

# Smart Cities Initiatives in Lagos, Nigeria: Are there Lessons to Learn from the Leading Smart Cities?

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## Abstract

Cities' roles as the economic hub and development drivers cannot be overemphasized. In an attempt to perform these roles, Lagos city grapples with various challenges despite its launch of smart city initiatives. This paper asks a pertinent question about what can Lagos learn from the leading smart cities. Consequently, this paper explores smart city initiatives in Lagos, as well as Vancouver and Singapore with proven achievements before lessons learned, are discussed. A descriptive qualitative research design is adopted and data were obtained from secondary sources comprising journal articles, government publications, research institution reports, books published by international organisations, cities' websites, and newspaper publications. An inductive exploration of the data was conducted for analysis. Findings revealed that indicators comprising citizens' engagement, partnership, and political will are priority areas that Lagos must consider and improve upon. The paper concludes with a synopsis and suggests the way forward.

## Keywords

Governance, Information and Communication Technology, Infrastructure, Planning, Smart Cities

## Introduction

Cities are focal points in an economy and “drivers” of societal development, not simply bricks or mortar; they are places of dreams, nostalgia, and imagination (Oyesiku & Odufuwa, 2011). They are a notable player in infrastructural, economic change, poverty reduction, and environmental development (Odufuwa, Franssen, Bongwa, & Gianoli, 2009). Based on cities' notable attributes, cities provide access to knowledge that transforms lives generally (UN-Habitat, 2004). However, it is disturbing to note that cities in developing countries have not adequately and effectively responded to the opportunity for urbanization. Compared with cities in developing countries, like Nigeria, cities in developed countries are rapidly making progress in achieving economic, environmental, and social sustainability towards improving city living standards and economies. The progress recorded could be linked to “a pre-existing,

substantive technology base and culture as well as having optimized resources geared towards efficiency and effectiveness” (Okoye, 2016).

But most Nigerian cities are often affected by the inconsistent supranational policy, particularly in the economic and political areas, and consequently, the problems of Nigerian cities cannot be solved by linear urban management and development strategies. Adeago (2002) explained that Nigerian cities, especially Lagos, Kano, and Ibadan have witnessed rapid population and economic growth. The consequences of rapid population increase have resultant effects on the image and viability of cities' sectors in form of housing shortage, inadequate and poor infrastructure, increasing crime rate, inadequate employment opportunities, and vigorous environmental hazards. The many challenges witnessed in Nigerian cities constitute concerns to city

residents, foreigners especially investors, professionals, and policymakers. Perhaps the smart city approach is the way to go.

Since the emergence of the smart city concept, there is no universally accepted definition of a smart city (United Nations, 2016; Johnston, 2019). Meanwhile, Gardner and Hespanhol (2018) described the smart city as a “techno-urban imaginary” promoted by businesses and governments locally and internationally. A smart city is a system of systems – water, power, transportation, emergency response, built environment, etc. – with each one affecting all the others. A smart city uses information and communication technology (ICT) to enhance its livability, workability, and sustainability. It has been further argued that the smart city is part of an even larger trend – the “Internet of Things.” Cisco (a technology provider) estimated that there were 200 million devices connected to the Internet in the year 2000. By 2012, that number had increased to 10 billion. And after a year, there are approximately 200 connectable “things” per person or 1.5 trillion things globally (Smart Cities Council, 2013). Furthermore, Putlitz (2016) noted that smart cities centre around infrastructure, connectivity of people and information, mobile devices, or big data; pursuing goals of being better coordinated, more resource-efficient, generally optimized; and providing a better quality of life; more economic growth, resilience; or sustainability. Indeed, smart cities provide notable solutions (save cost, enhance livability, promote citizen participation, facilitate transparency, accountability, etc.) compared to most traditional cities.

Given this background, this paper will ask questions regarding the status of the smart city initiatives in Lagos. What can Lagos city learn from the leading smart cities in developed countries? It is assumed that answers to these questions would help gain insight into the current scenarios of Lagos smart city and case studies in developed countries, and ultimately assist in drawing lessons for the envisioned Lagos smart city.

This paper is organised as follows. Section 1 provides background to the study. Section 2 describes the methodology employed, Section 3 presents and discusses the study results and Section 4 is for the concluding remarks.

## Material and Methods

The objective of this paper is to explore smart city initiatives in two different contexts; a developing country (Lagos city) and the developed world (Vancouver and Singapore), and more importantly

highlight what Lagos can learn from the leading smart cities in the developed countries.

This paper adopted a descriptive qualitative research design, and therefore, employed secondary data sources such as journal articles, government publications, publications by research institutions, books including those published by international organisations, city websites, and newspaper publications. According to Kumar (2011), a descriptive study focuses on the description of a situation, problem, or phenomenon, and is not interested in examining relationship or association. This approach was utilised because of the nature of this paper, which focuses on qualitative data. For the data analysis, an inductive exploration of the data was conducted to identify themes or concepts and then the description and interpretation.

Lagos city was purposively selected among other cities in Nigeria based on specific reasons. The selection of Lagos city for this study was based on its obvious intention to attain smartness. Besides, Lagos is one of the largest cities in the world with a growth rate of about 3.2%. It accommodates 10% of Nigeria’s population despite it being the smallest in terms of landmass. It is the most urbanized in Nigeria and western Africa (Fadare & Oduwaye, 2009). Its population has been projected to reach about 33 million by 2050 (Hoomweg & Pope, 2017). This population no doubt will be accompanied by its associated challenges if there is no plan to cater to the growth. Fadare and Oduwaye (2009) posited that besides Abuja Federal Capital Territory, Lagos is the best served with infrastructural facilities in Nigeria but it remains where the facilities are most insufficient due to its population density. Notable challenges confronting Lagos include housing shortages, inefficient waste management, and traffic congestion. Despite the relocation of Nigeria’s capital from Lagos to Abuja in 1991, Lagos has remained the country’s economic-industrial hub due to the strategic location of Murtala Muhammed Airport (one of the busiest airports in Nigeria) and Apapa seaport (one of the largest and busiest seaports in Africa) (Ministry of Economic Planning and Budget, 2022). It also boasts of the presence of the headquarters of the multinationals and accounted for the largest concentration of industries in Nigeria. Apart from being the most populous city in Nigeria, it has been described as a mini Nigeria because of the heterogeneity in its population. The attributes of Lagos as expounded are the factors that informed its selection for this study among other cities aiming to achieve smartness in Nigeria.

Furthermore, two case studies of leading smart cities in developed countries, that is Singapore and Vancouver were explored. The two case studies are

purposely selected for the similarities they shared with Lagos city in terms of population density, population diversity, and traffic congestion among others, and more importantly, the giant strides made in the implementation of smart city initiatives.

Singapore, as a smart city leader (Johnston, 2019), is well-positioned to be a smart city and has implemented many aspects of smart city technology (Technology and the city 2018 cited in von Richthofen, Tomarchio, & Costa, 2019). Singapore's choice was also hinged on the fact that it gained independence at about the same time as Nigeria where Lagos is situated, and more importantly, both Singapore and Nigeria were colonized by the British (Umezulike, 2016). Again, Singapore like Lagos city is densely populated, and thus translate to congestion on the road, a problem connected to scarce resource when it comes to road space. For instance, a case of a vehicle population of 917,000 over 3,240km of road was reported, but with the deployment of smart solutions, transport routes are less congested with low CO<sub>2</sub> emissions (Accenture, 2015). Singapore has also dealt with "urban issues, renewal, and land use planning for more than 50 years", and by this, they could offer "expertise and experience African cities can use" (Macfarlane, 2022). The city-state also recognized its increasingly diverse population attributed to its open economy and immigration policies (Ministry of Foreign Affairs, 2018).

On the other hand, Vancouver is among the leading smart cities in the world and since the launch of its smart city initiatives over a decade, it has implemented a well-thought-out and phased plan. Vancouver also became a choice among other smart cities because it shared some attributes with Lagos city. Vancouver is the most congested city in Canada, and this has been adduced to its being a popular destination for visitors and new residents in Canada. It is also highly diversified, particularly in the southern and eastern parts and experiencing increasing population accompanied by economic growth. Consequently, this growth imposed some constraints, such as traffic congestion, as well as soaring property and housing prices (Artibise, 2015). Vancouver aims to be the world's greenest city despite its pursuit of economic growth. Therefore, the city prioritizes green energy, smart transportation, and zero waste and CO<sub>2</sub> (Urban Technology Alliance, 2018), which constitute priority areas for Lagos city.

Undoubtedly, the two smart cities offer lessons Lagos city can leverage to attain smart city status. More importantly, some of the challenges these two leading smart cities tackle align with the area of needs in Lagos city. Finally, this paper employed three criteria comprising political will, citizen engagement and

partnership, considered relevant to smart city development. The criteria emerged from the highlights of the activities and achievements of case studies (leading smart cities) on issues pertaining to planning, engagement, transportation, communication, and collaboration, and more importantly, the criteria constitute aspects Lagos city needs to improve on if it must achieve the smart city vision.

## Results and Discussion

### *Smart Cities Initiatives in Nigeria*

Nigeria is one of the few African countries that have launched smart city initiatives at the national level. Others include Rwanda, Ghana, and Ethiopia (Siba, & Sow, 2017). Nigeria's smart city initiative was launched on 8th August 2017 at a summit aimed at initiating "sound and actionable strategies for transforming Nigeria's major urban centres from traditional dysfunctional cities to modern, efficient, responsive ones capable of satisfying the needs of present and future generation of Nigerians" (Mansur, 2019). Also, the Nigeria smart city initiative was intended "to cover more than 50% of all Nigerian cities (National Information Technology Development Agency - NITDA)" ...that will see to the transformation of over "380 mostly traditional and largely malfunctioning urban centres within the very short time..." (Mansur, 2019). Interestingly, the Nigerian government is making efforts to develop smart cities in the country; and cities that have set in motion mechanisms towards actualising smartness in Nigeria are not limited to Lagos (case study) selected for exploration in this paper.

### *Lagos City*

The objective of the Lagos Smart City initiative is to connect human capital, social capital, and ICT infrastructure to address public issues, achieve sustainable development and increase the quality of life of citizens within the short possible time. The Lagos smart city is expected to comprise components such as e-government, safe city, mobility/WiFi/digital citizens, open data, smart farming/agriculture, smart buildings, and smart grid/energy/utilities amongst others. The mission of the initiative is to "engage people who actively participate in governance and reforms..." The initiative would also focus on "security, and surveillance, implementation of the fibre network and e-governance (Ajanaku, 2018).

The project will be in two phases. Phase I will address the security, transportation, and infrastructure; while phase II will build on the foundation of security and transportation and then connectivity in a sustainable manner. For security, there will be the

deployment of thousands of surveillance CCTV cameras across the state, while the transportation side will be about intelligent transport system service (ITS). The last component is connectivity which will involve the provision of a metro fibre network via a major internet service provider (ISP) that will facilitate connectivity to various homes, offices, and institutions in the state (Ajanaku, 2018).

Regarding land management policies, land administration processes, and data infrastructures for housing production findings revealed that Lagos city has adopted the ICT towards enhanced land registration, land valuation, land-use planning, and land development. More importantly, in the domain of data infrastructure, the state initiated and built the Lagos GIS Enterprise in 2011 (Agunbiade, Rajabifard & Bennet, 2016). This initiative is not without its challenges as there has been an occasional failure in the payment platform making access to the service difficult. In the domain of land-use planning and housing, some of the recent initiatives included the Model City Plans. Lagos city has also initiated an e-planning permit application in a bid to replace the submission of hardcopy of relevant documents for planning approval processing to secure a planning permit. Although an e-planning permit is being implemented, an investigation revealed that compliance is marginal.

Similarly, the Bus-Rapid-Transit (BRT) is another smart city initiative that has helped to partly reduce the traffic problems in some areas of the city. Furthermore, mobile lines of Nigerian Police and firefighters' institutions were made available to people in case of emergencies and these had been of tremendous value in response efficiency. Also, there has been a Lagos smart city workshop that led to the convening of architects, urban planners, artists, computer scientists, and university students to explore the smart city concept for Lagos with a focus, especially on smart and sustainable mobility (World Cities Culture Forum, n.d.).

The creation of an app on energy, the setting up of the 20-member innovation Advisory Committee Council, and the mapping of clusters of innovative businesses in Lagos are worthy of mentioning as part of the steps taken by the Lagos State government in its pursuit of smart city (Okoye, 2016). Okoye (2016) noted that due to institutional collapse and lack of political will and interest, there have been scenarios of residents creating "smart Lagos" of their own through digital platforms facilitated by their mobile phones and social media. One of the innovations is the ReVoDA mobile app, which gives support to crowd-sourcing of election data from polling stations and allows citizens to report happenings from election results to violence

at their polling stations on social media platforms (Okoye, 2016; Disu, 2014). According to Okoye (2016), there are other citizen-led initiatives such as:

- i. Truppr – a social media app that helps fitness lovers organise and find teammates;
- ii. WeCyclers – a social business offering convenient household recycling services in a densely populated low-income neighbourhood, thus helping them to capture value from wastes and providing a reliable supply of raw materials to the local recycling industries; and
- iii. Gidi Traffic – a traffic and navigation app that allows users to share real-time transit information.

Also, other solutions aimed at tackling mobility challenges include a ride-sharing service called Jekalo, and taxi services such as Tranzit, Easy Taxi, and Afrocab.

In furtherance of the Lagos Smart City initiative, the implementation of a unified fibre duct infrastructure and connectivity project across the state was announced in 2020. This project is aimed at ensuring that "Mobile Network Operators with fibre coverage in Lagos State have multiple fibre ducts on the same routes." This is believed would replace the current system of multiple right-of-way approvals along the same routes, thus conforming to global best practices (Adepetun, 2020). Meanwhile, the laying of the optic fibre network cables and broadband infrastructure was reportedly stopped without explanation (Heinrich Boll Stiftung Abuja & Fabulous Urban Nigeria Foundation, 2022).

## Leading Smart Cities: Vancouver and Singapore

Notable cities in developed countries started to develop ICT strategies during the 1990s. These strategies were characterized by: (i) focus on technological issues, and (ii) internal orientation - how to use technology. Cities worked hard to create internal networks, increase the use of personal computer systems and other ICT applications and automate administrative procedures. Indeed, city e-strategies have evolved from internal and technology orientation to a more outward-looking approach in which the focus is on the way ICTs can benefit the urban economy and society (van den Berg, van der Meer, van Winden, & Woets, 2004).

However, this section explores the smart solutions offered by two leading smart cities in the developed world. The intention is to highlight ways by which these cities have adopted ICT to improve cities' efficiency and citizens' quality of life. It is noteworthy that none of the examples is exhaustive as examined

and presented in this paper rather the paper made efforts to identify a few practicable initiatives that could be of inspiration to Lagos city in its quest of achieving smartness.

### *Vancouver, Canada*

This city intends to achieve its goal of attaining smart city status through the Greenest City Action Plan 2020. The plan was adopted in 2011 by the Vancouver City Council after more than 35,000 people were engaged in the process leading to its evolution. Their involvements were through various means comprising social media where they monitored progress, face-to-face workshops and events. Stakeholders including “more than five dozen city staff, 120 different organizations and 9,500 individuals actively contributed ideas and feedback.” The plan focuses on three main areas: carbon, waste and ecosystems (City of Vancouver, 2012; Smart Cities Council, 2013). To achieve its aim of a smart city, the city deploys the VanConnect, a mobile app that provides access to City Hall services at a go. Other areas in which the city has used ICT and data to improve connection and convenience are through the provision of WiFi; wired bike sharing (Mobi by Shaw Go) (Figure 1); EV plug-ins (Figure 2); smooth traffic; ask, act, participate; and quick response (City of Vancouver, 2018).



Figure 1. Mobi Bike  
Source: City of Vancouver (2020)



Figure 2. Electric vehicle (EV) at a charging point  
Source: City of Vancouver (2012)

The city, rated as one of the largest WiFi providers in North America, provides access to more than 550 public spaces (public library sites, city administration buildings and VanWiFi locations) across the city. Concerning smart mobility, its bike-sharing system also offers the public convenient, comfortable, flexible and affordable mobility. Since its launch in the summer of 2016, it is on record that over 125 stations, over 1,200 bikes, and over 650,000 trips covering 2 million kilometres have been attained, thus ensuring a healthy transportation option (City of Vancouver, 2018).

For the electric charging stations, provisions have been made in 250 locations in its quest to achieve zero emissions, and efficient, quiet and low-stress transportation. These charging stations can be found using online maps and mobile apps such as Plugshare and Chargehub. While 75 of these stations are on city properties, 175 charging points are managed by parking garages, hotels, shopping malls and other services. Besides, towards the improvement of the network of charging stations, the city is introducing user fees, from which the city is aiming to gather data for an informed decision on where more plugs are needed so that through monitoring, fees can be reduced in areas not being utilized. It is noteworthy that there is a steady growth in sales of electric vehicles with about 70% growth year-over-year since 2011. The current report puts its electric vehicle figure at over 3,000 in Metro Vancouver while the city expects the number to rise to 300,000 by 2050 (City of Vancouver, 2018).

Vancouver city's progress in pursuit of a smart city has been recognized by the IESE Cities Motion Index 2020 which ranked it in 44th position among other smart cities. However, the city was regarded as the biggest mover as it moved to the 18th position (Forbes, 2020). In addition, the city's collaboration with Surrey City got them shortlisted for the USD50 million award competition (City of Vancouver, 2020; Eden Strategy Institute and ONG&ONG Pte Ltd, 2018).

### *Singapore*

Singapore is the smartest city in the world (ABI Research, 2018; Juniper Research, 2018). Its smart city vision was launched in 2014 to build a cohesive nation and maintain its competitiveness (Johnston, 2019; UBS, 2019) and one that will anchor on key pillars of the digital economy, digital government, and digit society (UBS, 2019). There are several ways through which the city has deployed technology for efficiency and to improve quality of life.

The Singapore smart city is noted for its leading role as a transportation and freight hub with innovations in driverless taxis, autonomous shuttles

(Figure 3) and platooning trials and projects ongoing (Agentschap NL, 2013; Smart City Hub, 2017). For example, the city through its Land Transport Authority adopted Intelligent Transport System for improvement in operational efficiency and road safety by offering innovations such as “Real-Time Traffic Information Systems, Expressway Monitoring Advisory System (EMAS) that monitors traffic along expressways, traffic accident alerts to motorists and rescuers, Green Link Determining (GLIDE) Systems (monitors, adjusts and optimizes green time along the main roads in response to changing traffic demand); Traffic Scans (use taxis as probes on the road network to provide motorists with information on the traffic condition island-wide); Parking Guidance System (provides real-time information on parking spaces availability of participating building developments) (Agentschap NL, 2013).



Figure 3. An autonomous electric passenger bus waits at a signal light while travelling along the test circuit at the Centre for Testing & Research of Autonomous Vehicles (CENTRAL) of Nanyang Technological University in Singapore. Source: Siemens (2018)

The plan for autonomous vehicles (AVs) is expected to come into the mainstream by 2020 as well as an ambitious plan “to unveil operational driverless rides in three towns by 2022”. Also, its integrated and shared mobility is second to none. For instance, car-sharing and bike-sharing keep expanding in the city whereas private vehicle avoidance contributed to its performance and resilience. A report by Deloitte revealed that “about 44% use public transport, 29% ride private cars, 22% walk, whilst some 1% use their bicycles” (Singapore Business Review, 2018). Singapore is the first city to launch a system of driverless taxis and is looking forward to launching driverless buses by 2022 (Forbes, 2020). Regarding autonomous vehicles, appreciable progress has been recorded in the aspects of “the number of trial areas, as well as the number of roads available for testing”. However, in July 2022, the State confirmed that the “timeline for the deployment of AVs in Singapore is dependent on the progress of AV technology in meeting safety standards and gaining public acceptance, within our local context” (Borden Ladner Gervais, 2022).

## Lessons Learned

The smart city initiatives currently being implemented in Lagos are laudable but not without their challenges. While there are shreds of evidence of challenges in the implementation of Lagos smart city, not much had been achieved like in the developed world. However, this study of the Lagos smart city initiatives indicated that there is potential despite the little progress made hitherto. The phasing of the project is laudable as there seems to be an acceptance on the part of the government that the project cannot be attained once-and-for-all.

Various lessons have been deduced from the two leading smart cities explored and this will be discussed in this section. The three priority areas identified are political will, citizen engagement and partnership.

- i. **Political will:** Political will is undoubtedly a *sine qua non* for attaining a smart city. This is key to the success of Vancouver and Singapore. It was observed that in Lagos city residents are left to take initiatives where the government is supposed to provide the leadership and set examples for citizens to follow. For example, residents created “smart Lagos” of their own through digital platforms facilitated by their mobile phones and social media. Equally, Lagos city should respect smart city plans by adhering strictly to the priority areas in the plan. For instance, the recent report about the laying of optic fibre network cables and broadband infrastructure across Lagos city aimed at accelerating internet connectivity across the different sectors came to a halt without explanation despite the promises made by the political actors (Heinrich Boll Stiftung Abuja & Fabulous Urban Nigeria Foundation, 2022) was a disturbing one. Undoubtedly, this would pose a setback to the actualization of the smart city vision of Lagos. Having a smart city plan or allocating funds for the development of the smart city is not enough to achieve smartness in cities but ensuring effective implementation. Just like cases of Vancouver and Singapore, the government needs to demonstrate leadership commitment towards providing an enabling environment. Because of the huge financial investments required for its implementation, political will and a functional institutional framework must be put in place for its actualization. For instance, in 2019, Singapore is projected to commit an investment of a whopping sum of over \$1 billion on smart city programs (Business Wire 2019 cited in Johnston, 2019).

Additionally, in 2021, the Singaporean government spent S\$2.7 billion on upgrading government digital services (Legislative Council Commission, 2021). According to Ang-Tan and Ang (2021), the Singaporean government has not had it so smooth in its quest to achieve a smart city but is willing to shoulder the blame and consequences when its smart city initiatives fail or result in negative/unexpected outcomes.

- ii. **Citizen engagement:** Smart city development is always people-centred (Johnston, 2019). This is evident in the case of Vancouver (Smart Cities Council, 2013) and Singapore (Johnston, 2019). The two cities executed an extensive engagement of their citizens in the development of a smart city plan by leveraging technology to realise its objectives. Lagos city should seek to engage the citizens whose initiatives being developed are meant to serve from the onset to allow them to make contributions to the development of various initiatives the city aims to achieve. The identification of stakeholders and their proper engagement in the development of smart city initiatives is critical. This is an important lesson for Lagos in its quest to achieve smartness. Consequently, the idea of developing a plan without involving the citizens from the outset should be jettisoned while citizens are allowed to contribute their quota to the development of smart city plans. The merit of this is that it gives the citizens sense of belonging and then allows the policymakers and other actors to gain insight into the probable setbacks which can be taken care of at the preparation stage of the smart city master plan.
- iii. **Partnership:** The need to network, collaborate and share ideas with leading and successful smart city is one of the lessons that was drawn from the case studies examined. Like the case studies cities of Vancouver and Surrey that collaborated for a City Challenge. Apart from networking, this kind of partnership would engender, the experience and lessons that would be acquired in the process and would promote efficiency that might be impossible to attain when standing alone. For instance, Vancouver's commitment to sustainability when it comes to renewable city strategy was recognized

whereas Surrey's implementation of a smart waste management system through the locations of smart bins all around the city. The partnership between the two cities indicated huge potential very germane to furthering the smart city agenda by harnessing their strength in sustainability (Eden Strategy Institute & ONG&ONG Pte Ltd, 2018). Beyond the international collaborations, the partnership could also be implemented among government agencies overseeing different sectors as well as in a public-private partnership arrangement as exemplified by Singapore. As advocated by Ang-Tan and Ang (2021), the public sector needs to take responsibility for innovation while the private sector provides funding and resources.

## Conclusion

This paper explores smart city initiatives in Lagos city and leading smart cities (developed countries) to draw lessons for the development of smart city initiatives in Lagos. It has been shown that Lagos smart city can learn from Vancouver and Singapore by paying attention to the criteria regarding the political will, citizenship engagement and partnership. The most prominent lesson is that each city focused on limited issues that would greatly benefit its residents, though smart transport and e-governance are common in both case studies. Furthermore, this paper concludes that smart city initiatives in Lagos can only translate to valuable results if Lagos city would identify areas of concern and deploy smart solutions that best serve the citizens. There is a need to provide an enabling environment for the diverse stakeholders whose contributions to the goal of a smart city are very germane. Besides, there is a need for partnership with other cities through the development of initiatives that would improve citizens' quality of life. It is noteworthy that the implementation of a smart city does not have to be too humongous as sometimes it is being made to look but little steps can be allowed to evolve steadily and metamorphosed to become a success. It should also be about setting priorities, which can be determined through a bottom-up approach. It is assumed that success in Lagos city would spur other Nigerian cities and other cities in Africa to develop many other smart solutions.

The limitation of this study is that it focused on two smart cities in developed countries from which lessons are drawn. Smart city initiatives abound globally from which more lessons can be drawn. As such future research can be more comprehensive to capture more case studies including those obtainable in Africa since initiatives deployed might be more

practicable or adjustable for adoption by the Lagos smart city and by extension to other Nigerian cities.

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