# INTERNET OF THINGS AND SMART CITY DEVELOPMENT: IS NIGERIA LEVERAGING ON EMERGING TECHNOLOGIES TO IMPROVE EFFICIENCY IN PUBLIC SERVICE DELIVERY?

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**Abstract**: *Over the past four decades, technology has gradually penetrated and influenced the operation of public sector organizations by changing and increasing its roles. The world is experiencing a dramatic shift from the traditional ways of delivering service to a more information and communication technology driven approach where governments are forced to use technology to shape policies and provide services to the people. This article aims to analyze the use of internet of things in achieving smart city and to make an attempt to explain how leveraging on emerging technology can improve public service delivery. The article observes that smart cities are an endeavor to make cities more efficient, sustainable and liveable. It notes that most cities in Nigeria are deprived of vital elements like the quality of life and socioeconomic development which can be delivered by the smart cities. The article discuss how emerging technologies can improve public service delivery in Nigeria and how these factors can make the internet of things and smart city initiatives a successful project in Nigeria. The article concludes that Smart Cities through the internet of things, with a proper roadmap, will serve people at large and will surely help in reducing cost on workforce and improve public service delivery.*
**Keywords**: *Internet of Things, Smart City, Emerging Technology, Service Delivery, Public Service*

## 1. INTRODUCTION

Today's world is advancing through accelerated transformation owing to the fast pace of advancement in technological growth and adoption. The improvement in information and communication technology is pushing governments in different countries of the world to move from manual-based to an information-based method of service delivery (Al-Khouri, 2013). The world is experiencing a dramatic shift from the traditional ways of delivering service to a more information and communication technology (ICT) driven approach where governments are forced to use technology to shape policies and provide services to the people. The existence of technological advancement as stated by Osinbajo (2017) is evident enough that the fourth industrial revolution is upon us.

There is no doubt that the 21st century is faced with fast urbanization and growing population, which presents enormous tasks and pressure in our urban areas (Abdulkadir, Adamu, & Abdul-Fatou, 2017). Globally, the challenges and opportunities of urbanization are driving the government to seek new solutions on how to manage modern cities. The problems range from how to provide an immeasurable quality of life for citizens to ensure appropriate socio-economic development. The opportunities can be

seen in public sector becoming more efficient and innovative through the use of ICT in the delivering of services to the citizen, due to the current state of migration facing most cities in the world. United Nations (2012) observes that more than half of the people of the world now live in urban areas. The global population is now predominantly city dwelling, and as a result, demand is increasing for urban infrastructure investment (Accenture, 2015). Technological advancement is seen as the critical factor that can address the challenges facing governments in managing the modern city.

The United Nations (2012) notes that the population of city dwellers of about 250 million at early 20th century has increased to 2.8 billion at the beginning of the 21st century. This is evident in 2008, for the first time in the world; the population of the urban center was equaled to that of the rural area. It is estimated that by 2050 the urban population will double to 6.4 billion (Ojo, Dzhusupova, & Curry, 2015). This poses challenges to the traditional approaches to city management and urban lifestyle (DiChristina, 2011). However, the steadily rising urban populations are placing enormous stress on the world's cities, as the available resources are required to meet the demand of more people. Ismail (2016) observes that managing the ever-increasing pressure on the available resources in the urban center is becomingly increasingly difficult, and so attention has turned to developing new systems that address the challenge of megacities. Therefore, combining cities with smart technology solutions has become the expectation of today's digital age.

With an increase in the population of urban centers, governments around the world are beginning to understand the enormous potential of the emerging technologies by leveraging the Internet of Things to build a smart city that will enhance efficiency in service delivery to the people. The primary goal of the smart city is to strengthen the use of public resources, increasing the quality of services delivery and reducing operational costs. While this objective cannot be accomplished with the present mode of service delivery, leveraging the deployment of Internet of Things (IoT) within a Smart City can go a long way to reaching this goal (Meering, & Balella, 2016). This will enhance personal satisfaction by using technology to improve the effectiveness of public service delivery.

## 2.    STATEMENT OF THE PROBLEM

Our world is becoming more intelligent and interconnected due to globalization. The emerging technologies that underpin the provision of services in most countries are becoming smarter. We live in a time of modern advances in every sector of human endeavor. In the developed societies, we see the coming of age of a whole new generation of intelligent systems and technologies more powerful and accessible than ever before (Lierow, 2014; United Nations, 2015). Unfortunately, the same cannot be said of Nigeria. The country is wrestling with both an infrastructure gap, after years of underinvestment, and an innovation gap from poor innovation performance in the public sector over the years (Hajduk, 2016). This is evident in Nigeria, where the implementation of modern public project management tools, methods, and techniques is still not well established in the public sector which has resulted to failure public

infrastructures (Fatile & Adejuwon, 2014). This, as argued by Adejuwon (2012a), shows that the Nigerian public service is irrefutably beset with gross incompetence and ineffective management of public infrastructures. The state of infrastructure decay shows that the performance of the civil service in Nigeria has remained very abysmal, hence the present predicament of underdevelopment (Adejuwon, 2016). Though Nigeria has emerged as one of the world's most fast-growing economies in the world. What is surprising is that service-delivery outcomes have remained disappointing (Fatile, Olojede & Adejuwon, 2015). This shows that the public sector in Nigeria has been bedeviled with ineffectiveness (Adejuwon, 2012b).

Due to rural-urban migration, Nigeria has experienced a significant pressure on the infrastructures in the urban centers. Problems associated with health, traffic, pollution, scarcity of resources, waste management, and poor amenities arise and hence the development of city falls apart (Toppeta 2010; Washburn, Sindhu, Balaouras, Dines, Hayes, & Nelson 2010). In Nigeria, citizen's discontent with poor public services is soaring. This is because government as observes by Fatile, Williams & Adejuwon (2011) is the principal actor in service delivery. Quality education, health care, social welfare, and safety programs along with an efficient business environment that can create sustainable and competitive economies become a mirage. While traditional public management solutions have not delivered on this challenge

It is unfortunate that Nigeria with her enormous material and human resources over the years cannot boast of smart cities with modern infrastructure and public utilities. Most government services are yet to get online. Nigeria is backward in technological advancement. Though most countries are making their cities work with smart technologies that make life comfortable and secured, it is only the mobile phones that are beginning to get smarter, and that is what is we are celebrating as technology advancement in Nigeria. In Nigeria, the IoT is not widely used in the public sector.

Despite the importance of IoT as the primary driver of a smart city that will propel efficiency in public service delivery. Researchers on the Internet of Things and Smart City are mainly from developed societies. In Africa in general and Nigeria in particular, few publications have concentrated on the internet of things and smart city. These studies focus on mainly on the Internet of Things and smart City separately. This paper, however, tries to fill this gap by examining Internet of Things and Smart City, and how service delivery to the people can be improved.

This paper aims to analyze the use of internet of things in the development of a smart city and to explain how leveraging on emerging technology can improve public service delivery while addressing the opportunities and challenges faced in the process especially in developing countries like Nigeria.

## 3.    CONCEPTUAL REVIEW

This section provides the conceptual analysis and the relevant theory underpinning the study of Internet of Things and Smart City

**3.1 Internet of Things (IoT):** IoT was first used in 1999 by Kevin Ashton back in explaining how Internet-connected devices can change our lives (Wood 2015). Jin et al. (2014) observe that IoT originated as a vision to interconnect various everyday objects through the internet to achieve a common goal. The idea of IoT is the connection of internet devices through which person can interact with the physical and digital world.

IoT is the third stage in the development of the internet. It is an emerging technology that works with the integration of many other present-day technologies (Gade, Gade & Reddy, 2016). IoT makes every device internet ready and offers connectivity that enables the flow of data by creating a network of objects (Mohammed & Bagavathi, 2016). Through IoT, the future can be imagined, where the devices will be equipped with microcontrollers, sensors, trans-receivers for digital communication, suitable protocol stacks and network models will make these devices to communicate with each other, while the users become an important part of the Internet (Gade, Gade & Reddy, 2016).

**3.2 Smart city:** The smart city is an emerging concept. As a result, there is no universally accepted definition. The following are the working definitions of smart city:

| Author | Year | Definition |
|---|---|---|
| Nam & Pardo, | 2011 | Smart Cities are about leveraging interoperability within and across policy domains of the city (e.g., energy, healthcare, transportation, public safety, education, healthcare, etc.). Smart City strategies require innovative ways of interacting with stakeholders, managing resources and providing services |
| Hall | 2000 | A city that controls and unites conditions of all of its critical infrastructures |
| Gade, Gade & Reddy | 2016 | Smart city is a global trend of urban policies aimed at improving the quality of inhabitants living in urban areas and at leveraging on innovation and high technologies to solve the complicated problems generated by high-population density |
| Bakici, Almirall, & Wareham | 2013 | A smart city is that city that utilizes ICTs with the purpose of increasing the quality of life of the people while providing sustainable development. |

*Source: Compiled by the Author*

From the above, there are three primary attributes of the Smart City. First, Smart city is characterized by the "high intellectual or human capital" needed to sustain continuous innovation and address challenges. Second, regarding goals, smart city aims at social inclusion, significantly improved quality of life and economic development. Third, Smart city policies also target improvement of human capital through continuous learning, efficient management of resources, and sustainable urban development in general (Ojo, Dzhusupova, & Curry, 2015). While Smart city is expected to improve their citizens' quality of life dramatically, encourage investment, and create a sustainable environment. Smart city initiative is a key to building smart connections, inspire, empower people and deliver innovation in public services.

**3.3 Emerging technologies:** The term emerging technologies are science-based innovations with the potential to create a new industry or transform an existing one (Day & Schoemaker 2000). Emerging technologies can be explained as are new technologies

that are currently emerging or will be developed in the next few years, and which will largely change the social and business environment (Srinivasan, 2008). Vine (2002) defined emerging technologies as technologies that have the potential to gain social relevance within the next 10 to 15 years. Haag, Cunnings, & James (1998) identified that emerging technologies fall into two categories. These include; a technology that is so new that most businesses have not exploited it yet; or technology that is fairly well established, but business has not fully used it.

From the above definitions, it shows that emerging technologies are not necessarily new. Technology can be considered emerging when it is not widespread in a particular context.

## 4. THEORETICAL BACKGROUND

**Technological determinism theory:** Technological determinism (TD) is the idea that technology has important effects on our lives. This idea figures prominently in the popular imagination and political rhetoric, for example in the notion that the internet is transforming economy and society. Technological determinism has also had a long and controversial history in the social sciences in general and in organization studies in particular (Adler, 2006). Technological determinism was developed an American Economist and Sociologist, Thorstein Veblen. This theory believes that nature technology in any society defines its nature. Technological determinism viewed technology as the driving force of culture in any society, and it determines its course of history (Adler, 2006). Technological determinists interpret technology in general and communication technology as the basis of society in the past, present and even the future. Therefore smart cities regarded from a technological-deterministic view produce a lot of data and require the use of robust geographic information systems to analyze this data (Jan-Philipp, 2015).

Technological determinism has been criticised based on the fact that technology never forces itself on members of the society. Man creates technology and chooses to use them. Man invents television and wishes to view it. There is no pressure on the part of the technology to be used instead technology needs people to engage themselves at some point or another to use a microwave or a car. The decision of using technology and experiencing its effects, therefore, lies in the hand of a human being. Despite the criticisms of TD, the relevance of technological determinism, to this paper, is that technology directs the transformation of public sector organizations, which means that technology or its potential cause changes in processes, structure, people and organizational culture. In the public sector, technology is the factor that directs the transformation of organizations and their elements.

## 4.1 THE INFLUENCE OF EMERGING TECHNOLOGY ON PUBLIC SECTOR ORGANISATIONS

Emerging technologies today are one of the most major drivers of the performance of public sector organizations. They are transforming government agencies

and the nature of governance and pose new challenges for the civil service (Desouza, & Bhagwatwar, 2012). Over the years, the development of technology has prompted the public organization to change. One of the most significant changes in technology has been the evolution of the information systems and how their development has influenced the way the world uses technology. The combination of technology that enables the conversion of data into information has had an immense influence on the field of public administration and its theoretical foundation (Dianne, 1997). These technologies have emerged and developed after great development and progress in the area of science and technology, which in turn represented a meaningful addition to the field of public administration. These technologies mean all the innovations which help to perform the functions of all governmental activities.

In fact, emerging technologies developed as a result of rapid developments arising from the revolution in information and communications technology in particular, which in turn produced many technological distinctive innovations which are considered as an addition to the governmental process, which continuously develops and brings greater features and attributes for the field of public administration. Consequently, emerging technologies have added a lot of scientific and practical dimensions to public service delivery. The imperatives of emerging technologies to transform public service delivery provide a compelling context for the more excellent use of digital technologies and assistive technological labor-saving solutions in the public sector. Today, these new demands on governments are driving public sector modernization, which continues to require systematic and consistent efficiency and productivity, especially regarding service delivery.

## 4.2 EVOLUTION OF SMART CITY

Today, the concept of the smart city is one of the most frequently mentioned concepts in the management of the modern city. Smart city phenomenon developed due to some significant challenges such as technological progress, innovative devices, knowledge economy, environmental pressures and the political support from various global institutions like United Nations, the OECD, the European Union, etc. (EU 2011, 2014; Thite 2011; Winters 2011; Zygiaris 2013; Cocchia 2014).

At European level, the smart cities initiative was launched in 2011 to forging partnerships between industry and cities 'to develop the future urban systems and infrastructures. Later, smart city programs have been launched by national agencies, most notably across Asia (e.g., China, India, and South Korea). Major international technology companies, including Cisco, Hitachi, and IBM, have become active both as contributors to conceptual development and partners in pilot projects (Moir, Moonen, & Clark, 2014). In the United Kingdom, the Department for Business, Innovation, and Skills in 2013 launched a smart cities initiative. This is to foster innovation as well as to enable businesses in Europe to benefit from the global market of more than £200 billion by 2030 (UK Department for Business, Innovation & Skills, 2013). The European Commission has launched a funding program to accelerate the development of system standards for smart cities and communities solutions (Caragliu et al. 2011).

In last two decades, the idea of a smart city has become more and more popular in development literature and policies. This in the opinions of Mori & Christodoulou (2012) is the prime role of cities in the social and economic aspects of people worldwide, and in the tremendous impact on environmental sustainability. In the last few years, the smart city concept has played a significant role in public sector management. In a smart city, investments in social and human capital, traditional and modern communication infrastructure always improve the economic and quality of life, with effective management of natural resources through participatory governance (Caragliu, 2011).

## 4.3.    IOT AND SMART CITY: THE NEXUS

IoT is very crucial to the development of a smart city. It has become ever more prominent in everyday life, the concept of the smart city has begun to grow. Smart cities are urban developments that combine various ICT and IoT solutions to manage public infrastructures such as transportation systems, libraries, the management of schools, water supply, waste management, hospitals, power plants, law enforcement, etc. (Advanced Maui Optical and Space Surveillance (AMOS), 2016). The most significant utilization of IoT is smart cities (Gade, Gade & Reddy, 2016). The smart city uses smart technologies such as IoT to improve the quality of life in cities and communities.

It is clear that IoT and smart city are the features of the world's major cities, which in turn means that skilled developers, operations professionals, engineers, IT security specialists, and public administrators will be in high demand. There are many growth opportunities in the immediate future and in the coming years for the government to delivery efficiency service by leveraging on emerging technologies. IoT applications that leverage ubiquitous connectivity, big data and analytics are enabling Smart City initiatives all over the world. These new applications introduce tremendous new capabilities such as the capability to remotely monitor, manage, control devices and to formulate new insights and actionable information from massive streams of real-time data (Amos, 2016). IoU shows how a city can move from being an efficient city to a brilliant city.

Though a lot of people believe that building the smart city will be exceedingly disruptive, Kolade (2016) states that governments did not have to tear down the towns of today to develop smart cities, which would enhance services and the quality of life for their inhabitants. He believes that through the use of Internet of Things technology, building a smart city with some intelligently connected services would become possible. Kolade (2016) notes further that an IoT enabled smart city can reroute traffic gridlock in real time, automatically schedule repairs for collapsed infrastructure like bridges and street light,   intelligently manage energy use and pollution right across the environment. IoT can also protect citizens and businesses from crime more efficiently, and safeguard vulnerable inhabitants in their homes. The IoT is assisting the world's largest cities to do this, on a grand scale, and at a remarkable rate.

## 4.4 Relevance of IoT and smart city to efficiency in public service delivery

Just like the Internet has helped economies to develop and flourish, the Internet of Things will do the same. It will assist governments to do their jobs in a more efficiently. The public sector needs to embrace this technological development and reap its benefits. IoT can help the government to achieve its goals, increased economic growth, improved environmental sustainability, efficient service delivery, public safety, and productivity. While many organizations in developed societies have already captured the vast potentials of IoT, most developing countries are yet to benefit from the advancement in technology through IoT.

The public sector organizations can benefit from the diversity of devices in IoT, by leveraging the power of these devices, we are entering the era of smart cities, where sensors and automation can enhance public services, and impact on daily life of citizens.The benefit of a smart city includes an efficient management of human, natural and capital resources. This revolves around improved products and services to individuals and businesses, waste management, energy renewal, high level of security and delivery of high standard education. This will inevitably reduce operational costs, increase savings and invariably improve the quality of life of citizens and inhabitants of the city.

The benefits of smart connectivity in the public sector are tremendous. IoT lends itself seamlessly to applications in smart transportation, smart waste management, smart parking, etc. The ability to monitor tunnels, traffic, bridges, and other public facilities for problems offers both increased public safety and costs reductions. Additionally, telecommuting, or reduced travel, provides cross-agency cost savings. IoT offers exciting possibilities for effectiveness, improved public safety, and emergency response of medical officers, police, and firefighters.

In the transport sector, IoT not only makes the lives of the commuters easy but can also help the government improve their services. By analyzing all the digital information obtained from swipe cards, the frequency of public transportation can be determined at certain hours of the day. It can help you better manage traffic. Traffic police officers do not need to be physically present to help navigate traffic and avoid congestion. By utilizing GPS tracking devices, traffic can be analyzed in real-time, and the traffic lights can be managed accordingly.

IoT can make highways safer by enabling connected vehicles to interact with each other to prevent accidents. It can make quality health care more accessible through remote monitoring devices and telehealth practices to reduce delay in response and improve efficiency both in factory supply chains and in the running of cities. Smart city will not only be more useful for the citizens but will also attract more investments. For instance, Tourists can opt to get immediate notifications about what's happening in the city and which are the hottest places to hang out right now. To make city smarter, the governments need to start promoting several start-ups and other industries to operate on the IoT technologies so that they can be fulfilled in various areas of urban living.

## 4.5 Emerging technologies and efficiency in public service delivery in Nigeria

Emerging technologies have the potential to make major cities more functional and convenient for the people and the government. Even so, there are still challenges to

surmount. Though IoT provides immense opportunities to improve the effectiveness of governance, public safety, and support development, it also offers some challenges for the cities to overcome to build the dream smart cities. The application of information technology in improving public service delivery will transform the way government operate and deliver services. The application domains for ICTs in smart cities range from transport, tourism, health, ambient assisted living, crime prevention, governance, infrastructure, disaster management, environment management, smart homes to smart energy.

Internet of Things will play an instrumental role not just in communication networks but also in sanitation, transportation, healthcare, and energy use. It will create bits of knowledge that city specialists could use to enhance street and rail transport, lessen crime, improve social insurance, improve public service delivery, and diminish wastage of money related assets (Abdulkadir, Adamu, & Abdul-Fatou, 2017). IoT can facilitate the collection of reliable information about how efficiently public servants, policies, and programmes are addressing mission challenges and by helping the government to deliver services based on real-time and situation-specific conditions (Wlliam, 2015). By implementing the real potential of IoT, governments can improve services to its citizens, increase sustainability, and make the existing cities a better and more livable place for all its citizens. Internet of Things is the next big thing in the evolution of the information and communications technology space. IoT is a crucial aspect of smart cities that Nigeria needs to achieve.
Through the adoption of IoT, refuse collectors will make fewer journeys and use less fuel, will the operators can reduce the number of refuse trucks they use. IoT tracking devices can be installed on trains or buses to determine the location in real time. With IoT technology, cities in Nigeria can become smart cities, creating cleaner, safer and more efficient environment for the citizens.

A smart city is an idea to integrate various technologies which work together with a common aim to improve the quality of life. Smartness of a city can be shared among several sectors namely smart governance, smart building, smart environment, smart mobility and smart utilities. In this context, the IoT is growing due to the continually growing number of important devices like smartphones, laptops, tablets, and other devices such as sensors which are interconnected through the Internet (Manoj; Markus & Marija, 2016).

## 4.6 An overview of IoT and smart city in Nigeria

With about 48 million active internet users, Nigeria is one of Africa's´ countries with an enormous market for IoT. Nigeria has been building the infrastructure slowly from the year 2010 when it formulated national information communication technology strategic plan 2010-2015. Like many countries in Africa, while Nigeria is yet to establish major IoT projects, the remarkable initiate was taken by National Agency for Food and Drugs Administration and Control (NAFDAC). Faced with perennial counterfeiting problem, NAFDAC in 2010 resorted to product verification initiative using Radio Frequency Identification (RFID). The technology carried out in collaboration with

Verification Technology Limited (VTL), use tags equipped with RFID to secure the genuinely of drugs throughout their supply chain starting from manufacturers, distributors, wholesalers, retailers and even consumers (Onyalo, Kandie & Njuki, 2015).

It is essential therefore to state that smart city initiative is the future reality in Nigeria and other developing countries which is anticipated to add more than 212 million to her urban populace between 2014 – 2050 (Abdulkadir, Adamu, & Abdul-Fatou, 2017). Many individuals are living in urban centers than in rural areas internationally, with 54% of the total populace dwelling in the urban areas. In 1950, 30% of the entire world population was urban, and by 2050, it has been estimated that 66% of the world population will be urban. While India, China, and Nigeria are required to represent 37% of the estimated population of the world, with Nigeria alone anticipated to include 212 million (United Nations, 2014; Abdulkadir, Adamu, & Abdul-Fatou, 2017).

Similarly, Kolade (2016) notes that about 48 percent of Nigerians are living in urban areas and this will continue to grow as urbanization continues. With the number of people living in cities around the world predicted to rise to 6.4 billion by 2050, cities like Lagos, Abuja and Port Harcourt need to embrace IoT technology to meet the rising expectations of a mega city.

Nigerian Smart Cities Initiative is a conscious effort by government working with the private sector and all other stakeholders to forge a public-private partnership to develop a solution that will make cities and citizens smarter through technology (International Gold Event, (IGE), 2017). Presently, Nigeria is making efforts at developing its smart cities in some states of the federation including the Federal Capital Territory, Abuja through coordinated and concerted efforts by the government through the public-private partnership. Notable amongst the cities are the Eko Atlantic City and that of Lekki which are jointly being managed by the Lagos State Government, Commercial Banks and Private Investors (The Federal Republic of Nigeria, 2016). The significant partnership between Lagos State and City of Dubai will guarantee Lagos rise as the first Smart City in Africa in an appreciated advancement (Abdulkadir, Adamu, & Abdul-Fatou, 2017). The Lagos State Attorney General and Commissioner of Justice (on behalf of Lagos state) and the CEO of Smart City Dubai have signed the Memorandum of Understanding (MOU) for the Lagos Smart City at the Emirates Towers, Dubai.

The smart city initiative in Nigeria is an idea based on the achievement of Dubai's creative information-based industry experts to engage business development for organizations and learning specialists everywhere throughout the world (Abdulkadir, Adamu & Abdul-Fatou, 2017). Through smart city project, the future has a place in Lagos state, as the smart city project would mark the major smart city in Africa when completed.

## 5. CONCLUDING REMARKS

The above analysis of leveraging on emerging technology to improve service delivery in government has brought out important aspects of successful implementation of the internet of things and smart city in developing countries like Nigeria. The utilization of emerging technology to enhance service delivery can never be over-

estimated, while the implementation process has to be in line with what is applicable. The smart city project should be planned in such manner that the relationship between the government and people should be more understandable to the people at large. Further, the acceptability of technology interventions amongst people increases manifolds if it has a direct, immediate and visible impact on service delivery (Sharma, 2014).

With more than one-half of the world's population living in cities pioneering new IoT solutions, such as smart healthcare, smart parking, smart energy, connected waste, and traffic management, holds great promise for fighting the major challenges of high-end urbanization. We are likely to see many smart cities of the future coming to life overnight. There is no doubt that smart cities will help Nigeria move forward, pushing business and government to rethink solutions to urban problems. The public sector can leverage the emerging technologies through IoT to improve service delivery, reduce costs and engage citizens. Smart city leverages on digital technologies will boost the quality of life of its inhabitants, and also to reduce costs and resource consumption.

Internet of Things and smart city applications can generate substantial benefits for citizens and businesses in Nigeria. There is a need for policymakers to design and implement smart city projects with a long-term vision, which are defined around citizens' needs, managed through smart governance, based on open and scalable systems and promote a culture of innovation, openness and transparency.

As a result of insufficient financial resources, smart city initiative will be best executed in Nigeria by visionary leaders who manage smart city projects using public-private partnerships to invest in pilot scale projects. Government's role in providing clear policy and regulatory framework needs to be translated to concentrate actions regarding articulating a clear roadmap, implementation plan and coordination mechanism towards the attainment of relevant stakeholders' objectives. Though smart city project, no doubt are money-spinning ventures for government at all levels, the opportunity must be explored to address the problem of slums in our cities to improve the welfare of the citizenry.

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