

We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

185,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com



Orchestrating Smart Cities, New Disruptive Business Models and Informal Enterprises

Ben Mkalama and Bitange Ndemo

Abstract

As the fourth industrial revolutions technologies intensify, cities are becoming smarter, new business models are emerging and informal enterprises are formalizing by default. Research demonstrates that the future of our world is decided by the quality of its future cities. As cities invest in information and communication technologies (ICTs) and embrace the Fourth Industrial Revolution (4IR) technologies to make life easier and solve many of the problems we face today, employment opportunities expand and citizens enjoy better lifestyle. This chapter will examine how the concept of smart cities is disrupting existing business models and creating new ones that have positively impacting Africa's informal enterprise sector. The chapter leverages abundance theory to explain the emerging phenomenon in the nexus between smart cities, new business models and informal enterprises in Sub-Saharan Africa. The study finds that indeed the concept of smart cities is indeed facilitating new business models that are formalizing the informal sector.

Keywords: smart cities, digital innovation, informal economies, gig economies, Africa

1. Introduction

A global phenomenon that is currently not in dispute is rapid urbanization with estimates suggesting that by 2030, over 60 per cent of the global population will be living in cities, increasingly concentrated in Africa, Asia and Latin America [1]. This inevitably places social and economic strain on the existing urban infrastructure. These strains are placed on physical factors such as deteriorating conditions in the environment, transport efficiency, utilities such as water and energy, as well as economic factors such as unemployment. As a result of this, there is an emerging informal sector, which though unproductive and lacking employee protections, continues to be the place where bulging African youth population finds its livelihood [2].

Digital technologies and internet connectivity are playing a major role in making better cities that they are now considered as a panacea for solving Africa's chronic unemployment [3] and other associated challenges. As a result of this thinking, and to address these and emerging challenges, the smart city concept offers unusual opportunities for diverse countries [4]. Intensified digitization is increasingly becoming integral part of everyday life, more data is being collected and as a result

leading to the accumulation of large amounts of data which is in most cases used in several beneficial application domains. Effective analytics of these data and utilization of the same is a critical factor for success in emerging business and service domains, as well as the smart city domain [5].

The emerging digital phenomenon is disrupting and transforming the informal sector that what seemed impossible a few years back could be possible. Studies [6] from Nigeria, confirm that majority of the informal enterprises could be easily formalized. This chapter is guided by the question: Taking into consideration that connectivity is growing across the continent, could digitalization end the curse of informal enterprises in Africa? The chapter will seek to address the questions: Will the new business models address disrupt and destroy livelihoods?

We attempt to explain the emerging phenomenon of technology, new business models and disruption of informal enterprises through the theory of abundance. That what is happening with technology in SSA is an opportunity for different combinations of existing problems that can be solved with new entrepreneurial openings as countries gear up to develop smarter cities. The chapter therefore makes a number of contributions. First a research that is looking at how informal enterprises can be formalized (something that has troubled policymakers for ages). Second, is theorizing abundance. The basic premise is that the world is big out there with opportunities for everybody such that if you are willing to achieve your goals, simply learn and polish the discipline of your craft [7].

2. Literature review

2.1 Demystifying smart cities

There is no standardized commonly accepted definition of or set of terminologies for a smart city [4, 8]. Numerous scholars have defined the smart city concept differently, but these conceptual definitions however converge around three broad dimensions namely technology, people and institutions [9]. The three however have a nuanced effect on smartness of the cities. To have an impact, the policy directions and goals of a smart city should be ambitious and transformational [5–7, 10–16]. The focus of the city is to achieve an enriched quality of life for its citizenry whilst deliver tangible benefits by prudently employing the city's natural resources and technology. The chapter adopts the dimensions of a smart city as articulated by Deloitte [4] and is shown in **Figure 1**.

According to Deloitte [4], there are five layers that make up a smart city namely infrastructure, interconnected city systems, ecosystem, people and goals, aspirations and quality of life. In addition to this, according to UNDP [8], digital infrastructure is considered in the form of different supporting digital layers which create different opportunities, as follows:

- a. Urban Utilization: The layer where physical and digital infrastructures meet. Examples include smart buildings, smart mobility, smart grids (for utilities such as water, electricity and gas) and smart waste management systems.
- b. Sensor: This layer includes smart devices that measure and monitor different parameters of the city and its environment. This could include measurements in pollution in air or water.

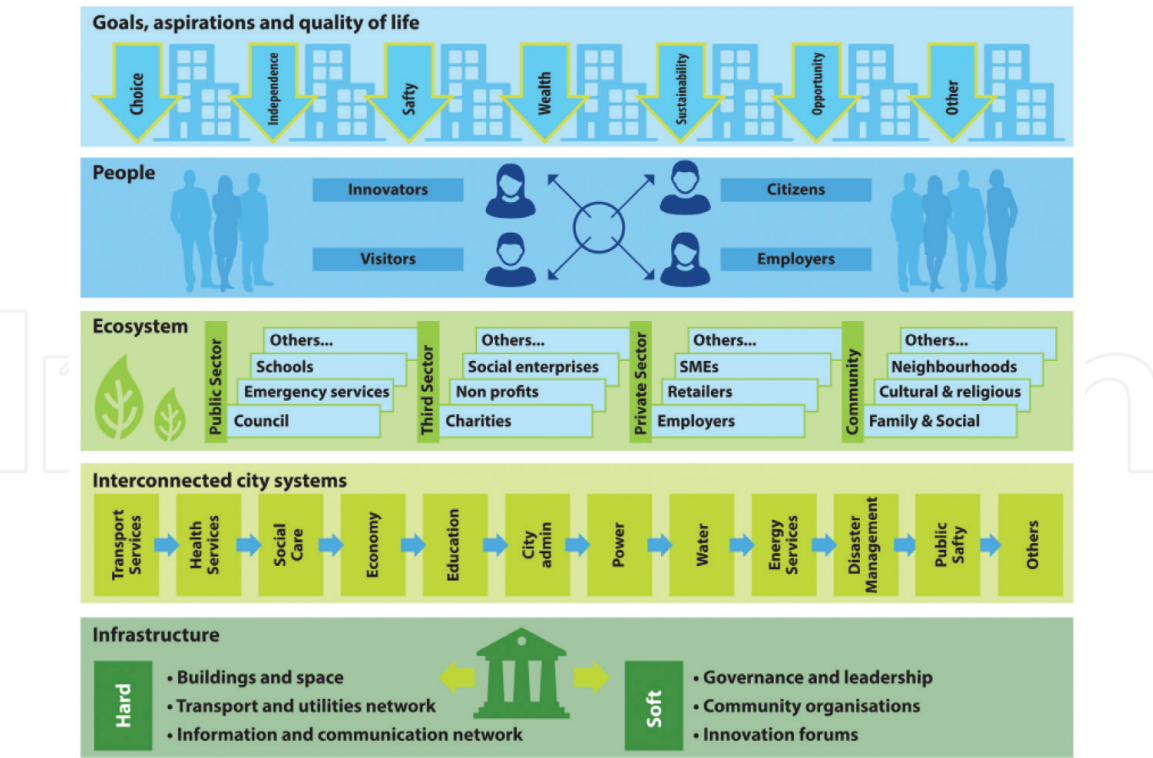


Figure 1.
Dimensions of a Smart City. Source: Deloitte [4].

- c. **Connectivity:** This layer involves the transport of data and information from the sensor level to storage and to data aggregators for further analysis. This is supported by appropriate bandwidth and fiber networks.
- d. **Data analytics:** This layer involves the analysis of data collected by different smart infrastructure systems, to help predict some events. This includes examples such as traffic congestion. It also includes digital health, whereby a programme determines on the basis of pre-determined symptoms on what the basic illness is likely to be and prescribes medicine.
- e. **Automation:** The digital enabling interface layer that enables automation and scalability for a large number of devices across multiple domains and verticals.

Establishing a smart city is a continuously interactive process that entails a robust, reliable and affordable broadband network coupled with an efficient ecosystem for the internet of things (IoT) and the capacity to utilize the big data that will be generated. Governance and leadership support are very crucial also as they allow harnessing and tapping into the local innovation system [10]; Leadership can also support open data and open science models that would have less reliance on proprietary technology models and prop research collaborations and create further opportunities for innovation [17].

2.2 Disruptive business models

Disruption of business takes place when the traditional business models face a challenger who changes the game by offering greater value to the customer in a manner that existing firms are not able to match the offer or be able to compete. In other words, “detonation of the status quo” [11]. Technology has enabled

unprecedented development of new business models that have brought greater value as well as increased productivity. For example, the entry of mobile money in Africa had changed business models, brought greater value and enhance efficiency.

Digital disruption in form of platforms has started changing the very nature of what it means to be informal or formal. Digital platforms enable firms with basic business services so that they can concentrate on their core competence. These basic services range from offer advice on how to set prices, customer service training, accounting, sales data, and even collection of sales taxes. Similarly, platforms can handle customer service, payments and returns.

2.3 Informal Enterprises in Africa

Informal enterprises refer to micro or small firms in the informal economy (unregistered with government, are mostly unregulated, employees have no formal contract and no safety net and pay no taxes to authorities). The informal economy is by far the principle source of employment in Africa and accounts for more than 70 per cent of employment in Sub-Saharan Africa [2, 12]. A large informal economy makes it harder to measure the economic performance hence the reason why many governments want to formalize the sector. In the hope of achieving greater value and efficiency, informal enterprises have widely adopted technology. The informal economy is complex and to paraphrase Dungy and Ndofor (2019) [18], is the, "... the utopian and the dystopian, the connected and disjointed, structure and chaos, legitimate yet illegal, legal yet illegitimate all residing together in one big tent...". Furthermore, informal work brings freedom, flexibility, precarity and vulnerability into the lives of African gig workers [3].

2.4 The state of digital readiness in Africa

2.4.1 ICT indicators

Globally, there has been an eightfold growth in the number of individuals using internet over a period of less than twenty years from 495 million to over 4 billion people [19, 20]. This portends well for additional value add products and positioning of technological growth in the continent. Sub-Saharan Africa (SSA) has not been left behind and has seen rapid growth in internet penetration and related technology investment. The International Telecommunications Union (ITU) estimates that sub-Saharan Africans' individual internet usage increased from 2.7% in 2005 to 28.2% in 2019. The trends for the key ICT indicators are shown below in **Figure 2**.

As observed from **Figure 2**, the penetration rate of all ICT indicators has seen positive growth. The increase in internet usage has been accompanied by increased investments in data storage, processing power and innovation ecosystems. In spite this, there are still further opportunities in terms of the population that is not digitized. This has resulted in many large multinational information technology firms viewing Africa as their next frontier of growth [4].

Since 2009, Sub-Saharan Africa (SSA) has witnessed massive investment in digital development and creating enabling conditions but there is still work to be done. With several (TEAMS, SEACOM, EASSy and LION) high-capacity undersea fiber optic connectivity into the continent and boosting capacity to more than 36 Terabits per second, SSA has made tremendous strides. Prior to 2009, the entire continent used a mere 1 Giga Byte per second from satellite. The challenge now lies with last mile coverage.

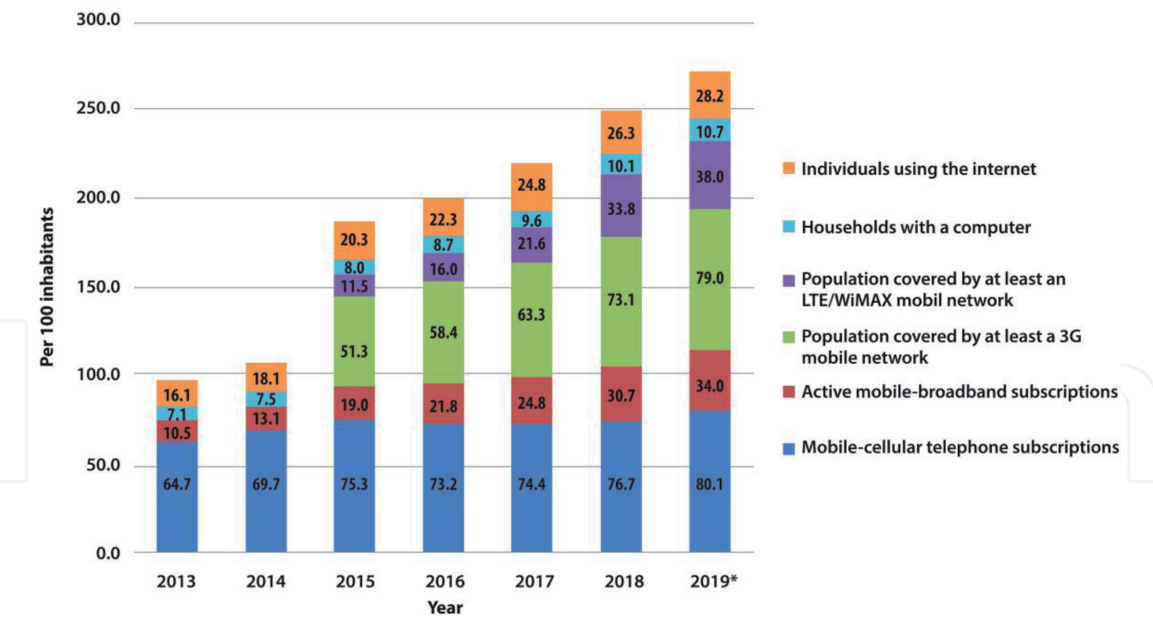


Figure 2.
Sub Saharan Africa key ICT indicator penetration rate (2013–2019). Source: ITU 2019 [20].

2.4.2 Improving access through 4G digital technologies

The last mile coverage especially in advanced systems like fourth generation (4G) network is a major strength of access to digital technologies. 4G network is an advanced network to replace 2G and 3G systems that were used for communication across the world. Its introduction was celebrated as important in SSA because many people first accessed the internet on their mobile phones. As such, 4G with its higher download speeds, sometimes as fast as high-speed fixed broadband, greatly improved user experience. Its introduction has helped to improve productivity. Investments in 4G have largely been in urban areas with much of the rural areas using the older generations. To unlock Africa’s digital potential to stimulate enterprise, each country must work toward improving access and affordability.

2.4.3 Broadband affordability for improved access to digital technologies

Affordable broadband improves access to digital technologies and facilitates economic growth. Recent research however, questions if the internet has any effect on economic development. A study by McKinsey Global Institute (2011, p.7) [13] noted that “much of the impact of the internet and the way that it contributes to growth and raising standards of living have gone unmeasured”. Follow up studies like Vanags and Grāvelis, 2015 [16], indicated that investment in broadband positively impacted on GDP gain as well as employment. The investment in 4G for example, was meant to improve broadband penetration but comparison between 4G coverage and broadband penetration revealed that without affordability, access alone had no impact. For example, 4G rollout in Rwanda is almost 100% compared to Kenya’s 53% but Rwanda’s broadband penetration (11.3%) is less than half of Kenya’s (47.8%). The difference is explained by affordability, access to devices and human development index.

2.5 Technology-enabled business models

Technology has created a range of new opportunities in the gig economy, a demand-driven independent, short-term or a task-by-task economic activities that

payment is received upon the completion of the assignment. The opportunities are available to anyone in the world and provided for anyone who demands them [3]. The operating models of the online gig platforms can be divided into ‘on-demand’ work like ride hailing drivers like Uber taxis for instance and ‘crowd-work’ which includes for instance a Kenyan online gig worker, providing translation services for a client based anywhere in the world through Upwork. These platforms may also include homestay hosts like Airbnb, e-commerce logistics like LoriSytems, e-commerce sellers like Jumia, and business-to-business marketplace platform like Twiga Foods. These enterprises would not be possible without investment in ICT infrastructure.

Digital progression enables informal businesses to successfully make the progressive transition from start-up to formal enterprise making each step at less cost and lesser risk [2]. This is exhibited in **Figure 3**.

As observed in **Figure 3**, an informal economy gradually gets used to mobile money and other additional steps. Unlike the Digital business progression model, the ascent in the traditional business progression model is very steep. The use of mobile money has enabled improved financial inclusion in the informal economies [1]. Indeed, according to GSMA [19], Sub Saharan Africa leads in the uptake of mobile money across the globe. This is shown in **Figure 4**.

The growth of mobile money in Sub Saharan Africa has been phenomenal thereby creating massive opportunities for integration. In due course, the firms get

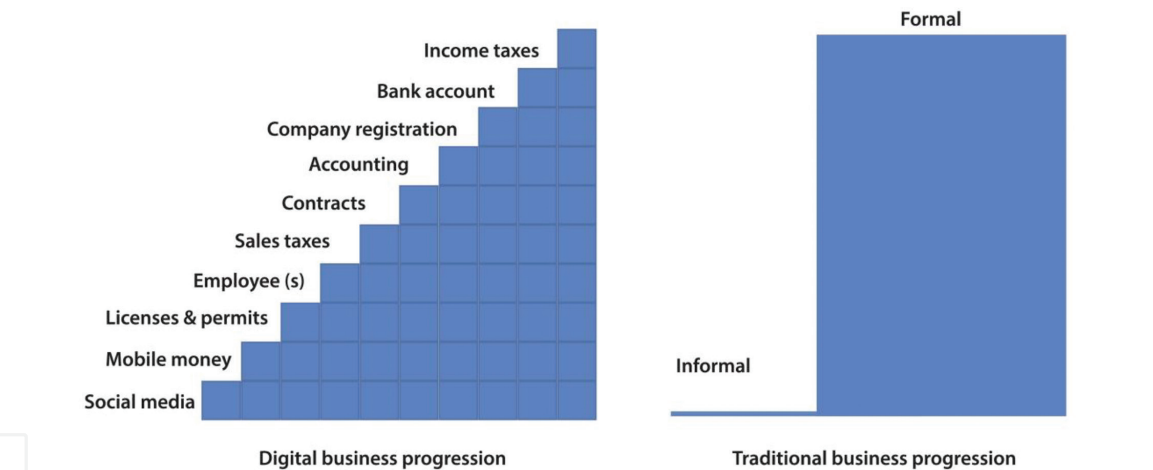


Figure 3. Digital vs. traditional formalization process. Source: Ng’weno and Porteous (2018) [2].

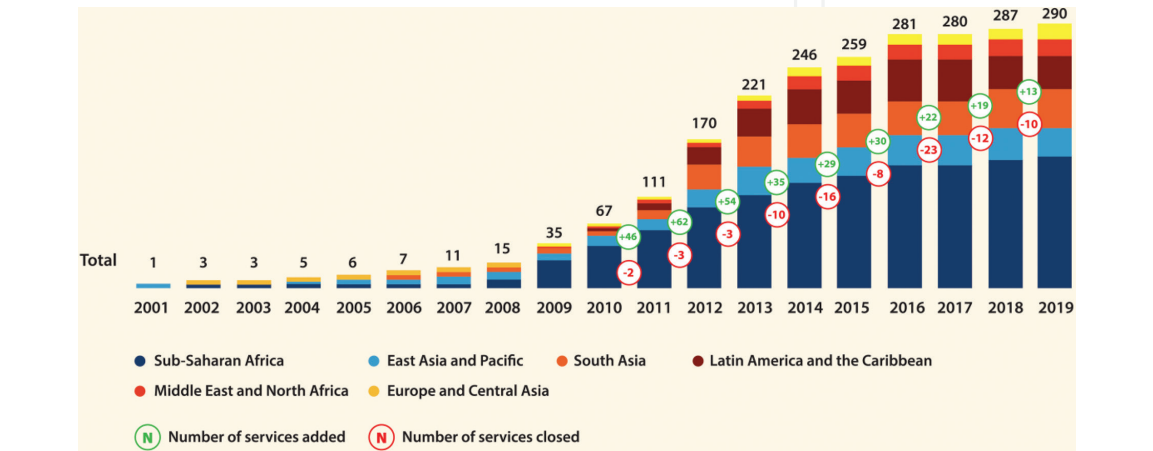


Figure 4. Evolution of the global Mobile money landscape, 2001–2019. Source: GSMA (2019) [19].

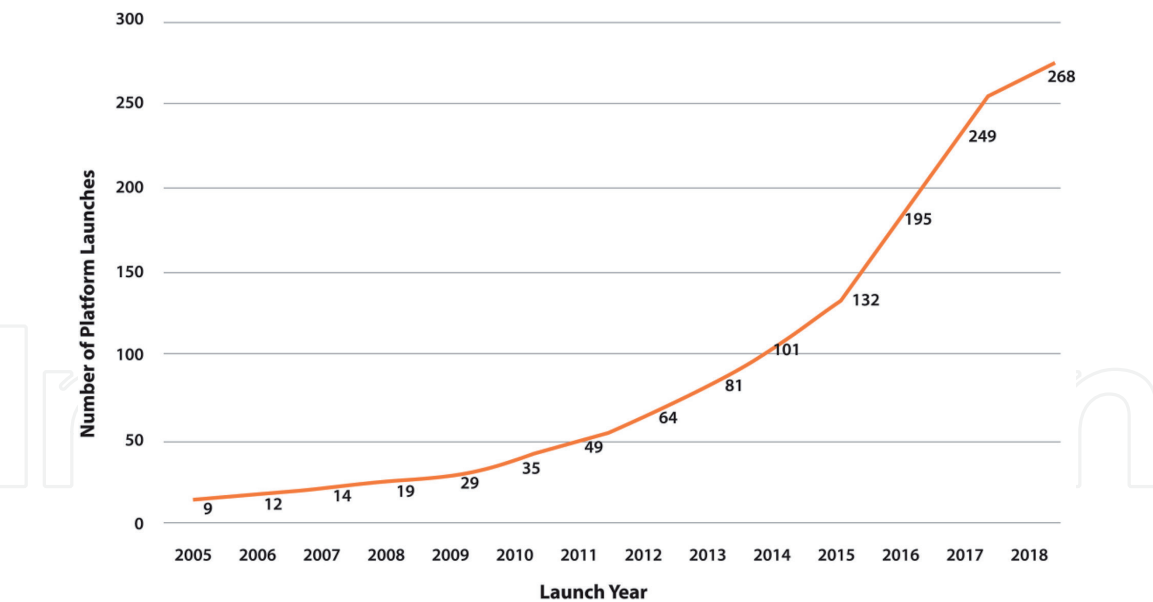


Figure 5.
Platform launches across eight African countries. Source: Smit et al. (2019) [23].

absorbed into the formal economy, paying taxes as required amongst other formal activities. This creates massive opportunities for the formalization of the national economies. In Kenya for example, a study by Genesis Analytics Limited [21] suggested that the total size of the online Kenyan gig economy as at 2019 was \$109 million and employed more than 36,000 workers and was projected to grow by over 33% over the next 5 years. Additionally, an estimated 4.8 million African workers reported having derived an income from online gig work in seven surveyed countries namely Ghana, Kenya, Nigeria, Rwanda, South Africa, Tanzania and Uganda [22]. These digital labour markets have a potential for future growth [1]. In addition to this, Smit, Johnson, Hunter, Dunn and van Vuuren (2019) [23] established that the growth of platform launches across Africa has been steady and this is shown in **Figure 5**.

In spite all this, there have been challenges that are associated with working conditions in platforms and online gigs [2, 3, 21, 24]. These challenges range from low remuneration, social isolation as a result of having to work alone, working unsocial and irregular hours to meet strict deadlines, overwork, sleep deprivation and exhaustion as a result of the gig workers having to balance the gigs and their normal responsibilities [24].

Innovation hubs create various pan-sectoral initiatives that promote beneficial ecosystems where entrepreneurs and other stakeholders can collaborate and promote their ideas. To a large extent, these are mostly driven by technology. Hubs characteristically provide in-kind support that includes trainings, advice and facilities as well as financial support programmes. The number of identified tech-hubs in Africa, have seen a phenomenal growth from 314 in 2016 to 643 in 2019. This is represented by **Figure 6**.

According to the survey by Briter Bridges and Afrilabs, as shown in **Figures 6**, 41% of the tech-hub facilities are incubators, 24% are innovation hubs, 14% are accelerators and 39% offer coworking space [25].

2.6 Digitization of informal settlements and inclusivity

The use of information and communication technologies (ICT) and geographic information systems (GIS) to map informal settlements, and by openly providing spatial maps, has led to improved conditions for the poor people living in slums.

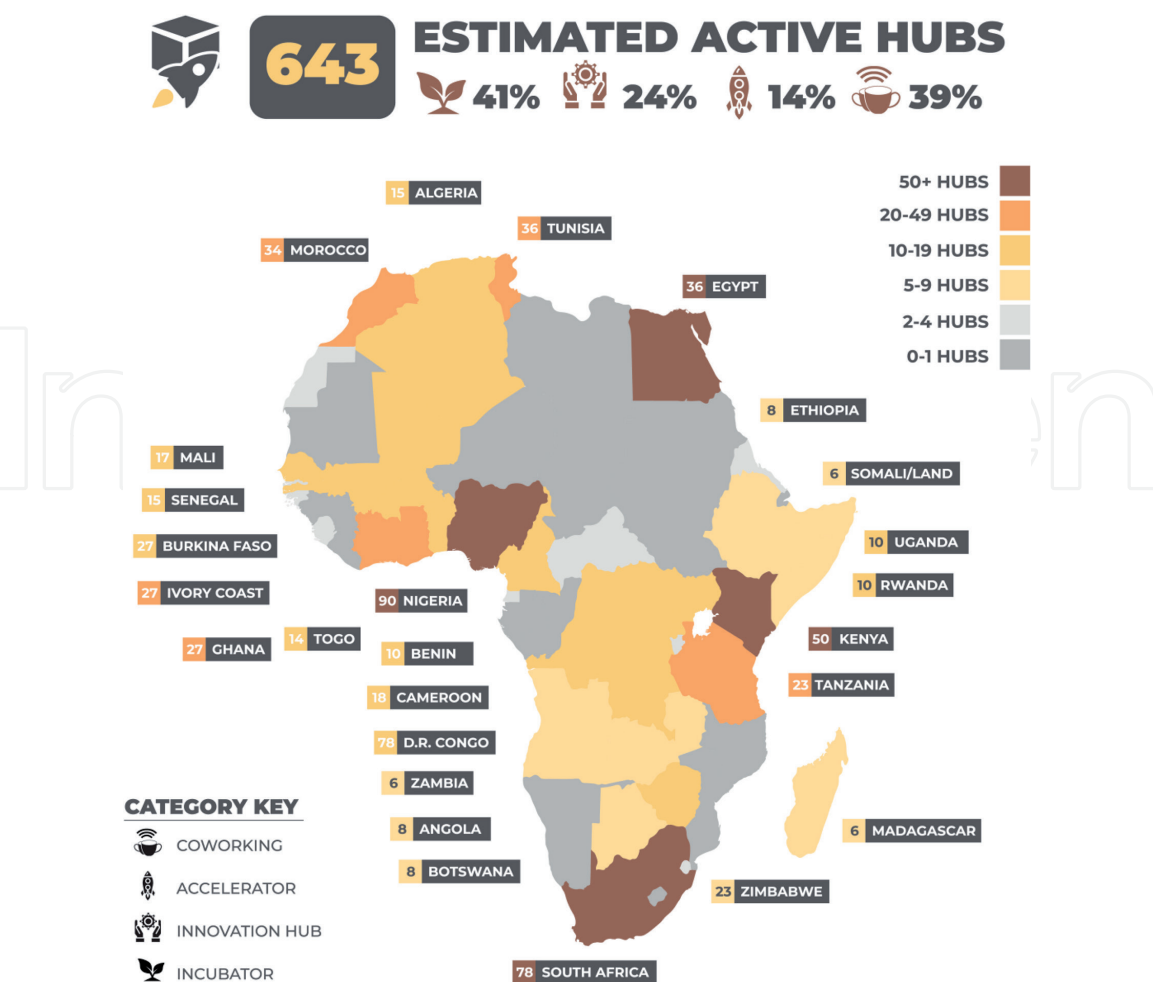


Figure 6.
Tech hubs in Africa, 2019. Source: Afrilabs and Briter Bridges (2019) [25].

Furthermore, ICTs and GIS has forced policymakers to apply much-needed changes of urban renewal, by beginning to pay attention to the plight of the poor in slums to not only identify their slum assets but become but of the growing e-commerce that has brought greater inclusivity improving both livelihood and security. Whereas those living in slums have complex situations, increased transparency through open mapping has provided a platform for sustainable renewal and created new enterprises [15].

3. Methods

In this chapter, we study the impact of smart cities on the creation of new business models and informal enterprises in Sub-Saharan Africa (SSA). SSA provides the best environment to conduct such a study since digitisation is under way, the informal economy is large and the emerging technologies are enabling disruptive business models. Over a period of three years we developed an innovative, inductive method of identifying policymakers from some of the most progressive countries in information and Communications Technologies (ICTs) in the continent for qualitative interviews. We eventually interviewed 18 policymakers as respondents at conferences and more notably at the Transform Africa Summit, 2019 that was held in Kigali, Rwanda. These were qualitative interviews with the key respondents. In addition to this, secondary data, where appropriate was used in the analysis. The findings have been discussed based on the thematic dimensions identified by Deloitte [4].

4. Findings and discussions

Based on observations and interviews, we found many responses to be largely positive in terms of attitude toward technology and what it can do to facilitate economic development in the continent. Almost all the respondents used the term leapfrog at least five times through the interview. There is a can-do attitude even in countries that have not developed sufficient human resource capacity. It confirmed the abundance theory that is keeping policymakers hopeful that it will guide Africa's competitiveness. Psychologists suggest that this theory explains a world in which any person "with the correct attitude, training, or spiritual alignment can acquire personal abundance which should lead to material abundance: wealth regardless of economic or social circumstances."

"With many young people in Africa and the spread of ICTs, nothing will stop Africa from leapfrogging. I have noted that Rwanda has attracted top learning institutions from across the world offering Africa the opportunity to develop global standard labour force..." a senior African Union Official said in the opening ceremonies of Transform Africa in Kigali).

4.1 Building the infrastructure

All of the participants were aware that building of the ICT infrastructure to support smart cities is critical but expensive and as such they are creating new embracing new models of infrastructure development, To build especially the hard infrastructure such as building and space; transport and utilities network; information and communication network they need to leverage public private partnerships (PPPs). Indeed, virtually all of the countries that had started major infrastructure development of new smart cities, leveraged on PPPs. Infrastructure has always been a major problem in Africa but the continent has extensively dealt with it. The current state of infrastructural requirements especially the undersea cables is in place. However, only a handful of countries that have developed or are in the process of developing smart cities (see Table below) as infrastructural bases for smart development.

The African transport infrastructure performance quality which has over time dropped in quality can be replaced with smart urban transport systems that combine and integrate the use of big data, AI and other multiple technologies. Apart from this, other infrastructural requirements can also be applied in areas of energy production and distribution through smart grids. Smart public and private health management systems through AI, blockchain and big data analysis can also be developed and devise innovative and efficient ways for disaster management. The use of additive manufacturing brings affordability and efficiency in production. Subsequently, smart cities leverage on e-commerce platforms to formalize the commercial entities and education.

Many of these new cities are envisaged to create thousands of new employment opportunities in the emerging technology sector in the continent. Some of the cities at the advanced stages of development are seen in **Table 1**.

The soft requirements of infrastructure fall in the second category and include governance and leadership; community organizations and innovation forums. This can easily be the weakest link because technology is incessantly being developed and "...we love tech so much (that) it inhibits our ability to judge its pros and cons..." [26]. There is a need for public policy framework that enables the infrastructural base to provide an integrated support to the other dimensions of the smart city [27]. This will require leveraging on the regional pan-country like the Smart Africa Initiative [27] as well as other in country initiatives.

Name	Location	Financing model
True Wakanda	Ethiopia	USD 3 billion project in partnership with private developer.
Hope City	Ghana	\$10 billion public private partnership
Konza Silicon Savannah City	Kenya	\$10 billion in public-private partnership, with national government providing 10% of the total funding (mainly in infrastructure).
Ebène Cybercity	Mauritius	Loans guaranteed by the Indian government.
Eko Atlantic	Nigeria	\$6 billion public private partnership
Kigali Innovation City	Rwanda	USD 2 billion project funded by the Rwandese Government and Africa50
Waterfalls	South Africa	\$1.2billion Private sector funding expected to be completed in 2025.

Source: Compiled by Authors from Secondary Data.

Table 1.
Financing model of African smart cities.

“If Africa is to succeed in the digital economy, there will be need to develop a single digital market that will support scalability of local innovations across the continent. Small markets find it difficult to compete with such nations as China, United States of America and India. There is also need to create a technology-monitoring mechanism to understand changes in technology, future workforce demands and developing the necessary capacities to remain informed of the different varieties of opportunities for the future of work. For example, Africa must be ready for the emerging 4th industrial revolution and its technologies in order to remain competitive...” United Nations Economic Commission for Africa executive noted.

4.2 Considerations for the future smart cities in Africa

The fourth industrial revolution (4IR) describes the ongoing global conversion of labour-intensive processes to the use of information technology. It is not only ubiquitous but is also happening dramatically. Some of the pillars of 4IR include robotics, artificial intelligence (AI), internet of things (IoT), big data, customer service personalization, cloud computing, and other forms of digital innovation. The resulting shifts and disruptions imply that we live in a time of both great promise and great peril. As the 4IR technologies intensify, cities are becoming smarter, new business models are emerging and informal enterprises are continually under disruption. Experts have argued that 4IR has the potential to rejuvenate Africa’s economy, enhance its productivity and improve its global competitiveness [27]. As a result of this, emerging technologies support the development of smart cities. As shown in **Figure 1**, the dimensions of a smart city require an interactive process between people, ecosystems, interconnected systems, and responsive infrastructure.

4.2.1 Goals, aspiration and quality of life

African cities are uniquely advantaged to have a competitive edge for the future. Some of these advantages include limited legacy drawbacks; youthful consumer population; urbanization; entrepreneurial culture; connectivity; overarching government leadership strategically positioning ICT as an enabler [4]. Furthermore, the rise of the gig economy has created employment opportunities that has impacted upon poverty reduction in the emerging economies [1, 28]

thereby improving on the quality of lives. With a population that has increasingly been well educated and exposed to different cultures and lifestyles, the goals, aspiration and quality of life for the urban individuals has improved over time.

Lifestyle is a key driver for smart cities. The broad areas of concern in the individual's lifestyle include government efficiency, employment, transport, education, healthcare, energy, environment and public security and safety. As a result of the adapted lifestyle, individuals are ambitious to have freedom to choose without compromising on their feeling of independence. Furthermore, the same individuals are desirous of being in control and feeling safe and secure. To meet these objectives, the individuals need to have opportunities for creation of wealth and sustenance of their lifestyles.

4.2.2 People

The dimension of people relates to the nexus between the opportunity seekers who double up as the innovators, the residents who desire the quality of life, the employers who utilize the opportunities and visitors of the urban areas. A smart city makes use of the pragmatic ideas by creative people to provide smart scientific solutions that address the lifestyle concerns around the city. As a result of the solutions, the residents of the smart cities have access to a number of features that range from smart homes, smart buildings, smart offices and larger smart ensembles like airports, shopping malls hospitals or university campuses which are fitted with a multitude of mobile terminals and embedded devices as well as connected sensors that are monitored and programmed for certain decisions. In addition to these, there are a whole range of interconnected logistical support and services through various platforms that provide background support to the lifestyle solutions. These functionalities are enabled through technology by IoT and robotics.

"The deployment of sensors across the city of Nairobi has lessened crime especially carjacking that was rampant prior to installation of ICT infrastructure to monitor transport..." a Kenyan delegate told the conference.

"Our endgame with ICTs in Kigali is to see smart services especially Smart city tourism that will be enhanced through Smart ticketing, Smart-security services, intelligent crown management, improved transport services, virtual reality, linguistic services or even smart city bots to guide visitors around. Through IoT, additional features can be availed to the discerning tourist on the basis of their smart phones. These services would require the local city's residents to be adequately skilled to be able to perform the back ground support tasks..." a Rwandan official noted while explaining their future plans for Kigali.

Already employers are leveraging on a smart city infrastructure and have many routine tasks accomplished at decentralized locations. This sets a basis for online gig and platforms. A challenge that however that subsists is that whereas online platforms will not always have individual workers' interest as their priority, there is increased agitation for increased regulation of this sector. Secondly, by its very definition, online gig tasks can be carried out in a borderless fashion with minimum regard for local regulation on working conditions.

4.2.3 Building future ecosystems

Digital technologies have enabled inclusion, efficiency and innovation of opportunities. A smart ecosystem is a conceptual extension of smart space from the personal context to the larger community and the entire city. It straddles the public and private sector and the broader community. It encompasses policies, laws, regulations and processes that are weaved together to obtain a desired smart

outcome. An enabling ecosystem is based on a skilled and equally aspirational citizenry as well as transformational leadership. To enable continuous innovation, smart cities proactively encourage innovation programmes that include labs, training, skills development and partnerships with different academic, vocational and research institutions. A Smart city ecosystem facilitates the integration of data and information. This is done by initiatives that support open data, analytical services as well as monetization framework. The ecosystem needs to encourage data sharing whilst protecting privacy and what and how data is generated. Herein lies the digital age paradox, where transnational firms have comprehensive information on individuals' lives and can trade it in the global marketplace, whereas individual citizens struggle to get rudimentary information on growth in income and wealth at a macro level [1].

4.2.4 Interconnected systems

The world is more connected than ever [19, 20, 28]. Similarly, as shown in **Figure 1**, a smart city has interconnected systems that cover different facets of the city's activities. Smart cities strive to make strategic choices that attain transformational leaps in the quality of life within its region of operation. There are many ways in which technology connectivity can be used in pursuit of urban management. For example, through the use of IoT, roads can be equipped with LED street lamps that sense pedestrian movement, and consequently dimming and brightening in accordance with the movement. These IoT enabled gadgets also sense and collect pollution data in the air, and send this information to a data base. Additionally, the IoT gadgets can detect humidity and weather conditions in an area and advised to the consumers of this information.

Furthermore, IoT can be used to analyze the traffic on roads and adjust parking metre fees accordingly. This feeds to an automated urban traffic management system. IoT can also identify weak infrastructure like potholes on roads thus helping authorities prioritize their budget for urgent repairs. Remotely monitored close circuit cameras, will take pictures of an accident scene and send it to some database, but machine learning and AI would be required to translate this data into actionable information that can trigger emergency services to save lives. Finally, the IoT enabled street lamps can also act as free WiFi routers to nearby citizens.

Such interconnected systems allow the smart cities to remove inefficiencies that come about as a result of manual monitoring and intervention. The role of human intervention would now be directed to higher skilled tasks. This calls for a re-think into our skills development in the continent by facilitating creation of mechanisms supporting school-to-work transition in each country by (i) developing content around career choices and investing in counselors to help students navigate the transition (ii) revamping TVET institutions to meet the new demand for jobs (iii) changing the negative perception of TVETs and (iv) collaborating with the private sector to provide internship to graduating students as part of the transition process.

5. Conclusion

Smart cities allow the leveraging of digital transformation in a shift to abandon traditional paradigms and create a novel globally entangled experience and life-style. As the cities become smart, formalization of the informal sector improves. New digital businesses are forcing the shift into formalization which benefits the economy by making it possible to measure the economy and better worker safety. Through the use of technology, and the democratization of information, smart

cities enable transnational innovation processes that would be targeted at universal, grand challenges. Our contention is that the absence of legacy systems and the advent of affordable broadband has set SSA on a roller-coaster of change that may see the formalization of informal enterprises by new business models offering better value. The combination of informality, technology and disruptive business models brings a new territory of change and discovery [14]. However, not every country in SSA has had the chance of seeing change and discovery. Several other factors stand in the despite the fact that SSA has the necessary infrastructure to enable greater productivity through technology.

6. Policy recommendations

Not every African country that has embarked on making cities smart. As such each country needs some policy interventions starting from building a national vision that is dedicated to national level commitments to developing smart infrastructure. This also will spell out the commitment to funding through PPPs and collaborating with institutions of higher learning to do studies on the impact of the changes. Smart cities require an urgent development of localized relevant skilled capacity as they can easily result in gigs being performed from remote locations thereby not actually addressing the local issues of unemployment. For better outcome, it is imperative that governments embrace Research and Development as well as education. Hold regular hackathons on innovation and competition in order to build the future infrastructure to support the smart cities.

Conflicts of interest

The authors declare no conflict of interest with respect to the research, authorship, and/or publication of this article.

Appendices and Nomenclature

AI	Artificial Intelligence
4IR	Fourth Industrial Revolution
ICTs	Information and Communication Technologies
IoT	Internet of Things
ITU	International Telecommunications Union
PPP	Public Private Partnerships

IntechOpen

IntechOpen

Author details

Ben Mkalama* and Bitange Ndemo
University of Nairobi, Nairobi, Kenya

*Address all correspondence to: ben@mkalama.co.ke

IntechOpen

© 2020 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. 

References

- [1] UNDP. *Human Development Report 2019: Human Development for Everyone*. New York: United Nations Development Programme; 2019
- [2] Ng'weno A, Porteous D. *Let's Be real: The informal sector and the gig economy are the future, and the present, of work in Africa*. In: Centre for Global Development, Study Group on Technology, Comparative Advantage, and Development Prospects. Centre for: Global Development; 2018
- [3] Anwar, M. A., & Graham, M. (2020). Between a rock and a hard place: Freedom, flexibility, precarity and vulnerability in the gig economy in Africa. *Competition & Change*, 0(0), 1-22.
- [4] Deloitte. (2018). *Africa Is Ready to Leapfrog the Competition through Smart Cities Technology*. Deloitte.
- [5] Al Nuaimi, E., Al Neyadi, H., Mohamed, N., & Al-Jaroodi, J. (2015). Applications of Big Data to Smart Cities. *Journal of Internet Services and Applications*.
- [6] Onyima J, Ojiagu C. Digital technology and formalization of informal businesses: A case of African traditional spiritualists. *International Journal of Academic Research in Business and Social Sciences*. 2017;7(11)
- [7] Dawson, M. (2011). Theory of Scarcity Versus Theory of Abundance. *The Internet Writing Journal*.
- [8] UNCTAD. *Smart Cities and Infrastructure*. Economic and Social Council, Commission on Science and Technology for Development. Geneva: United Nations Publications; 2016
- [9] Nam, T., & Pardo, T. A. (2011). Conceptualising Smart City with dimensions of technology, people, and Institutions. *The Proceedings of the 12th Annual International Conference on Digital Government Research*.
- [10] Sarkar, A. (2020). *Global Business Models of Smart and Sustainable Cities*. Retrieved from Smart Cities Journal: <https://www.thesmartcityjournal.com/en/articles/859-global-business-models-of-smart-and-sustainable-cities>.
- [11] Future Trends Trust. (2018). *Disruptive Business Models*. Future Trends Trust: <https://www.fundacionbankinter.org/documents/20183/156075/Business+Model+Disruption+Report+EN+2.pdf/e238c273-e45c-4ccd-bd3a-802926094203>.
- [12] ILO. Resolution concerning decent work and the informal economy. In: *The General Conference of the International Labour Organization Meeting in its 90th Session*. International Labour: Organization; 2002 <https://www.ilo.org/public/english/standards/relm/ilc/ilc90/pdf/pr-25res.pdf>
- [13] McKinsey Global Institute. (2011). *Internet Matters: The Net's Sweeping Impact on Growth, Jobs and Prosperity*. McKinsey: https://www.mckinsey.com/insights/high_tech_telecoms_internet/internet_matters.
- [14] Muegge, S. (2012). Business Model Discovery by Technology Entrepreneurs. *Technology Innovation Management Review*.
- [15] Ndemo, B. (2020). Slum digitisation, its opponents and allies in developing smart cities: The case of Kibera, Nairobi. In S. Hawken, H. Han, & C. Pettit, *Open Cities Open Data*. Singapore: Palgrave Macmillan.
- [16] Vanags, A., & Gravelis, L. (2015). The benefits of 4G: Sweden and Estonia - European leaders in 4G.

TeliaSonera Institute Discussion Paper No.16. <https://www.biceps.org//assets/docs/petijumu-serija/TSIDP16>.

[17] Chesborough H. *Open Innovation Results*. In: *Going beyond the Hype, and Getting Down to Business*. Oxford University: Press; 2020. DOI: 10.1093/oso/9780198841906.001.0001

[18] Dungy TN, Ndofor HA. A dialogue on the informal economy in Africa. *Africa Journal of Management*. 2019;5(4):401-407

[19] GSMA. *2019 State of the Industry Report on Mobile Money*. GSMA: Mobile Money Programme; 2019

[20] ITU. (2019). *International Telecommunications Union*. Retrieved July 2020, from Global and Regional ICT Data: www.itu.int/itu-d/itu-d-ict-statistics.

[21] Genesis Analytics Limited. *Towards a Digital Workforce: Understanding the Building Blocks of Kenya's Gig Economy*. Nairobi: Mercy Corps' Youth Impact Labs; 2019

[22] Onkokame, M., Schoentgen, A., & Gillwald, A. (2018). *What is the state of microwork in Africa? A View from seven countries*. Retrieved July 2019, from research ICT Africa: https://researchictafrica.net/after-access_the-state-of-microwork-in-africa/

[23] Smit, H., Johnson, C., Hunter, R., Dunn, M., & van Vuuren, P. F. (2019). *Africa's Digital Platforms and Financial Services: An Eight-Country Overview*. Insight2impact. Johannesburg.: Insight2impact.

[24] Wood A, Graham M, Lehdonvirta V, Hjorth I. Good gig, bad gig: Autonomy and algorithmic control in the global gig economy. *Work, Employment and Society*. 2019;33(1):56-75

[25] Afrilabs and Briter Bridges. (2019). *Building a Conducive Setting*

for Innovators to Thrive: A Qualitative and Quantitative Study of a Hundred Hubs across Africa. Afrilabs and Briter Bridges.

[26] Postman, N. (1993). *Technopoly: The Surrender of Culture to Technology*. New York: Vintage Books: ISBN 978-0-679-74540-2.

[27] African Development Bank. *Potential of the fourth industrial revolution in Africa*. In: African Development Bank; Technopolis; Research ICT Africa. Tambourine Innovation: Ventures. African Development Bank; 2019

[28] World Bank. *World Development Report 2016: Digital Dividends*. The World Bank: Washington D.C; 2016. DOI: 10.1596/978-1-4648-0671-1