IST's approach to data as viewing it as transactional without understanding the analytical opportunities it presents. Additionally, like many other municipal departments, IST has capacity issues and *"their main primary goal is just to keep the ship afloat."* This refers to the department's function of keeping the ERP platform running which further limits their ability to provide strategic role in developing implementation strategies around smart urbanism.

Many of the respondents stressed that the IST department should be viewed as an enabling department for smart city strategies and not where the strategy is housed or developed from. In other words, technology is the enabling mechanism for smart city development and not the strategic lens through which to conceptualise a smart city. As mentioned earlier, this conceptualisation needs to take place at a higher level, for example, at the City Manager or Mayoral Committee level. It is widely acknowledged that the IST department needs to be central to the conversation of how to devise and implement smart city strategies (as well as advising on what is possible and feasible), however, it is argued that they do not have a broad enough insight into the core objectives of *the City* to be able to adequately define what smart urbanism should look like in Cape Town.

The challenge is that there is limited understanding outside the IST department about smart city concepts and what is possible within this space. In the absence of this, IST has assumed the responsibility of formulating the strategy in a reactive rather than proactive capacity, developing and growing a strategy out of emerging necessities rather than looking at the policy direction of the city as a whole and formulating a carefully curated plan of action around that.

This section provided some analysis of the characteristics that have defined The City of Cape Town's smart city development from its inception until now. The following section provides some insight into how these characteristics relate to *the City's* guiding policy document for smart urbanism. In addition, we discuss how these characteristics speak more broadly of *the City's* approach to smart urbanism and how this may affect the future trajectory of their smart city aspirations.

source: https://sabrangindia.in


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

5. DISCUSSION

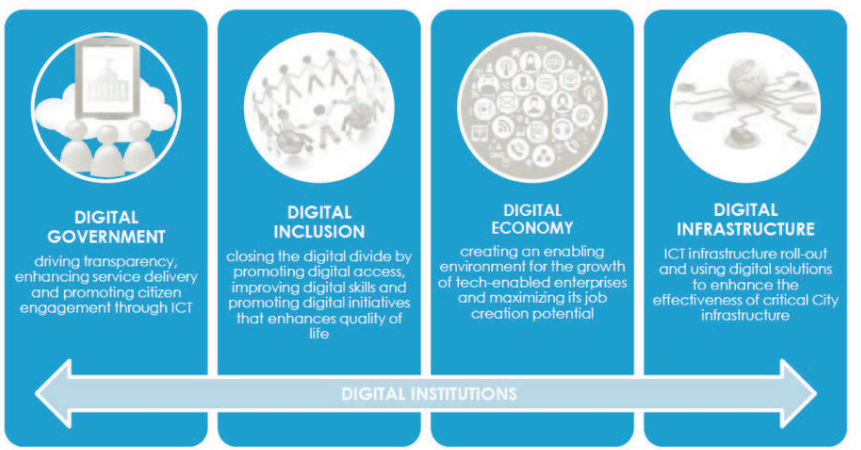
The following discussion uses the analysis of the previous section to link the characteristics of *the City's* smart city development to their guiding Digital City Strategy. Furthermore, based on the characteristics outlined above, the discussion more broadly examines *the City's* current approach to smart urbanism and how this may need to evolve to achieve its smart city aspirations.

5.1. LINKING THE CURRENT STATE TO THE DIGITAL CITY STRATEGY

The previous report provided an overview of The City of Cape Town's Digital City Strategy; the overarching framework for Cape Town's smart city development. This strategy document has four pillars: Digital Government, Digital Economy, Digital Inclusion and Digital Infrastructure. From the analysis of the data collected from various city officials, politicians, and other key stakeholders in Cape Town's smart city development, it becomes clear that there is a lack of consistency relating to the implementation of the strategy and it is primarily implemented through the Digital Infrastructure and Digital Government pillars. This underlines the fact that having a guiding policy document is valuable, but it needs to be translated into actions across the organisation in a consistent manner for the implementation to align with the strategy. This adds weight to the finding in the previous report that the Digital City Strategy lacks substance and, in order to be effective citywide, it needs to be fully embedded in the organisation. Presently, the city has not developed a coherent citywide strategy for smart city development. It is argued that such a strategy is necessary to reignite the original flames that drove pioneering advancements within smart urbanism in Cape Town.

Whilst *the City* has made significant progress in the areas associated with digital infrastructure, and serves as an example for other African cities to follow, it is argued that more could be done to drive the proliferation of internet connectivity across the city, particularly in under-serviced communities. Many respondents identified developing digital infrastructure as a top policy priority for smart city development. Digital infrastructure forms the foundation layer of any smart city development and it is crucial in driving ICT enabled social and economic transformation. Given the inequities that exist in Cape Town and how access to connectivity provides opportunities for upward mobility and developing economies in impoverished areas, it is surprising that *the City* has not invested more time and energy into developing more comprehensive mechanisms to drive greater connectivity through digital infrastructure across all areas of the city. This outlines how, without careful consideration, smart city development can further entrench historical dynamics where the poor are denied access to the city in both a physical and digital sense.

The City of Cape Town has excelled in establishing a strong Digital Government and this has formed the backbone of *the City's* smart city development since its inception. This has become problematic in that it has created an entrenched mindset and focus within *the City*. This is particularly the case for the IST department, who are widely regarded as the 'owners' of smart city development, who have been criticised for being internally focussed, and mainly concerned about building the administrative and management capabilities of the organisation. Whilst this has meant that *the City* has built world-leading IT infrastructure and back office systems, they have also missed an opportunity to develop more citizen-centric solutions that could arguably be of more benefit for the broader population of Cape Town.



Source: City of Cape Town (2016)

5.2. TRANSITIONING FROM BEING ADMINISTRATIVELY SMART TO ECOSYSTEM SMART

The Urban Real Estate Research Unit subscribes to the idea of local government's role in a smart city as providing a digital platform/ecosystem which serves to enable an open and collaborative exchange between government, private sector, civil society and academia to develop innovative solutions and make decisions relating to issues of urban development and service delivery. Thus, a central feature of a government in a smart city would be to drive more transparent processes of urban development and governance through enabling citizens and private sector to develop solutions to issues they know and understand. In order to make strides towards this conceptualisation of a smart city, the enabling entity (*the City*) needs to focus more attention on its citizenry rather than viewing citizens merely as consumers of services when they are, in fact, also providers and enablers of those same services. This is an aspect that *the City* has struggled to respond to, and it is evidenced by the characteristics set out in this report.

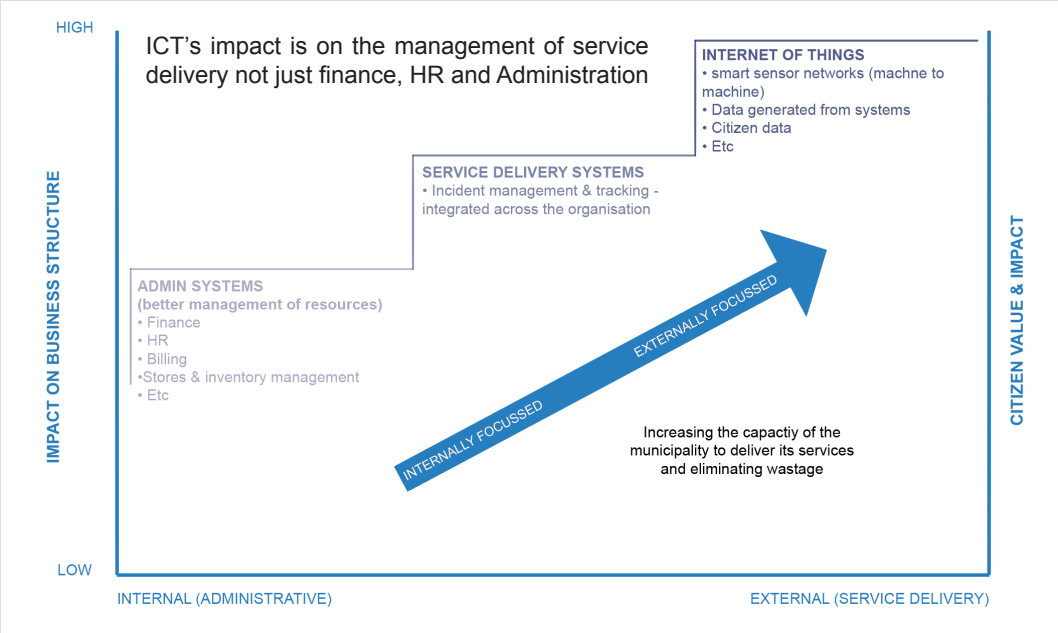


FIGURE 2: THE ROLE OF TECHNOLOGY IN TRANSFORMING CITIES & UTILITIES TO INCREASE VALUE & IMPACT

Source: P4DA (2018)

"The concept needs to evolve from just being administratively smart to being ecosystem smart. In the sense of, well, you need to engage with your citizens. So, there's no use you putting up all these types of things and he [a citizen] says he's going to use it and you don't have a way of connecting to the citizens or interacting with them… which really means trying to build an ecosystem which brings your citizen into the smart city concept"

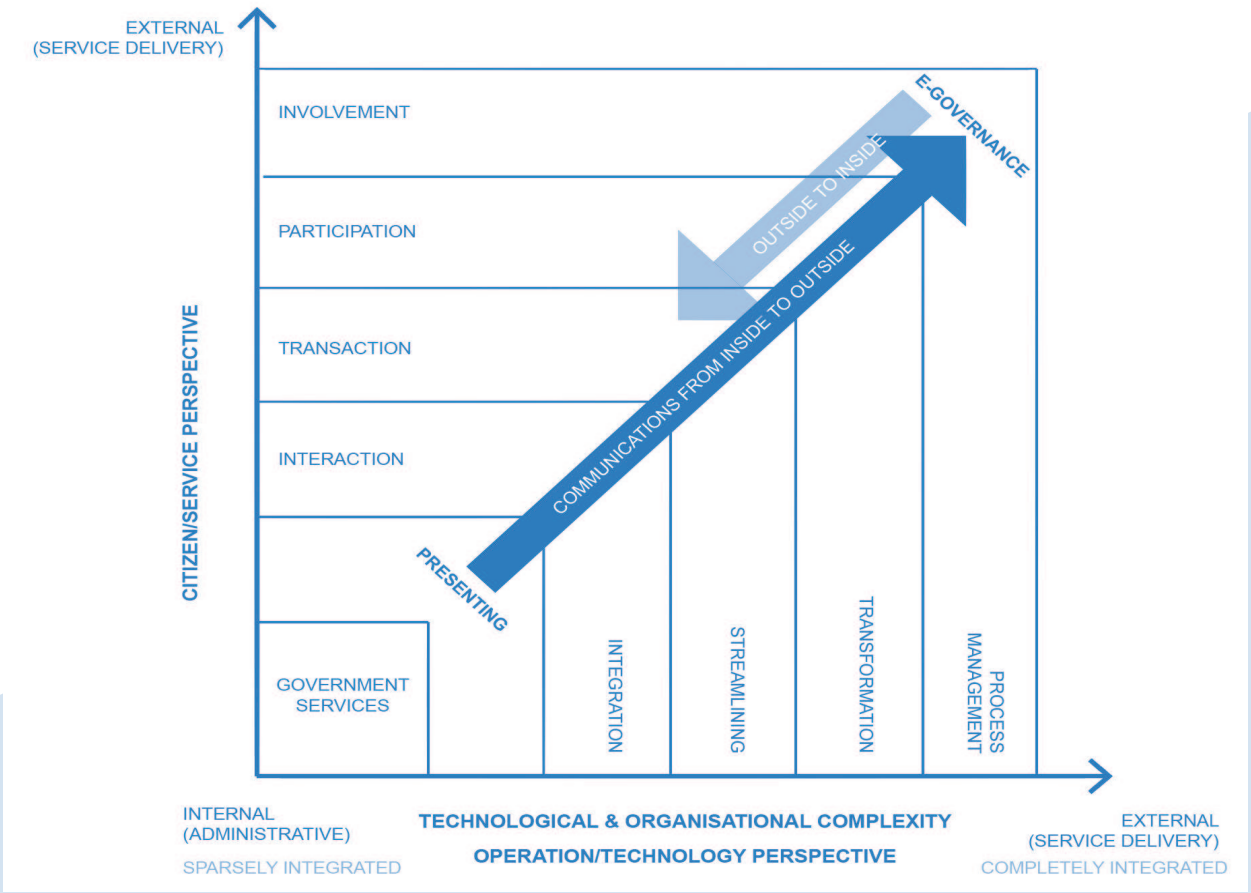


FIGURE 3: E-GOVERNANCE STAGE MODELS

Source: Adapted from Lee (2010) A Common Reference for e-Government Stage Models and African Ideas (2016) The Role of Technology in Transforming Cities

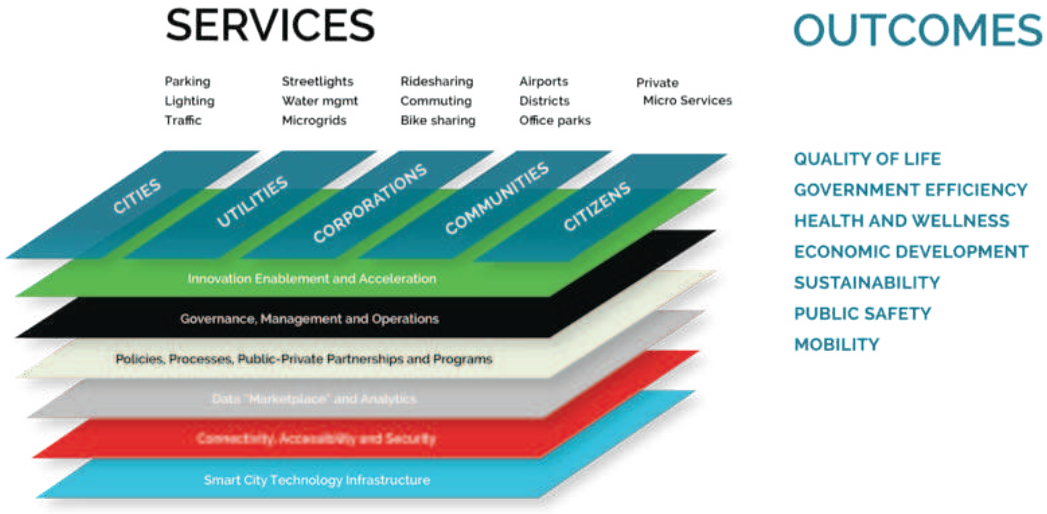
Figures 2 and 3 demonstrate the theoretical transition from being internally focused to externally focussed and the value that it adds to both citizens and government (P4DA, 2018). It is important to note that having a strong administrative base (internal) is a prerequisite for opening up the organisation to becoming more externally oriented. It also emphasises that the transformation to becoming externally focussed requires a shift in the way *the City* operates. The theoretical state called e-governance (see Figure. 3) is a situation where *"citizens are actively involved in political and administrative decision making. These decisions can be implemented in real time through the process management facilities in the e-Government system"* (Lee, 2010: p. 229). This reinforces the notion of a smart city creating an ecosystem (or e-Government system) to facilitate democratic processes of urban governance and development. Such an ecosystem would be externally focussed but would be integrated into *the City's* administrative systems. *The City* currently has the digital backbone to advance this type of governance but has not yet taken this next step.

Figures 2 and 3 highlight how technology enables the effective transition from an internally focused city government to one that is more externally focussed. Essentially, what the figures depict is how the strategic use of technology can better equip local government to facilitate the involvement of civil society and private sector. This allows non-state actors to assist in the service delivery and decision-making functions traditionally regarded as the responsibility of government. Whilst this model of governance is largely reliant on enabling technologies, it also necessitates an opening up of local government and permitting access to city data and decision-making processes. The outcome is increased input and feedback (involvement) from citizens and businesses within a city. Thus, decisions are made, and services are delivered via a two-way exchange of resources and ideas which increases a city's capacity to deliver/facilitate services and make effective decisions. The underlying premise is that the more a city government invests in the technologies and models of operating that supports this open and collaborative exchange between urban actors, the more a city (as a collective) can drive adaptive and innovative solutions to an array of urban issues and development objectives.

Having ubiquitous digital infrastructure would reinforce this approach and current infrastructure limitations may hinder the progress of driving a more externally focussed smart city strategy. However, *the City* has made the necessary infrastructure investments to get this off the ground and transform the trajectory of the current model of smart city development (P4DA, 2018). What is lacking from *the City* in this regard is not necessarily a shortfall of infrastructure to support an externally focussed strategy but the strong leadership and skills that it would take to get there. This approach would involve a significant transformation in the way *the City* has traditionally operated and the majority of the IT skills and experience housed in *the City* remains internally oriented. We argue that perhaps there presently is not a critical mass of skills and understanding to effectively create the stimulus to transition to an external state of governance. This would require city officials to recognise the importance of managing and producing accurate data and supporting the various technologies that create digital platforms for innovation.

Nevertheless, there are many officials within *the City* that understand that smart city development needs to be more citizen centric, open and collaborative. They also know that they have the IT backbone that places them in a favourable position to transition to this next level. *The City* is also investigating other aspects to drive this transformation more coherently in terms of digital architecture, infrastructure and other digital systems. However, an understanding of these principles needs to be embedded across the entire organisation. Currently, there is no clear and comprehensive understanding of these concepts, both at the political level and across *the City's* directorates. Taking this bold new step on the path to a smart city is not without its risks and will require strong and clear leadership that is supported by a clear understanding of the value this would offer *the City* and its citizens by the various departments, directorates and politicians.

This section reveals that *the City's* implementation of their Digital City Strategy is primarily focused on two of the four pillars, namely: Digital Government and Digital Infrastructure. A more comprehensive and substantive citywide strategy for smart development is required in order to drive a more consistent strategy across *the City*. Additionally, this section highlights that *the City* needs to evolve its current approach of being internally focussed to externally focussed if it aims to make genuine strides to advancing its smart city aspirations.



Source: Strategy of Things

6. CONCLUSION

While *the City* is currently ahead in Africa in terms of smart urbanism, the strategy has lost traction for a number of reasons, primarily relating to the political restructuring that took place in 2016. However, it is important to bear in mind that *the City* is still viewed as a pioneer in smart urbanism in Africa and these two factors should not be viewed as mutually exclusive, and there is still plenty of opportunity and promise to realise *the City's* ambitions around smart urbanism.

The characteristics that have provided the driving force behind smart city development to this point have largely been supported by *the City's* digital backbone, its focus on digital infrastructure such as broadband networks, the strategic use of vendors, and the strategy has been principally driven by the IST department. This uncovers the concern that smart city implementation in Cape Town is not consistently applied. It appears that there is a lack of clarity regarding what *the City* wants to achieve in terms of driving smart city strategies and what coordinated activities will translate those strategies into a reality.

Additionally, the report highlights that *the City's* approach to smart urbanism requires a paradigm shift from being internally focused to externally focussed. This means providing a platform or ecosystem that enables open and collaborative innovation. The fundamental building blocks required to launch more citizen-centric services and engagement certainly exists, but to date, no significant steps have been made to make this a reality. It is time, once again, for *the City* to take a bold step into the unknown with the understanding that educated risks can have substantial and longstanding benefits, as exhibited by the ERP implementation. In order to cultivate an environment for smart development in today's increasingly complex political and social environment, more risks will need to be taken.

Cape Town's smart city development is currently at an important crossroads and *the City* is ultimately central in determining which direction Cape Town will take. Changing the trajectory to becoming more externally focussed will take committed and clear leadership with a broader focus, where collaboration is celebrated, and citizens are central. Not only would this need to be underwritten by a comprehensive and overarching guiding framework, but the leadership will also need to be supported by a critical mass of diverse skills that understand the application of innovative smart city principles across *the City's* various directorates and how they align to a clear and common vision. With the foundation for genuine smart city development already in place, as well as the understanding of the need for strong leadership and a consolidation of current ideals, *the City* can begin to align itself with a new and more promising vision for a smart future.

"Becoming Africa's leading digital city will need a bold, coordinated and integrated approach that will cut across the whole of society" (P4DA, 2018: p.1)

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