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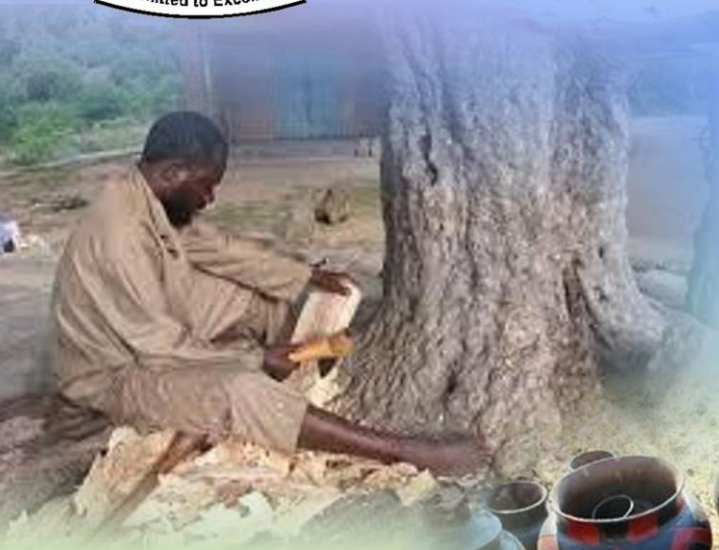
THE ZIMBABWE EZEKIEL GUTI UNIVERSITY
JOURNAL OF DESIGN, INNOVATIVE THINKING AND PRACTICE



ISSN 2957-8426 (Print)

Vol 1 Issues (1&2), 2022

Published by the Zimbabwe Ezekiel Guti University Press
Stand No. 1901 Barrassie Rd,
Off Shamva Road
P.O. Box 350
Bindura, Zimbabwe

Typeset by Divine Graphics
Printed by Divine Graphics

SUBSCRIPTION AND RATES
Zimbabwe Ezekiel Guti University Press Office
Stand No. 1901 Barrassie Rd,
Off Shamva Road
P.O. Box 350
Bindura, Zimbabwe
Telephone: ++263 8 677 006 136 | +263 779 279 912
E-mail: zegupress@admin.uz.ac.zw
http://www.zegu.ac.zw/press

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The *Kuveza neKuumba - Zimbabwe Ezekiel Guti University Journal of Design, Innovative Thinking and Practice* provides a forum for design and innovative solutions to daily challenges in communities.

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Planners, engineers, social scientists, business experts and scholars and practitioners from various fields.

JOURNAL SPECIFICATIONS

Kuveza neKuumba - Zimbabwe Ezekiel Guti University Journal of Design, Innovative Thinking and Practice

ISSN 2957-8426 (Print)

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The Smart City Concept in Africa: Case of Zimbabwe

TINASHE MAGANDE[1], ANDREW CHIGUDU[2], MIRACLE P MABVUNDWI[3] AND BEATRICE HICKONICKO[4]

Abstract

This article seeks to interrogate the Smart City concept and its relevance to African built environment planning and management. Like many buzzwords of times, the Smart City concept is a notion whose rooting in countries that still lag in terms of development, is an aspect of great concern and requires scrutiny before generalisation. In an ideal environment, free from many ordeals, a Smart City is one that operates like a human machine and in which artificial intelligence has become the motor-generator for urban processes. It is a robotised city, a system whose subsystems speak to each other, communicating for progress. In such a city, the sectors and subsectors are very much interconnected and can be made to modularise or assemble as defined by the purposes of what needs to happen. In such a city, land uses, population mobility, circulation and flows (energy, water, transport, etc) are both centrally and locally coordinated. Developing such a city is a function of deep study of the human and non-human needs over a period, or an artificial superimposition of a system or model learnt elsewhere.

Keywords: human-machine, urban processes, urban informality, planning,

INTRODUCTION

Africa still has several gaps, including disconnected spaces and uneconomic or mismatched space needs largely explained by rampancy of urban informality and disengagement of political,

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social and economic interests. While trying to be human, urban spaces are then marketed by district contradictions and enslaving rich versus poor, serviced versus un-serviced, politicised and neutral spaces. Without smart citizens, there are no Smart Cities.

This article seeks to interrogate the Smart City concept and its relevance to African built environment planning and management. Like many buzzwords of times, the Smart City concept is a notion whose rooting in countries that still lag in terms of development, is an aspect of great concern and requires scrutiny before generalisation. In an ideal environment, free from many ordeals, a Smart City is one that operates like a human machine and in which artificial intelligence has become the motor-generator for urban processes. It is a robotised city, a system whose subsystems speak to each other, communicating for progress. In such a city the sectors and subsectors are very much interconnected and can be made to modularise or assemble as defined by the purposes of what needs to happen. In such a city, land uses, population mobility, circulation and flows (energy, water, transport, etc) are both centrally and locally coordinated. Developing such a city is a function of deep study of the human and non-human needs over a period, or an artificial superimposition of a system or model learnt elsewhere.

Playing a central role in the behaviours that underline present-day life, information and communication technologies (ICT) are at the heart of this knowledge-driven economy. They provide opportunities for reducing distance and time constraints by facilitating information exchange and knowledge sharing and they also promote the development of networks, hence fostering social, economic and territorial cohesion (Santinha and de Castro, 2010). Mitchell (2007) argues that the new intelligence of cities resides in the increasingly effective combination of digital telecommunication networks, ubiquitously embedded intelligence, sensors and tags and knowledge management software. The development of Smart Cities enables the global functioning of local innovation clusters and regional systems of innovation. The growth and expansion of cities in Africa are essentially uncontrolled, thereby compounding hitches in the region (Mabogunje, 1990). Among these problems is poor

housing that is also inadequate to cater for the existing population, slum areas with inadequate water supply, poor solid waste disposal, traffic and human jamming, high unemployment rates, poverty, crime and other social problems. These problems have been related to issues of poor planning and ineffective governance at all levels (Ogbazi, 2013).

CONCEPTUAL FRAMEWORK

The focuses of Smart City development are improvements in citizens' life (Neirotti *et al.*, 2014), environment efficiency, security and sustainability (Niaros *et al.*, 2017) with centrally controlled and monitored technological infrastructures. A Smart City integrates ICT and the Internet of Things (IoT), entrenched into most of the sectors of urban development such as government functionality, city operations, services deliveries and intelligent analytics to maximise services, production and usability. Although there is no agreement on the exact definition of a Smart City, several main dimensions of a Smart City have been given in the literature (Giffinger *et al.*, 2007, Fusco Girard *et al.,* 2009; van Soom 2009) and these include smart economy, smart mobility, smart environment, smart people, smart living;, and smart governance.

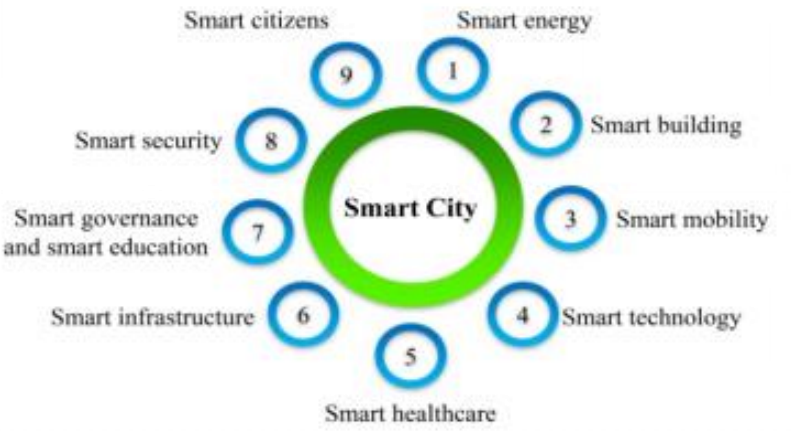

Figure 1: *The main aspects of a Smart City* (Arasteh *et al.*, 2016)

A city is a huge human settlement that has an extensive system for housing, transportation, sanitation, utilities, land use and communication. Its density facilitates interaction between people, government organisations and businesses, sometimes benefiting different parties in the process (Cohen and Garrett, 2010). The concept of Smart Cities has always been attributed to the individual, characterising outstanding human mental accomplishment. Smart cities belong to an emerging movement targeting the creation of settings that expand intellectual skills and abilities to learn and innovate (Komninos, 2006). As a result of this new terminology, that is the concept of Smart City surfaces, considered a place that assembles organisational capacity, institutional leadership and creativity, combined to produce innovation, the main driver of increased competitiveness. SSmart Cities constitute a new planning paradigm pertinent to both the fields of urban-regional development and innovation management (Komninos, 2009). The initiative for smart cities was launched in the late 20th century to help communities globally to better understand the important role of technology, economic development and prominently, creativity and innovation in success and survival in the new global economy (Smart Communities, 2008). In Canada, Smart Cities succeeded through a top-down planning proposal that went through a process of covering the entire city. The concept of a Smart City ascends in search of a remedy to the increasing challenges that were haunting the urban areas, for which purpose these new model cities are being created. Innovations through the establishment of Smart Cities are being integrated for generations yet to come.

The major idea of a Smart City is to offer efficient organised services, improve the safety of the people who reside in the city and provide a good quality working and living environment. A Smart City has good e-governance systems, street lighting and good water and waste management. There is need to link power consumption, digital communication, internet connectivity, energy efficiency and other digital infrastructure components to achieve this. A Smart City, according to Giffinger *et al.* (2007), is

> "A City performing in a forward-looking way in economy, people, governance, mobility, environment and living, built on the smart

combination of endowments and activities of self-decisive independent and aware citizens.

A city is believed to be smart when investments in human and social capital, transport and modern ICT communication infrastructure accelerate sustainable economic growth, high-quality life, participatory governance and wise management of resources.

To put the idea of Smart Cities in perspective, it is useful to go back to the beginning of a long evolutionary process. The physical fabric of earliest cities, long before the industrial revolution, consisted essentially of skeleton and skin columns, beams, walls, floors and roofs. Its functions were to provide shelter and protection and to intensify land use. The inhabitants, sometimes assisted by domestic animals, provided their mobility, performed social and economic transactions face-to-face and supplied the coordinating intelligence needed to make the city function as a system. Then, with industrialisation, cities started to acquire, increasingly extensive artificial physiologies. Now there were water supply and liquid waste removal networks, energy supply networks, transportation networks and heating and air conditioning networks in buildings. Food processing and supply networks extended human alimentary canals at one end, while sewers extended them at the other. Inhabiting a city meant being continually plugged into these networks and dependent upon them survival.

Cities extended the capabilities of the human in more comprehensive and sophisticated ways and took over more of the functions traditionally performed unaided by the human body, so the cyborg condition intensified. Finally, in the latter half of the 19th century, cities began to add artificial nervous systems to their fabrics of skeleton, skin and supply, processing and removal networks. This process began with the construction of telegraph, telephone and radio communication systems, picked up momentum through the first half of the 20th century and then accelerated extraordinarily after the introduction of digital telecommunications in the late 1960s, eventually producing today's pervasive connectivity through the

internet and mobile wireless networks. The pioneering media theorist Marshall McLuhan presciently hailed these new networks as extensions of human nervous systems. At the dawn of the 21st century, cities possessed all of the crucial subsystems of living organisms: structural skeletons; input, processing and waste removal networks for air, water, energy and other essentials; and multiple layers of protective skin.

LITERATURE REVIEW

Cities have always been at the centre of important social and economic changes, but more new expectations, ambitions and needs have been raised by people and institutions concentrated in these localities. Apart from the need to stay safe, the establishment and importance of sound, which has been regarded as a major birthplace of knowledge for people about the environment, have been observed. Sounds were a means of communicating and transferring information to members of society. The development of building clusters also moved in line with the developed role of sound (Lubman and Kiser, 2001; Mourjopoulos, 2015). Despite a positive correlation between the cities and ICTs, widen the gap between the rich and the poor in economic terms. In Sub-Saharan Africa and in Zimbabwe, primarily, ICTs have gained impetus during the past decade, diffusing from the first-world countries where they have already taken supremacy.

Rawte *et al.* (2017) argue that:

> ...We will not have Smart Cities without Smart Citizens: the citizens need educated and helped to be Smart. We will not have Smart Cities without Smart Buildings as the Smart Building is our most fundamental component."

"A smart approach is an opportunity for knowledge integration, necessary to solve crucial problems of contemporary societies" (Nižetić *et al.*, 2019:2). Connecting everything to the internet where they can be regularly supervised by users has become to be known as the IoT (Atzori, *et al.*, 2010). The concept has been used in various sectors and Smart Cities are not an exception. The impact of the IoT has been predicted to be extensive in the promotion of Smart Cities, particularly with the use of smartphones. The idea of a city able to be smart and digital,

that is, to use technology and, ICT especially, to improve the quality of life in urban space, is quite old.

In Smart Cities, the smart grid is associated with the issue of smart meters and smart energy, *inter alia*. Danielly *et al.* (2019) provided a review of the literature related to smart metering to ensure smooth functioning and secured smart grids. The paper discussed the main challenges associated with smart metering, drawing from the currently available smart metering technologies on the market. The paper recommended the use of the internet of digital technologies to solve the identified challenges. Mkireb *et al.* (2019) carried out a study that establishes the development of a smart and sophisticated water control management system that is controlled through digital methods. Hussain *et al.* (2019) explored the use of smart grids in the management of wind energy. The study developed an effective model for energy management modelling in the concept of Smart Cities. Smart grids are reliable, cost savings and have energy independence.

These grids should also be extended to densely populated cities that will host ICT devices and where data collection will be done for policy making (Zedadra *et al.*, 2019). Those who reside and work in Smart Cities benefit from better city planning, faster delivery of service and economic development. There is need to generate great infrastructure in Smart Cities due to the extraordinary data that needs to be generated (Gharaibeh *et al.*, 2017). In the future, Smart Cities will not only hold most internet of things devices, most of the users and applications will be used for solving several problems that are related to modern cities (Nižetić *et al.*, 2019). Marques *et al.* (2019) noted that digital technologies are important in smart waste management systems. The study identified it as a long-term proposed solution for waste management in Smart Cities. The availability and quality of the IT infrastructure are not the only definition of a Smart City (Caragliu *et al.*2009). Transportation are one of the non-separable sectors of society Mathew and Rao (2007). Ajayi (2021) identified the concept of Intelligent Transportation Systems as one of the key concepts of Smart Cities that have developed rapidly across the globe. Rapid global development has been witnessed much in the western world.

Conversely, the study revealed that Africa and Asia have not witnessed much growth in the deployment of smart transport systems. These regions have witnessed dilapidating road infrastructure, poverty and poorly maintained mass transit vehicles as major concerns. It was revealed that the importation of western technologies cannot overlook in this respect. Through westernisation, smart technologies have found their way into African cities. The study systematically reviewed literature to determine the state of the art of these technologies in African countries. It concluded that African particularities impeding the common implementation of smart transport systems were discussed, followed by the development of a conceptual architecture for an integrated intelligent transport system for African cities. Mitchell (2007) asserts that the City Car is one example of the comfortable, cheap and sustainable contributions that a Smart City can make to improve citizens' mobility.

In another study, concentrating on transport as a major component of the intelligent city concept, Madihlaba (2019) asserts that transportation is a key portent that directs an increase in population, investments and the use of land in cities. The study revealed that secondary cities in particular lack a firm future strategy for transportation when it comes to planning for development. This plunges such cities into transport challenges,leave them with ageing transport infrastructure, traffic jams, lack of parking spaces and high risks of accidents, *inter alia*. Secondary cities, particularly those in sub-Sahara, are ignoring the use of technologies in managing transport challenges for which the remedy is vested in the establishment of smart ITS.

Kaźmierczak *et al.* (2021) did a subjective review of the glitches that should be carefully considered when planning and designing smart urban areas in the context of the presence of sounds in the smart city structure. The study found that the inhabitants of the city under research were willing to change their city into a modern Smart City. The results of the research revealed that city sounds matter to most people, with only a few giving negative answers. The majority were willing to change city sounds in the city. The study concluded that the topic of

eliminating, improving and boosting urban sounds is worth exploring. Although there is no agreement on the exact definition of a Smart City, several main dimensions of a Smart City have been identified through a literature review (Giffinger *et al.,* 2007, Fusco Girard *et al.,* 2009; van Soom 2009) and include smart economy; smart mobility; smart environment; smart people; smart living; and smart governance.

Kenya has an extensive experience in the use of digital technologies to include slum areas such as Kibera in the planning and land administration. Real-time data also allows better planning and management of service facilities as was observed in Kenya, where health workers use mobile phones to report counterfeit drugs and stock-outs. In the city of Lilongwe in Malawi, sanitation data collection through mobile phones, along with web-based sanitation monitoring systems, enabled real-time sanitation information that could guide timely responses. Mora *et al.* (2017:20) argue that "…the knowledge necessary to understand the process of building effective Smart Cities in the real world has not yet been produced, nor the tools for supporting the actors involved in this activity."

The government should be clear in its transactions, digitalise its records and run an open data system and allow citizens to participate (Gaza, 2018; Ghosal and Halder, 2018). Smart living should be given great attention since the whole idea of attaining a Smart City revolves around the creation of better living conditions for the city's citizens (Aghimien *et al.*, 2019; Macke *et al.*, 2018). This should not exclude the provision of a good healthcare delivery system, an innovative educational system to shape innovative thinking and creative thinking (Giffinger *et al.,* 2007), improved security (Colldahl *et al.,* 2013) and advance the quality of housing.

RESEARCH METHODOLOGY

The article engages documents and literature reviews compiled from case studies and anecdotal evidence from various stakeholders to the Smart City race in Zimbabwe and beyond. It was done using desk research and involved the reviewing of relevant literature and drawing useful insights from other available Smart City studies from Sub-Saharan Africa and the

rest of the world. In addition, extensive and detailed document analysis was also done, in a way that provided the study a good framework for properly analyzing the study issues. The desk research, therefore, included a literature search and review of existing academic and non-academic documents, that included written and unpublished papers, journal articles, reports and case studies. Documents for the literature review were identified mainly through searches on various websites of international publishers and organisations.

RESULTS

A Smart City has good e-governance systems, street lighting and good water and waste management. The deployment of renewable energy mini-grids promotes the global goal of achieving clean energy for all, while providing an economically feasible solution. Some African countries like Kenya, plan to achieve 100% electrification by 2030. Senegal sought to achieve 62% rural electrification by 2022. This gives a reflection of the targets of the countries in the sub-Saharan region. Zimbabwe targets to electrify most of its growth points through the rural electrification programme. The National Development Strategy 1 targets improving access to electricity for both rural and urban areas from 44% in 2020 to 54% by 2025. Besides the need for broadband networks and digital spaces, the objective of Smart Cities is to enhance innovation of the respective city or region rather than to offer digital services. Nearly a third (65%) of the Sub-Saharan African population lacks access to clean energy, is an essential service.

CASE STUDIES

EGYPT

In Egypt, the current development of ICT can enable new kinds of thinking regarding the development of urban areas, allow a larger set of input data and much wider resources for assessment and prevent or reduce central decision-making. Currently, smart solutions in urban design are not widely used in Egypt. There is a big demand for raising public awareness of smart techniques and their benefits for quality of life. The Smart City agendas should have a central place in urban development projects. Although those projects need huge

investments, they can contribute to making areas such as heritage areas and university campuses more attractive and usable with a focus on future generations' demands. Egypt, as one of the most strategic countries in Africa, has no cities that can be classified as Smart Cities. It is observed that there are only three Smart Cities in Africa. In Egypt, the concept of smart urban design (SUD) is addressed through government and private companies that use smart information systems. The Egyptian government currently is focusing on delivering more efficient services to citizens through e-government but, unfortunately, without considering improving the quality of current infrastructure and creating more attractive usable urban areas.

It should be taken into account that present and future generations are looking for data, services and dynamic and changing urban spaces. Although Egypt set a vision for sustainable development by 2030, making the development of information technology a priority, smartness is still represented only by technical projects such as the establishment of a few Smart Villages. But the systems for water, energy, garbage and transport management are not effective enough to be smart. Although Egypt is one of the countries with many highly educated people, with an increasing number of internet and computer users and many government services are currently delivered electronically, there is no Egyptian city that can be considered a Smart City. The future vision 2030 for sustainable development supposes that comprehensive urban development cannot be achieved without improving the ICT sector because data lead to the right vision and the right vision leads to the right actions. Additionally, this sector should play an important role in the Egyptian economy. Egypt's ICT 2030 strategy includes the development of ICT for education, ICT for health, ICT for government, green ICT and legislative services. Another potential is the current great interest in establishment of ICT corporations in Egypt. Some challenges counter the achievement of a smart governance approach in Egypt. The current administrative systems lack flexibility and adaptability. Most governmental action plans cannot adapt to changing conditions in terms of social and economic circumstances. There is a gap between the administrative system and citizens

because of the absence of communication techniques required to engage citizens in the decision-making process. Weak regional cohesion leads to the difficulty in regional collaboration in the fields of investment and marketing to support the infrastructure and facilities.

NIGERIA

Nigeria's quest to plan and prepare for her ever-growing human population and to solve a myriad of economic, social and environmental challenges within her major cities, highlights the importance of a Smart City for the country. There are over 200 million people currently living in Nigeria of which the overall size and geographical landmass are approximately 924 000 km^2 . Nigerian cities are now a major hub of economic survival for many families which is why Akujobi *et al.* (2017) and Kadiri *et al.* (2019) were of the view that Nigeria's highly complex characteristics regarding human behaviour, conflicts, variations and adaptation that sit in the demographic and socio-economic profile of the citizens also account for the proliferation of settlements, crimes, urban distortions and other social problems. Nigerian cities often succumb to fragility, evidenced by many urban dwellers living in overcrowded and under-serviced slums, while a good number of the citizens trek to work or travel in highly congested buses due to a lack of affordable alternative transport. To avoid the risk of Nigerian cities becoming both unbelievable and indebted, requires a change of mindset from traditional agglomerations to Smart Cities. Smart Cities for Nigeria would address most of the challenges facing the traditional agglomeration, typically evidenced in the growing number of urban dwellers outpacing the present urban governance plans and efforts. Smart Cities for Nigeria will aid in solving the many challenges that confront the country's traditional agglomerations, including power supply challenges (Patrick *et al.*, 2013; Dada, 2014; Monyei *et al.*, 2018), housing, urban poverty, inadequate formal land development, urban decay and fragility, slum settlements and absence of essential services (Ogbazi, 2013) and encourage sustainable development, limitations with realising a Smart City in Nigeria interrelated with governance, economic, social, technological, environmental and legal issues being the dimensions of the challenges the country must deal with in actualising a Smart

City. Adejuwon (2018) examined how Nigeria is leveraging emerging technology to improve efficiency in public service delivery. In Nigeria, the challenge of urbanisation includes urban poverty, inadequate formal land development, squatter and slum settlements and the absence of essential services (Ogbazi, 2013). These problems are associated with poor planning and ineffective government at all levels (Egbu *et al.*,2008; Ogbazi, 2013). These crises in the Nigerian urban setting are due mainly to corruption, lack of human and material capital and the absence of harmony between the federal and state governments and local and state governments. The crisis of urbanisation in Nigeria was exacerbated by a lack of data and outdated city plans (Aribigbola, 2007), lack of coordination amongst planning institutions (Ogu, 1999), failure to execute detailed land-use plans (Gandy, 2005; Bloch, 2014; Sawyer, 2014), absence of cutting-edge technology to facilitate planning and land administration processes (Akingbade *et al.*, 2012), lackadaisical attitude to new knowledge in the field of planning and poor urban coordination and corruption, (Ogun, 2010; Idemudia, 2012), as a result of the failure of the government to utilise the huge oil returns that have attracted the citizen to urban centres not adequately prepared to cope with the influx, leading to increased pressure on existing infrastructure.

SOUTH AFRICA

In South Africa, several measures are being considered to propel city smartness. By adopting diverse digital technologies (DTs), ICTs and broadband connectivity, it is believed that a Smart City that adopts intelligent services in achieving innovative environments can be achieved. Ghosal and Halder (2018) describe it as the proper management of energy, water and waste. This is one crucial aspect also being championed in South Africa with the National Development Plan of 2030 which is geared towards ensuring a sustainable environment with an adequate supply of needed infrastructures and wise consumption of energy. Respite is not in sight in terms of this rapid urbanisation, as it is projected that by the year 2050, over half of Africa's population will be living in cities (United Nations, 2017). Although not the worst among developing countries, especially in Africa, South Africa suffers this same fate.

Most cities in South Africa are described as transitioning cities because they have a high urbanisation rate (Deloitte, 2014). In South Africa, the NPC (2012) notes that for improved unification of urban districts and citizens, change, update and allowance for increased basic service supplies and development of areas set aside for civic use is necessary. ICT and related industries in the cities of South Africa will revitalise the economy of the cities which might lead to a smart economy, an essential element of a Smart City (Das, 2019). The economy should moreover be inclusive, safe, resilient and sustainable (Allam and Newman, 2018; Kummitha, 2019), needing to be at the forefront of city development in South Africa. Low carbon emissions, traffic safety, use of economical and low-carbon emission cars are important determinants of smart mobility in a city (Emuze and Das, 2015), which are major challenges in South Africa (Das, 2015).

ZIMBABWE

The introduction and advancements in information and communication technologies (ICTs) have not benefited the generality of the poor in the cities of Zimbabwe. In sub-Saharan Africa and in, primarily, Zimbabwe, ICTs have gained impetus during the past decade, diffusing from first-world countries where they have already taken supremacy. The creation of Smart Cities moves in line with the expansion of ICT. Zimbabwe's telecommunications service providers, Econet, Netone and Telecel, have worked hard to increase network coverage in the country. The Ministry of Information Communication Technology has been striving to iron out challenges in ICT but unless the issues of tariffs and income are addressed, the challenge will remain. This puts such cities into transport challenges that leave them with old transport infrastructure, traffic jams, lack of parking spaces and high risks of accidents in particular. The secondary cities, particularly those in Sub-Sahara, where Zimbabwe is not an exception, are ignoring the use of technologies in managing transport challenges for which the solution is in the establishment of Intelligent Transport Systems (ITS).

Almost two thirda (65%) of the Sub-Saharan African population lacks access to clean energy which is an essential service. This

is a reflection of what is happening in Zimbabwe where the population in the rural areas depends on charcoal, kerosene and other resources that result in pollution and poor quality of life. Zimbabwe is one of the countries that has experienced an information class struggle as the marginalised population is excluded in terms of accessing this important service of information while a few have the preserve to access and use it.

> ...there is an increasing digital divide between the poor and the rich although the poor have relatively acquired certain ICT gadgets including cellular phones, satellite dishes and now can watch movies in the comfort of their homes (Chirisa and Dumba, 2014).

The Zimbabwe National Development Strategy 1 (NDS1) prioritises the use of smart technologies throughout the NDS1 period to enhance ICT usage. This strategy moves in line with the establishment of intelligent cities. It calls for measures to be put in place to develop smart programmes such as smart government systems, smart agriculture, smart health and smart transport and safe cities through using it. All these approaches promote the establishment of intelligent cities across the nation.

Over the past decade, Zimbabwe has climbed great ladders in the uptake and use of ICT. The Ministry of Information and Communication Technologies champions ICT literacy and the use of digital technologies in the country. The country's use of digital technology has exclusively increased recently, especially in the use of digital money. The Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZIMASSET) blueprint pronounced the use of ICT as a policy enabler to help push Zimbabwe's economy forward. ICT has been embedded in all national development strategies in the country for universal access to be attained by 2030. The country's use of digital technology has exclusively increased recently, especially in the use of digital money.

DISCUSSION

While trying to be human, the urban spaces are then marketed by district contradictions and enslaving — rich versus poor, serviced versus un-serviced, politicised and neutral spaces. Dysfunctionality is embraced as the norm and serves to perpetuate certain ideological memes. Concerning Zimbabwe,

creating the idyllic Smart City would require that the colonised township mentality be erased. This would involve instituting and acknowledging urban and regional planning as critical instruments and catalysts for progressive change. It means giving planning a chance, sprucing it up to match global standards and upgrading it from colonial minimalism. Populism can be achieved by thinking of a city as an inheritable asset that needs to pass from one generation to the other sustainably. Currently, planning is used as an instrument for adhocracy and is sometimes totally disregarded. When it is brought on board, it is to clear some mess or to legitimise illegality. While the instruments and toolsof planning are theoretically set, they are sometimes twisted and de-sensitised to work. Above all, creating a Smart City is a function of scale, this means that the macro-micro and mesoscale of reference must 'sing from the same hymn book'.

The concept of Smart Cities has always been attributed to the individual, characterising outstanding human mental accomplishment. Smart cities belong to an emerging movement targeting the creation of settings that expand intellectual skills and abilities to learn and innovate. Innovation is a considerable piece of intelligence Smart Cities constitute a new planning paradigm pertinent to both the fields of urban-regional development and innovation management. Smart cities in Canada succeeded through a top-down planning proposal that went through a process of covering the entire city. There has been a great push and an improvement in the expansion of Smart Cities in this most precise sense. Within the context of this highly spread expression of a knowledge-driven economy, cities, as the leading centres of population, transportation networks and business transactions, shape spaces where the generation and use of information are combined to produce knowledge, thus playing a leading role in generating economic value and competitive advantages in a globalised world.

Cities have always been at the centre of important social and economic changes, but more new expectations, ambitions and needs have been raised by people and institutions concentrated in these localities. In the field of urban-regional development, Smart Cities sustain the rise of knowledge-based local and

regional economies. In the field of innovation management, they sustain the globalisation of innovation networks and the consequent opening up of innovation systems on a global scale. Bridging local resources, innovation institutions and broadband networks, Smart Cities can address the challenges of global competition faced by cities and regions for knowledge and innovation (Komninos, 2009). The environment that emerges is highly complex enabling each company to create its innovation ecosystem, combining elements of the physical, social and virtual space of the city. Playing a central role in the behaviours that underline present-day life, ICTs are at the heart of this knowledge-driven economy,providing opportunities for reducing distance and time constraints by facilitating information exchange and knowledge sharing and they also promote the development of networks, hence fostering social, economic and territorial cohesion.

Smart Cities reside in the increasingly effective combination of digital telecommunication networks, ubiquitously embedded intelligence, sensors and tags and knowledge management software. Developing countries and emerging markets have embraced the use of digital technologies, ICTs and technological innovations, *inter alia,* in their growth patterns. Smart City ascends in search of a remedy to the increasing challenges that were haunting the urban areas, for which purpose these new model cities are being created. Innovations through the establishment of Smart Cities are being integrated for a generation that is yet to come.

Despite a positive correlation between the cities and ICTs, Braga (1998) and Brown (2001) assert that ICTs widen the gap between the rich and the poor in economic terms. In Sub-Saharan Africa and in Zimbabwe, primarily, ICTs have gained impetus during the past decade, diffusing from the first-world countries where they have already taken supremacy. With all this effort that has been staged towards the creation of global Smart Cities by this technological diffusion, a new type of poverty is emerging where some marked differences in society are obvious and where quite a large population in developing countries are captured in information poverty. Zimbabwe is one of the countries that has experienced an information class

struggle as the marginalised population is excluded in terms of accessing this important service of information, while a few have the preserve to access and use it. ICTs will be harnessed to enable the fundamental ingredients of city development.

Tthere were water supply and liquid waste removal networks, energy supply networks, transportation networks and heating and air conditioning networks in buildings. Cities extended the capabilities of human bodies in more comprehensive and sophisticated ways and took over more of the functions traditionally performed by the unaided by the human body, so the cyborg condition intensified. In the latter half of the 19th century, cities began to add artificial nervous systems to their fabrics of skeleton, skin and supply, processing and removal networks. This process began with the construction of telegraph, telephone and radio communication systems, picked up momentum through the first half of the 20th century and then accelerated extraordinarily after the introduction of digital telecommunications in the late 1960s eventually producing today's pervasive connectivity through the internet and mobile wireless networks.

CONCLUSION AND FUTURE DIRECTION

Information Communication and Technology require a backup of power infrastructure that is reliable and available. Most cities in Zimbabwe occupied by poor marginalised societies are often without reliable electricity. Also, much as the poor may wish to access reliable ITC gadgets, among themselves, having advanced ICT equipment like handsets, computers and laptops is considered a luxury. A Smart City has good e-governance systems, street lighting and good water and waste management. There is need to link power consumption, digital communication, internet connectivity, energy efficiency and other digital infrastructure components to achieve this. These should also be extended to densely populated cities that will host ICT devices and where data collection will be done, for this will be done for policy-making. Those who reside and work in Smart Cities benefit from better city planning, faster delivery of service and economic development. There is need to generate great infrastructure in Smart Cities because extraordinary data needs to be generated.

Transportation is one of the non-separable sectors of society. A smart transportation system is one of the key concepts of Smart Cities that have developed rapidly across the globe. Zimbabwe has witnessed dilapidating road infrastructure, poverty and poorly maintained mass transit vehicles as the major concerns. Research needs to be done to determine the state-of-the-art technologies that are needed to improve cities in the country. The research should also bring out the particularities impeding the common implementation of smart transport systems, followed by the development of conceptual architecture for an integrated smart transport system in the country.

Smart metering is also an important component of the Smart City concept. The main challenges associated with smart metering are related to the currently available smart metering technologies in the market. It is recommended that the use of the internet of digital technologies will help to solve the challenges that are associated with challenges in smart metering.

REFERENCES

Adejuwon, K. D. (2018). Internet of Things and Smart City Development: Is Nigeria Leveraging on Emerging Technologies to Improve Efficiency in Public Service Delivery? *Journal of Public Administration, Finance and Law, 13*, 7-20.

Ajayi, O.O., Bagula, A.B., Maluleke, H.C. and Odun-Ayo, I.A (2021). Transport Inequalities and the Adoption of Intelligent Transportation Systems in Africa: A Research Landscape. *Sustainability, 13*, 1-29.

Akingbade, A., Navarra, D., Zevenbergen, J. and Georgiadou, Y. (2012). The Impact of Electronic Land Administration on Urban Housing Development: The Case Study of the Federal Capital Territory of Nigeria. *Habitat International, 36*(2), 324-32.

Akujobi, C., Nwakanma, U. and Ekeocha, O. (2017). Role of a Smart City in Sustainable Urban Development in Nigeria. *Journal of Applied Sciences and Development (JASD), 8*(1), 19-42.

Albino, V., Berardi, U. and Dangelico, R. M. (2015). Smart Cities: Definitions, Dimensions, Performance and Initiatives. *Journal of Urban Technology*, *22*(1), 3-21.

Aghimien, D. O., Aigbavboa, C. O., Thwala, W.D. and Ohiomah, I. (2019). Challenges Hindering the Attainment of Smart Cities. Interdependence between Structural Engineering and Construction Management (ISEC-10), Chicago, May 20-25, 2019, SUS 29,1-6.

Allam, Z. and Newman, P. (2018). Redefining the Smart City: Culture, Metabolism and Governance. *Smart Cities* 1(1), 4-25.

Arasteh, H. *et al.*(2016). Lot-based Smart Cities: A Survey. 2016 IEEE 16th International Conference on Environment and Electrical Engineering (EEEIC) 1-6. IEEE, un. 07 - 10, 2016, Florence, Italy · Italy.

Aribigbola, A. (2007). Urban Land Use Planning, Policies and Management in Sub Saharan African Countries: Empirical Evidence from Akure, Nigeria (Report presented at the 4th World Bank Urban Research Symposium), Washington, DC, June 2007.' Washington, DC.

Asghari, P., Rahmani, A. M. and Javadi, H. H. S. (2019). Internet of Things Applications: A Systematic Review. *Computer Networks*, *148*, 241-261.

Atzori, L., Iera, A. and Morabito, G. (2010). The Internet of Things: A Survey. *Computer Networks, 54*(15), 2787-2805.

Braga, B. (1998). Urban Water Resources Management in Tropical Climates. IAHS-AISH Publication, 277-286.

Brown, T. E. (2019). Human Rights in the Smart City: Regulating Emerging Technologies in City Places. *Reins, L. (Ed.). Regulating New Technologies In Uncertain Times. TMC Asser Press.*.

Chirisa, I. and Dumba, S. (2014). Intelligent Cities and Infrastructure: An Inquiry into Accessibility and Usage of ICTs by the Poor in Zimbabwean Cities. *Global Journal for Information Technology and Computer Science*, *1*(1), 1-7.

Das, D. (2019). Exploring Perspectives of the Information Technology Industry in a South African City. *Sustainability, 11*, 6520.

Deloitte (2014). *Africa is Ready to Leapfrog the Competition Through Smart Cities Technology*. UK: Deloitte Touche Tohmatsu Limited (DTTL).

Egbu, A. U., Olomolaiye and Gameson, R. (2008). A Neo-institutional Economic Critique of the System for Allocating Urban Land and Development Rights in Nigeria. *Habitat International, 32*(1), 121-135.

Emuze, F. and Das, D. (2015). Regenerative Ideas for Urban Roads in South Africa. *Municipal Engineer, 168*(4), 209-219.

Ghosal, A. and Halder, S. (2018). Building Intelligent Systems for Smart Cities: Issues, Challenges and Approaches. In: Z. Mahmood (ed.) Smart *Cities, Development and Governance Frameworks,* 107-125. Derby, UK: Springer.

Giffinger, R. and Pichler-Milanović, N. (2007). Smart Cities: Ranking of European Medium-sized Cities. Centre of Regional Science, Vienna University of Technology.

Idemudia, U. (no date). The Resource Curse and the Decentralisation of Oil Revenue: The Case of Nigeria. *Journal of Cleaner Production, 35*, 183-93.

Kadiri K. *et al* (2019). Smart Cities Implementation: Challenges in Nigeria. CIB World Building Congress, Hong Kong SAR China. Available online: https://uwe-repository.worktribe.com/OutputFile/1492643.

Kaźmierczak, J. *et al.* (2021). Sounds of Smart City: A Subjective Review of Acoustical Problems Appearing in Creating Intelligent Urban Areas. Available online: https://www.researchgate.net/profile/Jan-Kazmierczak/publication/353572241_Sounds_of_Smart_City_a_subjective_review_of_acoustical_problems_appearing_in_creating_intelligent_urban_areas/links/6103c2051ca20f6f86ea5e3c/Sounds-of-Smart-City-a-subjective-review-of-acoustical-problems-appearing-in-creating-intelligent-urban-areas.pdf.

Komninos, N. (2009). Intelligent Cities: Towards Interactive and Global Innovation Environments. *Int. J. Innovation and Regional Development*, 1(4), 337-355.

Kummitha, R.K.R. (2019). Smart Cities and Entrepreneurship: An Agenda for Future Research. *Technological Forecasting & Social Change, 149*, 119763.

Lubman, D. and Kiser, B. H. (2001). The History of Western Civilization Told through the Acoustics of its Worship Spaces. Proceedings of the 17th International Congress on Acoustics, 3-4. DATES

Mabogunje, A. L. (1990). Urban Planning and the Post-Colonial State in Africa: A Research Overview1. *African Studies Review*, *33*(2), 121-203.

Macke, J., Casagrande, R.M., Sarate, J.A.R. and Silva K.A. (2018). Smart City and Quality of Life: Citizens' Perception in a Brazilian Case Study. *Journal of Cleaner Production, 182*, 717-26.

Madihlaba, G. L. (2019). Adoption of Intelligent Transport Systems for Sustainable Transportation in Secondary Cities of South Africa: A Case of Port Shepstone. Dissertation.

Schmidt, J., Marques, M. R., Botti, S., & Marques, M. A. (2019). Recent Advances And Applications Of Machine Learning In Solid-State Materials Science. Npj. *Computational Materials*, 5(1), 83-92.Mathew, T.V. and Rao, K.V.K. (2007). Introduction to Transportation Engineering. NPTEL.

Mitchel, W J. (2007). Intelligent Cities. *E-journals on the Knowledge Society, 5*, 1-11.

Mkireb, C., Dembélé, A., Jouglet, A., Denoeux, T. (2019). Robust Optimization of Demand Response Power Bids for Drinking Water Systems. *Applied Energy*, 238, 1036-1047.

Mourjopoulos, J. (2015). The Origins of Building Acoustics for Theatre and Music Performances. *The Journal of the Acoustical Society of America, 137*(4), 2427-2427.

Niaros, V., Kostakis, V. and Drechsler, W. (2017). Making (in) the Smart City: The Emergence of Makerspaces. *Telematics and Informatics*, *34*(7), 1143-1152.

Nižetić, S., Djilali, N., Papadopoulos, A. and Rodrigues, J. J. (2019). Smart Technologies for Promotion of Energy Efficiency, Utilization of Sustainable Resources and Waste Management. *Journal of Cleaner Production*, *231*, 565-591.

Ogbazi, J. U. (2013). Alternative Planning Approaches and the Sustainable Cities Programme in Nigeria. *Habitat International, 40*, 109-118.

Ogu, V. I. (1999). Evolutionary Dynamics of Urban Land Use Planning and Environmental Sustainability in Nigeria. *Planning Perspectives, 14*(4), 347-68.

Ogun, T. P. (2010). Infrastructure and Poverty Reduction: Implications for Urban Development in Nigeria. *Urban Forum, 21*(13), 249-66.

Rate, R. (2017). The Role of ICT in Creating Intelligent, Energy-efficient Buildings. *Energy Procedia, 143*, 150-153.

Santinha, G. and de Castro, E.A. (2010). Creating More Intelligent Cities: The Role of ICT in Promoting Territorial Governance. *Journal of Urban Technology*, *17*(2), 77-98.

United Nations (2017). Drivers of Migration and Urbanisation in Africa – Key Trends and Issues. United Nations Expert Group Meeting on Sustainable Cities, Human Mobility and International Migration, New York, 7-8 September 2017.