

## Smart cities in South Africa! A case of misplaced priorities?

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### Abstract

The 'smart cities concept' has emerged as a defining and dominant discourse in urban planning. This discourse has permeated through to most South African metropolitan cities such as Johannesburg and Cape Town. Nevertheless, the question remains, do we really need smart cities in South African and other cities in Africa mired in poverty and inequality juxtaposed with wealth and un-paralleled information and communications infrastructure? This study argues that although the smart cities concept is a noble and viable approach, it often leads to undesired outcomes in South Africa because urban managers have hastily applied the smart futures approach. Moreover, what the people really want is not smart cities but an end to poverty, inequality and poor living conditions. If this drive towards smart cities continues unabated it will further entrench spatial segregation and inequality which were the hallmarks of apartheid planning in South Africa. Perhaps what is needed is a rethink of the smart cities concept, one that has been readapted and redefined to suit South Africa and developing countries in general, rather than imitating the developed world. A smart city strategy that meets citizen's needs is also needed.

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## 1. Introduction

Smart cities have been emerged as a buzzword amongst urban planners and in urban planning circles. There appears to be a race of cities wanting to be smart, yet many cities do not clearly comprehend what a smart city is. Smart cities have often been equated to the increased use of information and communications technology (ICT) in urban planning. Smart cities are often associated with the use of ICT such as, sensors, big data, web mapping, geolocation-based services, volunteered geographic information and the Internet of things etc. All these advances in ICT have meant an increasing supply of data to assist urban planning (Gruen, 2013; Hancke, Silva, & Hancke, 2013; Hashem et al., 2016; Zanella, Bui, Castellani, Vangelista, & Zorzi, 2014). Consequently new possibilities to guide and inform urban planning have opened up (Abella, Ortiz-de-Urbina-Criado, & De-Pablos-Heredero, 2017; Geertman, Ferreira, Goodspeed, & Stillwell, 2015; Li, Shan, Shao, Zhou, & Yao, 2013). Smart cities are not only about the use of information and communications technology (ICT) in urban and regional planning, but it pertains planning that promotes relearning, adapting, collaboration, participation and planning for the future (Ching & Ferreira Jr, 2015). Ching and Ferreira (2015) define smart cities using four themes, namely (1) “smart machines” and informed organizations, (2) engaging communities, technology providers and research institutions (3) (re)-learning and adaptation, and (4) investing for the future (Ching & Ferreira (2015). Smart machines and informed organisation implies that for cities to be smart there has to be adoption and increased adoption of ICT in planning related tasks. Smart cities call for the use of indicators to measure progress and this is even expressed in the New Urban Agenda 2030 in sustainable development goal 11 (Caprotti et al., 2017). Smart cities therefore have to leverage the ubiquitous data available to produce indicators useful for urban planning. The use of ICT in cities also enables smarter urban development, efficiency, improves service delivery, improve individual mobility, better access to information and services, save energy and resources and increasing citizens participation in the planning process (Batty et al., 2012). ICT is not the beginning and end of the smart cities but collaboration between community, technology providers, research institutes and public private partnerships are essential components of smart cities. Likewise for cities to be smart (re)-learning and adaptation need to be enabled. (Re)-Learning implies learning from other cities and best-practices for example; the European smart cities network (Giffinger & Gudrun, 2010; Rudolf et al., 2007). The (re)-learning and adapting is the ability to measure performance using measurable metrics or performance indicators. Use of

indicators is very crucial in light of sustainable development goal 11, which relies heavily on indicators. Nevertheless, in many in developing countries cities are often hesitant to assess performance as a result of political pressure, fear of public outcry and fear of political parties to loose votes (Musakwa, Tshesane, & Kangethe, 2017). Lastly, cities continuously need to think and invest in the future.

Smart cities are also described as possessing 6 key endowments namely (1) smart economy, (2) smart environment, (3) smart people, (4) smart governance, (5) smart mobility and (6) smart living (Giffinger & Gudrun, 2010). Giffinger & Gudrun (2010), define a smart city as a city that is well performing in these 6 characteristics, and a city that promotes activities of self-decisive, independent and aware citizens. Such a definition is comprehensive and it goes beyond equating smart cities being equated with ICT. There are numerous examples of smart city initiatives in the developed world (Abella et al., 2017; March, 2017). In the developing world cities have also embraced the smart city concept with India's attempt to build 100 smart cities, a key example (Charles, 2016). This is a noble and ambitious project that seeks to rejuvenate 100 selected cities in India of which currently, only 20 are selected. The project plans to invest \$7.5 billion to enhance physical infrastructure in (water, energy, built environment, waste, mobility and ICT) and social infrastructure (health, education and recreational facilities) (Charles, 2016). Nevertheless, there are challenges in this ambitious project such as governance issues, the business environment and misplaced priorities. It can be misplaced because it is argued that the citizens in India just want decent housing, roads and water not a futuristic city built on technologies (Lakshimi, 2015). Although smart cities are a noble initiative in developing countries, there is a need to comprehend the capacity and resource constraints of establishing smart cities (Odendaal, 2003). The geographic location, the social and economic landscape, and the availability of resources play an important role in creating smart cities in developing countries (Davison, Vogel, Harris, & Jones, 2000; Neirotti, De Marco, Cagliano, Mangano, & Scorrano, 2014). Smart cities may not be the only solution but in fact create bigger problems as inequality sustainability issues and social apartheid may emerge particularly in developing countries (Harrison, 2017). Accordingly, the aim of this study is to document smart city initiatives in South Africa in three cities (Johannesburg, Cape Town and Ekurhuleni) and to highlight the challenges and the need to juggle priorities in establishing smart cities in developing countries.

The remainder of the paper is structured as follows. The next section profiles smart city initiatives in three cities and the next section discusses if smart city initiatives have been a success or are misplaced priorities and lastly the conclusions are presented.

## **2. Smart City Initiatives in Johannesburg**

Johannesburg is South Africa's largest city and its economy hub and it is located within the Gauteng province. It has a population of 4.5 million (Statistics South Africa, 2012) and it is located adjacent to two metropolitan municipalities of Pretoria and Ekurhuleni and together they make the Gauteng city region. Johannesburg's smart city initiatives mainly focus on smart machines and informed organizations, and smart mobility. The City of Johannesburg has focused on getting citizens connected to the Internet and this has been possible through the city partnering with corporate entities (Johannesburg, 2016). Some of the projects include making the city a massive open online varsity, by connecting fibre internet to public libraries, use of state of the art video learning in libraries, free Wi-Fi hotspots in the city, training of youths in ICT, smart policing through closed circuit television (CCTV) surveillance, the digital ambassadors programs which trains households in digital literacy and the e-health project that was piloted in 15 clinics. The city argues that ICT will transform the city (Johannesburg, 2016). In the smart mobility domain, the city of Johannesburg has promoted non-motorized transport and the city embarked on a 70 million South African Rand project to build cycling lanes in Johannesburg CBD and in nodes such as Sandton (Johannesburg, 2015). Likewise, the city has also focused on promoting the use of public transit systems. Accordingly, the city is promoting transferring demand from private cars to public transport is an integral part of smart mobility. The city of Johannesburg has established a bus rapid transit system known as the Reya-Vaya project. Rea-Vaya is arguably Africa's first full Bus Rapid Transit (BRT) and it was mainly meant to improving the quality of life of the city's residence through a public transport system (Reya-Vaya, 2017). Reya Vaya operates in Region A to F in the Johannesburg Metropolitan City. It has completed the construction of Phase 1A and 1B and currently developing Phase 1C. Rea Vaya's Phase 1A has a trunk route operating between Ellis Park in Doornfontein and Thokoza Park in Soweto, linking with several feeder routes in Soweto (Reya-Vaya, 2017) (Figure 1). The inner city circular route (Figure 2) travels around the CBD from Hillbrow and Braamfontein, to Ellis Park in the east and Chancellor House on the western edge of the city (Reya-Vaya, 2017).

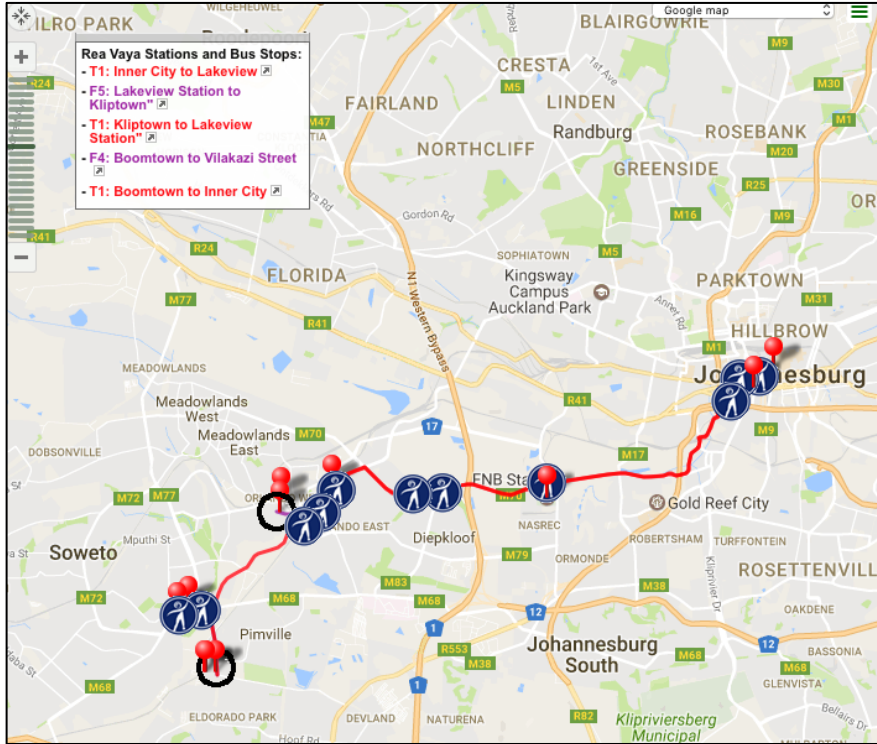


Fig 1: Reya Vaya Soweto route

Source: <https://www.reavaya.org.za/consumer-information/the-routes>

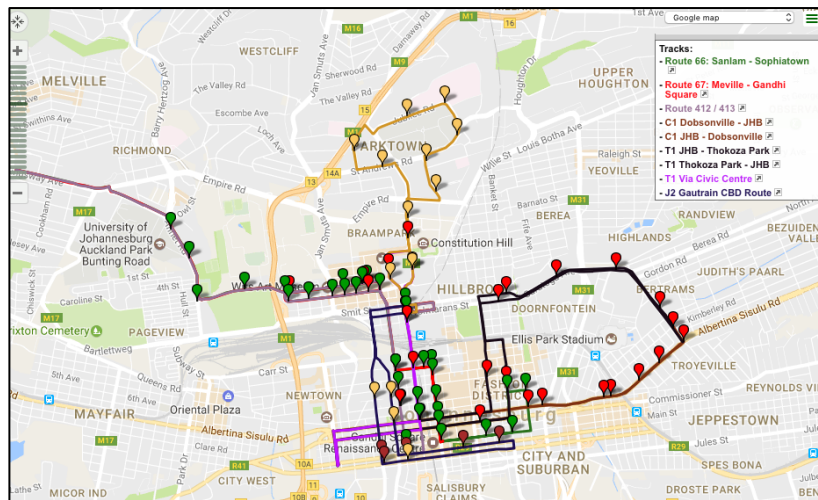
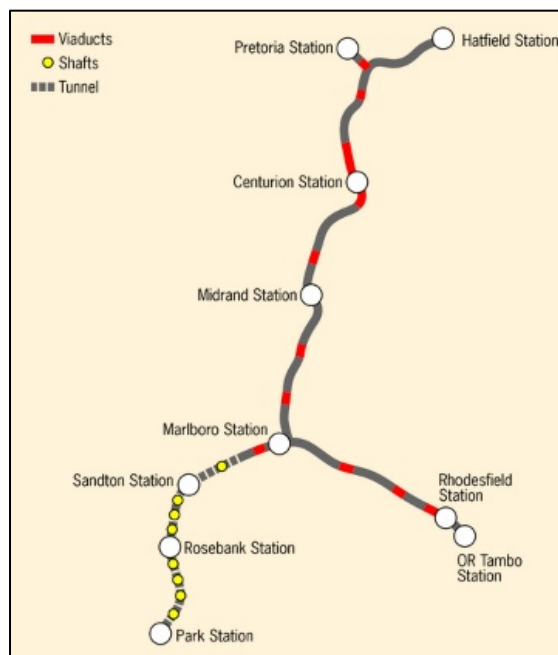


Fig 2: Inner city route map

Source: <https://www.reavaya.org.za/consumer-information/the-routes>

Apart from the Reya-Vaya, the Gautrain high-speed train was also launched in 2010. The Gautrain is not a city project but a Provincial initiative with a major impact in the Johannesburg. The Gautrain system is Africa's first world-class, modern rapid rail and bus service for Gauteng province (Musakwa, 2014; Van Der Westhuizen, 2007). The Gautrain is a state-of-the-art rapid rail connection between Johannesburg (Africa's business capital), Pretoria, South Africa's administrative capital and Ekurhuleni, South Africa's manufacturing hub (Donaldson and Van De Westhuizen 2011). The Gautrain has two routes the South-North and West-East routes (Figure 3). The North South route begins at Johannesburg park station in central Johannesburg to, Sandton and Pretoria and Hatfield in the north cutting across Johannesburg and Pretoria metropolitan municipalities. The West-East route takes passengers from Sandton Station, via Marlboro, to Rhodesfield Station in Kempton Park and then to OR Tambo International Airport (GMA, 2010b).



**Fig 3:** Gautrain routes source <https://www.newcivilengineer.com/latest/goals-for-gautrain/8624214.article>

### 3. Cape Town Smart City Initiatives

Cape Town is South Africa's second largest city and it is the legislative capital of South Africa. Cape Town's smart city initiatives include public Wi-Fi hotspots; improving Internet access in libraries, closed-circuit television, with 560 cameras located throughout the city; the establishment of an open data portal and the introduction of a smart grid (Engineering News, 2016). Of note is the Ukutunga enterprise resource-planning (ERP) project, which is arguably, the largest ERP System that offers a comprehensive solution for managing financial, revenue, human resources, operations and other services (in practical terms its "back office" systems) on a single integrated IT system (City of Cape Town, 2005). Because of such initiatives, Cape Town has won numerous awards (Techcabal, 2016) and considered a leader in Africa in Smart city initiatives (Mhangara, Mudau, Mboup, & Mwaniki, 2017). For smart mobility Cape Town has also established its integrated bus rapid transit known as the My Citi bus. My Citi has an extensive route system (Figure 4) that has an airport service, covering the CDB, high density areas or townships such as Khayelitsha, through to the Table mountain area and to the west of the city. The My Citi bus is being developed in phases with the first phase catering for the FIFA 2010 world cup and subsequent phases following suit.

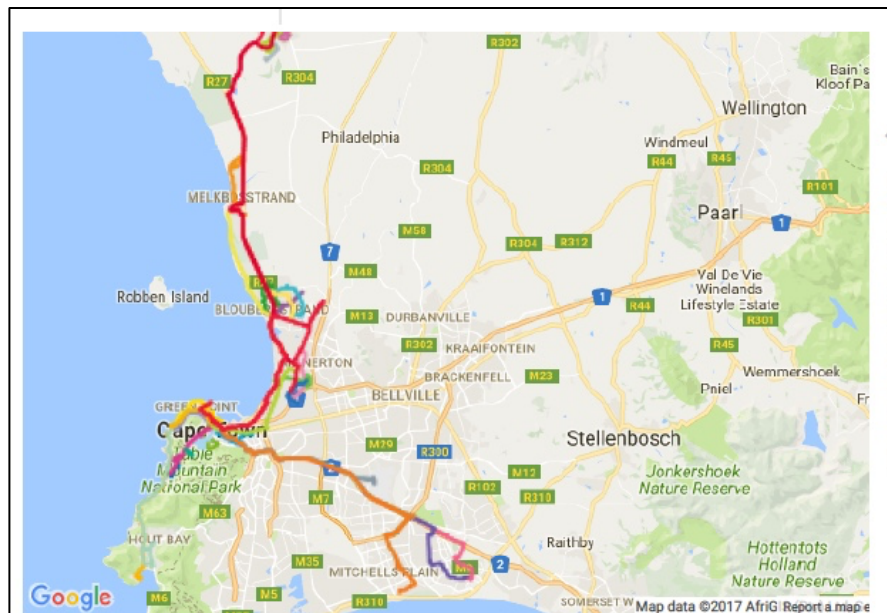


Fig 4: My Citi bus route Cape Town source: <http://myciti.org.za/en/routes/interactive-routes/>

The city of Cape Town has also invested in cycling lanes and the city has developed draft cycling strategy (Mhangara et al., 2017). The City's transport authority, has spent approximately R300 million on non-motorized transport (NMT) projects such as installing cycle lanes and walking paths in an effort to create a universally accessible, cycle-friendly city that also promotes walking and cycling to get around (Bicycle Cape Town, 2017; Future Cape Town, 2017).

#### **4. Ekurhuleni's Smart City Initiatives**

Ekurhuleni is South Africa's manufacturing hub located adjacent to Johannesburg. It is home to South Africa's largest airport, OR Tambo Airport and has subsequently branded itself as an Aerotropolis. An aerotropolis city seeks to centre complementary land uses around the airport for a more efficacy and sustainability. The City of Ekurhuleni vision is to become a '... smart, creative and developmental city' (City of Ekurhuleni, 2014). In 2014 the city embarked on a journey to transform the City to become smart and some of the projects includes installing Wi-Fi facilities for the public and its employees to increase economic growth and creating an efficient city (City of Ekurhuleni, 2014). The city also envisages a city where citizens may have a single point of contact by developing a mobile application for reporting crime, potholes and vandalism (City of Ekurhuleni, 2014). To enhance service delivery the installation of smart electricity metering and other self help devices have been developed. The city plans to offer free Wi-Fi at bus stations and various public open spaces across the city. A transport monitoring and control centre is another intervention that will be implemented by the city (City of Ekurhuleni, 2014). The city is also still constructing infrastructure for its new BRT system. These smart interventions for the city are designed in such a way that they promotes pro-poor development in the form of connecting citizens to both places and spaces and allowing service delivery to happen at a more rapid pace.

#### **5. Discussion and Conclusion**

In all three cities ICT has been central and the strategies are meant to connect citizens and this is also necessary in an era of globalization. The application of ICT in the three municipalities has led to improved governance, participation, and better response on problems and service delivery. For example, complaints can be easily logged online and citizens posting complaints on social media. Enabling access to Wi-Fi also entails improved access to opportunities for citizens in cities. All the cities also have



functional websites that link citizens to various websites. Despite the ambitious ICT projects one cannot ignore the digital divide in South Africa as a result of inequality in South Africa (Odendaal, 2003). South Africa is one of the most unequal societies in the world and smart city initiatives can further entrench this particularly as a result of globalization. For example, Johannesburg calls itself “a world class African city”. Johannesburg like Cape Town is a world of two cities, affluent areas that can keep pace with globalization and all the developments in ICT and a poor city where residents barely have the basics. It is difficult for the city to balance and address the digital divide. This also begs the question, do the residents want ICT (Wi-Fi hot spots etc.) or basic services such as water and housing. Should ambitious ICT projects be implemented when others don't know where their next meal comes from and this is the reality of an unequal society? There is no doubt that ICT is crucial in local governance, efficiency and service delivery, however there could be other pressing needs that requires attention such as housing, informal settlements, service delivery protests and unemployment. Perhaps the cities should not pursue grand designs that don't benefits citizens but rather tailor ICT projects to citizens needs which is what Cape Town purports to do. Cape Town has been fairly successful compared to other cities and it has been recognized through awards (Mhangara et al., 2017). Another key issue that also has to be addressed in rolling out IT infrastructure is crime. Despite the challenges associated with rolling out ICT the evidence suggest that the benefits of ICT in smart cities such as in improving service delivery, efficiency, communication, citizen participation and general access to information outweigh the disadvantages. Hence planners in local government are urged to embrace smart cities. For example, use of technology i.e. intelligent traffic systems such as intelligent traffic lights, vehicles communicating with other and traffic sensors can improve traffic safety.

Regarding the smart mobility projects in all three cities, they have all changed the cities structure and form. For example, the bus rapid lanes infrastructure is visible for all to see. The Reya-Vaya has also led to congestion as the lanes were built or marked on existing roads without expanding them, therefore, other road users were squeezed out as there is a lane now reserved for the Reya-Vaya only (Rahim, 2014). In a study by (Garau, Masala, & Pinna, 2016) they score the Reya-Vaya 0.3 and 0.53 out of 10 in terms of bus network density and uptake by commuters. This shows that the infrastructure is still limited and still in its infancy. The limited use may be because of culture where people are not yet used to BRT. There was also massive protests and opposition from mini-bus taxi operators pro-

testing development of the BRT system (Rahim, 2014). Minibus taxis are the largest transporters of commuters and yet they are being left behind. However, trying to integrate minibus taxis is a challenge since they are a law unto themselves. In Johannesburg the cost of the Reya Vaya trips is regarded affordable at an average of 8 Rands per trip and it uses a smart card as payment method for the trips (Allen, 2013). However, one cannot purchase the smartcard online which is a drawback. The smart card is also for use in the Reya-Vaya alone and one cannot use it to connect to other public transit systems such as the Gautrain. Therefore, it can be argued that the public transit systems are not yet integrated. Cape Town's BRT has been slightly successful with better uptake, however, issues faced by Johannesburg such as protests and lack of integration is a challenge (Transport Department, City of Cape Town, 2013). In Ekurhuleni construction has only just began. All the BRT systems are still relatively in their infancy compared to those in other countries such as Brazil. Pertaining to ICT there is limited ICT usage in the Reya-Vaya as shown by the often malfunctioning public information displays at Reya-Vaya's Bus stations, Reya-Vaya's static mobile application that is not real-time, inability to purchase tickets online, and commuters only being able to purchase bus tickets at the bus station only.

Regarding the Gautrain that is in Johannesburg and Ekurhuleni the Gautrain has been relatively successful as shown by its growing passenger numbers. The Gautrain started with around 300 000 passengers per month in January 2012 to almost million users a month in March 2015 (Gautrain Management Agency, 2015). This high number shows that maybe the marketing campaigns by Gautrain is bearing fruit. However, Gautrain is considered very expensive and it is mostly for the middle to affluent classes. It does not cater for the majority of poor who require cheaper means of transportation. It is also argued that a lot of money was wasted on developing a high-speed rail system that does not cater for the poor (Donaldson & van der Westhuizen, 2011; Van Der Westhuizen, 2007). Nevertheless, the Gautrain has led people from not using their cars and in so doing slightly reduced congestion on Johannesburg's roads. With the Gautrain there are ICT developments, which make the overall commuting better. For example, the Gautrain's mobile application, automated teller machines to purchase train tickets, interactive public information displays and a huge presence on social media. The Gautrain has thus harnessed the power of ICT in improving its image and making the commuting experience better. Nevertheless, some aspects such as making the mobile application real-time are crucial in making the Gautrain smarter.

Pertaining the cycling lanes although millions of Rands was spent in building the lanes a few number of cyclist use the lanes to commute to work (Musakwa & Selala, 2016). In Johannesburg and Cape Town it is common that lanes are being used for parking and in the Johannesburg's CBD one can hardly notice any cycling activity. In Johannesburg the recently elected new mayor has stopped the development of new cycling lanes and this highlights inconsistency in policies as a result of politics. The new mayor in Johannesburg argues that cycling is not a top priority but that all roads should be repaired first before embarking on cycling lanes (Tandwa, 2016). Politics is a major threat to establishment of smart cities as goals can be changed to gain political mileage. In a recent study, there are more cyclists for recreational use than commuting hence there is need to built cycling lanes for recreation in cycling hotspots in Johannesburg (Musakwa & Selala, 2016). The limited use of cycling lanes is also because of a car culture in South Africa and safety issues as crime is a major deterrent and the fragmented nature of South African cities. In Ekurhuleni cycling lanes are still being developed.

What is common from the smart city initiatives is that they are mostly top-down strategies and are undertaken without understanding the people's needs. Planners or city officials who are following the smart city bandwagon and merely transplanting some of the strategies from the developed world to South African Cities lead the strategies. This could explain the limited uptake in activities such as cycling and the BRT in these cities. A challenge that is also unique in South African cities is that instead of bringing various classes together some smart city initiatives perpetuate inequality. For example the Gautrain and cycling are considered for middle class. In South African cities there is that danger in pursuing smartness, which can lead to inequality. Cities also need to balance with other competing needs and interests. There is also need to develop coordinated smart city strategies not the piecemeal and uncoordinated experienced in South African cities. A beginning point would be what do the citizens want and how that can be improved by smart city initiatives. Instead of pursuing grand smart city initiatives smart city initiatives can be tailored to the citizens needs for them not to be misplaced priorities. ICT in smart city initiatives also has a big role to play in improving the level of service. Lastly smart city initiatives are still in their infancy, lessons learnt are critical in establishing better cities of tomorrow. There is no denying that South African cities can benefit a lot from the smart cities approach, however how smart

cities are established determines the extent to which ordinary citizens benefit.

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