

EXPLORING THE CAPABILITIES OF THE FOURTH INDUSTRIAL REVOLUTION FOR IMPROVED PUBLIC SERVICE DELIVERY IN NIGERIA

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Abstract:

The modern evolution of the Fourth Industrial Revolution (4IR) comes with new trends in technology that are altering the customary way of undertaking government tasks. The alterations appear as opportunities and threats based on the strengths and weaknesses of extant practices and systems operating in the Nigerian public sector. Therefore, the government faces the challenge of coping with new demands and some unanticipated risks in incorporating and adapting to the 4IR. Although the 4IR is considered valuable, the extent of its influence on Nigerian service delivery and how to harness its worth has yet to be established. This article seeks to determine the public sector's service delivery level regarding innovation and technological advancements. It further investigates how the 4IR can influence and harness improvement in the delivery of public services in Nigeria. A review of secondary sources from reports, government documents, and extant scholarly literature and data were analyzed thematically. While the Nigerian government has made some effort to provide the public sector with innovative technology, it is essential to improve on this provision to maximize the opportunities and strengths of the 4IR. Therefore, this article recommends intensifying technological and digitalization capabilities by providing suitable human and financial capital to improve service delivery, particularly in Nigeria.

Keywords: Training and Development, Fourth Industrial Revolution, Service Delivery, Innovation, Technological Advancement.

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INTRODUCTION

The world is undergoing major technological changes that are revolutionizing every aspect of socio-political and economic life, including labor and service delivery. Technological innovation has been central to the evolution and progress of human societies and has been the key driving factor of every industrial revolution the world has witnessed. Production was mechanized through steam power in the first industrial revolution. The two subsequent revolutions were powered and enabled by electricity and automation, made possible through information technology and electronics, respectively (Li et al., 2017; Schwab, 2017). Thus, the first three industrializations were mainly about mechanization, automation, and mass production (Madumo, 2020). The Fourth Industrial Revolution (4IR), which builds on these, is defined by advanced technologies increasingly incorporated into every facet of daily life, obfuscating the boundary between technology and social or personal life. Commonly known manifestations of the 4IR include Artificial Intelligence (AI),

Internet of Things (IoT), Virtual Reality (VR), Augmented Reality (AR), Robotics, Cloud computing, 3D printing, advanced wireless technologies, blockchain, and supercomputing, amongst others (Badimo, 2018; Li et al., 2017; Ndung'u & Signé, 2020). The central appeal and feature of the 4IR is the opportunity it offers for exponential efficiency in everything, saving cost and time and eliminating challenges caused by human limitations.

Governments, as well as public and private organizations around the world, are embracing 4IR technologies and deploying them to achieve improved service delivery and other objectives. However, minimal such effort is apparent in many African countries, including Nigeria, despite the immense impact that such technologies could have in resolving some of the gravest challenges in these countries. This paper, therefore, explores how 4IR could be exploited for improved service delivery concerning the Nigerian government. Being a conceptual paper, it relies on relevant constructs and ideas found in the existing literature to explore the relationship between 4IR and service delivery. It outlines the challenges of service delivery in the contemporary Nigerian public service, and it argues why and how the provisions of 4IR technology promise better delivery of public services in Nigeria.

METHODS

This study adopted a qualitative approach and reviewed secondary data sources. The desk research methodology was adopted to obtain, organize, synthesize, and summarise information from existing literature to provide greater insight into using 4IR from the Nigerian public sector perspective (Guerin et al., 2018). Data were collected from varied literature sources, such as relevant journal publications and reports from the Nigerian government (World Economic Forum, 2016). Literature was sourced from search engines such as google scholar, a directory of open-access journals, google books, science direct, and EBSCOhost. The study is exploratory, considering the low number of empirical studies on the subject matter. Key phrases that guided the research interests were, harnessing the 4IR, the 4IR and service delivery, 4IR in Nigeria's public sector, and innovation. The literature reviewed dates from 2015- to 2020. Data were presented and analyzed thematically.

RESULT AND DISCUSSION

Public Sector Innovation Framework. There is a growing awareness in the public sector of the need to explore and harness innovative strategies as innovation is recognized in the 4IR era as a significant driver to promote public service delivery improvement and to improve effectiveness, efficiency, internal processes, and structures of organizations. The public sector innovation framework developed by the Organisation for Economic Cooperation and Development (OECD) is employed here to justify the essence of innovation in the public sector in the era of the 4IR. According to Daglio et al. (2014), the public sector innovation framework takes place on four levels: the innovator herself or himself, the organization where the individual operates, the entire public sector, and the society. Governments are presently operating in a more challenging context than ever, and they are faced with greater uncertainties and demands, which necessitate a more refined and updated approach to modernization. However, the capacity to implement innovation and capitalize on future potential should be of great concern (Serrat, 2017).

Based on the public sector innovation framework, 'innovation' is defined as implementing improved or novel services or services, goods, or organizational approaches. Hence, innovation should be unique and executed to achieve substantial improvement and create public value (Lukman, 2021). Several studies by De Vries et al. (2018); Meijer (2015); Bertot et al. (2016) have highlighted the role of knowledge sources, collaboration, and innovation activities like capacity

development and training as factors that play an important role in public sector innovation based on public policy, public management, and e-government research. Public services could be delivered with novelty as a mechanism of generating maximum value for the public. Innovation in service delivery could be realized through innovation orientation, collaboration with external partners, and IT capabilities (Chen et al., 2009). Hence, this paper seeks to explore the capability of 4IR, in the context of the Nigerian public sector, to foster innovation and capability.

Opportunities and Challenges of 4ir for the Public Good. It is generally accepted that the 4IR has major implications for public administration, especially in delivering basic services such as water, sanitation, healthcare, electricity, education, and more. Mathebula (2021), for example, found that despite varying levels of acceptance and mixed feelings, 4IR presents many opportunities for improved provision of public goods and services in developing countries. 4IR has the prospects of time efficiency, cost efficiency, and improved customer satisfaction. Thani (2020) remarks that the 4IR may be seen as the solution to service delivery and an inevitable revolution that could be a major driver of change in Africa. However, the growing digital divide in Africa remains a concern. Challenges relating to connectivity infrastructure and the general lagging of Africa's technological development casts doubt on the readiness and capacity of many countries on the continent to participate in the 4IR economy (Thani, 2020).

In their report, Ndung'u and Signé (2020) observed that Africa's adoption of 4IR technologies had been limited and that indicators of the digital revolution generally show Africa to be behind. Mobile digital financial services have seen the most improvements in Africa, where nearly 50 percent of mobile money accounts are held, and the fastest growth is projected (Ndung'u & Signé, 2020). Mobile and internet technologies have immensely improved the flexibility and efficiency of financial services and real-time monetary transactions. Mobile phone-based money transfer services, such as M-Pesa in several African countries, provide financial securities and microfinancing facilities in rural and urban areas (Nalubega & Uwizeyimana, 2019). Similar services cater to thousands of transactions across countries daily, enabling better forex transactions and delivery of remittances across Africa. It confirms that 4IR can bring about desirable social and economic developments worldwide, improve the quality of life for many, and increase the effectiveness and efficiency of organizations (Ayentimi & Burgess, 2019).

Ndung'u and Signé (2020) also observe that blockchain and AI are gaining ground in Africa because of their potential to resolve socio-economic challenges on the continent. However, despite the absence of some aspects of 4IR technologies in Africa, Ndung'u and Signé (2020) are confident that the revolution will "transform Africa into a global powerhouse." The 4IR will promote structural change and economic progress; it should give the underprivileged access to information and open up job opportunities in providing services that will help combat inequality and eradicate poverty. At the same time, the inexorable shift towards 4IR will empower Africa, which has a growing educated workforce and it is ready to take advantage of new technologies, reinvent labor and production; improve financial services and investments; modernize the agricultural sector, which currently accounts for 60 percent of employment in Sub-Saharan Africa. Moreover, it will enable better healthcare, as already evident in the role of mobile technologies in health research and disease control in Africa, such as the use of Whatsapp for information diffusion and disease management during the Ebola and COVID-19 crises. These, however, will not occur automatically but will require African governments to invest in the appropriate education, skills development, and adequate infrastructure (Ndung'u & Signé, 2020). It should enable an effective transition to the 4IR economy and guard against some of the anxieties created by the revolution.

Arguably, the most popular conversation about 4IR is the impact it is having and will increasingly have on issues of power, privacy, and labor. Fears exist about how it could lead to increased marginalization and socio-economic inequalities based on access to digital technologies and the loss of thousands of traditional jobs and professions to more efficient machines (Schwab, 2017; Shava & Hofisi, 2017; Nhede, 2018). Prisecaru (2016) warns that while labor costs will be reduced, employment, revenue tax, and the Gross Domestic Product (GDP) of countries could experience a decline. The author believes that digitalization from the 4IR would exacerbate the prevailing inequalities in impoverished and developing countries such as Nigeria that are yet to transition from the second to the third industrial revolution. Shava and Hofisi (2017) explain that the development of artificial intelligence, robotics, and machine learning threatens customary corporate models. Adjusting will be difficult and time-consuming for many organizations as they grapple with the needed talent for the newest technologies. It could disrupt businesses, governments, and people's lives if effective strategies are not devised and intentional efforts are not made to understand the challenges and opportunities of 4IR. Thus, proactive measures by governments can help to achieve minimal negative impact and to empower their societies to take advantage of the 4IR. It is especially pertinent for countries like Nigeria that have suffered major development and service delivery setbacks.

Martins and Ledimo (2015) emphasized the importance of the 4IR in service delivery with the upsurge in customers' or citizens' population numbers and population divisions with a wide range of values and tastes. Previous pressure and demand for better public service delivery by citizens have been amplified through diverse available technologies such as Whatsapp, Facebook, Twitter, and Instagram. These online platforms have become sites where the populace express their views, encouraging social accountability and e-participation in government (Shava & Hofisi, 2017). Significant changes in the traditional business modes will likely be made through the evolving digital revolution, which could lead to some structural changes to gain competitiveness. From the governance and service delivery perspectives, the effects of 4IR on the business amount to product improvement, improved organizational methods, collective innovation, and heightened customer expectation. Collectively, these are influenced by the improvement of the products and services provided through digital competencies, the introduction of technology in the organization's operations, the use of a database to monitor performance, and the creation of a system with talents and a culture that is receptive to digital change. It will be realizable when senior administrators understand the changing milieu and inspire their subordinates to generate innovative ideas persistently (Schwab, 2017).

With the advent of 4IR, cybercrime, a threat to national security and peace, has become a major threat to public management regarding amendments of regulations, privacy, and information challenge. It is predicted that Nigeria and other developing countries will be insecure, and global technological resourcefulness will be required even when they have yet to upgrade their domestic security structures to counter-act cyber sabotage. In addition, new crime methods can be fashioned by hackers and cyber terrorists to proliferate terrorism and access classified information (Nhede, 2018).

The quest for an improved public service will raise moral and ethical concerns as artificial intelligence (AI) and robotics gain ground in the 4IR. AI lacks affirmative human capacities of sensitivity, empathy, motivation, and inspiration. These should be preserved (Prisecaru, 2016). However, Schwab (2017) points out that the 4IR will facilitate the surveillance of public servants' and citizens' activities. It is hoped to help curb corruption, improve professionalism, and change the bureaucratic administrative model, contributing to the malaise in public service (Nwokorie, 2017). Ultimately, Myers (2016) found that with new technologies presented with the 4IR, economic

development is guaranteed for countries that adopt these. Shava and Hofisi (2017) acknowledged that embracing the 4IR would intensify administrative decision-making using modern technological devices and regulatory structures. In that context, modern high-tech governance is needed for the survival of public organizations.

Public Service Delivery Challenges in Nigeria. Government institutions are established to provide citizens with water, electricity, education, health, and other public goods and services, expecting that the services will be delivered efficiently and effectively. The abysmal performance of Nigerian public organizations is reflected in their meager service delivery outcomes (Fatile et al., 2015). Despite the consistent expectations of citizens, the Nigerian public service is beset with several challenges that undermine the delivery of high-quality services (Kayode et al., 2013). These challenges are also responsible for the country's dismal digital opportunity index (DOI) compared to other countries. Nigeria ranked 31st among other African countries in the DOI score. The country has a low score of 0.01, 0.03, and 0.41 for utilization, infrastructure, and opportunity, respectively (Ifijeh, 2014). Hajduk (2016) argues that infrastructural and innovation gaps owing to inadequate investment and lack of novelty recognition in the public sector limit Nigeria's ability to take advantage of technological advancements. Below, we discuss some of Nigeria's major challenges to public service delivery.

Mismanagement: Central to the challenges that the Nigerian public sector is plagued with is mismanagement (Ojogiwa & Qwabe, 2021; Omotoso, 2014). The recurring subject of ineffectiveness and inefficiency in the sector is associated with poor management practices, resulting in accountability issues, derisory record keeping, and lack of assets and liability management. The 4IR would make seamless the task of accountability, record keeping, and the management of government assets and liability. Artificial intelligence can perform usual routines and tasks faster and with minimal errors. For example, big data can manage and systematically analyze data. Data are managed through gathering, cleaning, and keeping data. Hence, big data has been confirmed to be in use in the domains of the Internet of Things to expedite data processing, data storage, and the management of quality data (Ma et al., 2019).

Ethics and Professionalism Issues: The poor performance of the public service is traceable to the unethical issues ravaging the sector. The ethical issues reflected in the personnel code of conduct with issues of integrity, transparency, honesty, trustworthiness, and respect. The lack of professionalism has amplified corruption, and it is recognized as a cankerworm in the public sector. Kayode et al. (2013) and Ojogiwa and Qwabe (2021) noted that corrupt practices have thrived with the connivance of public officials. Nevertheless, digitalization can curb the unprofessionalism and irresponsibility of public servants as artificial intelligence could recognize economic, social, and ethical irregularities in work practices (Malik et al., 2020).

Nepotism: The large measure of autonomy and discretion given to public servants is habitually abused through favoritism, ethnicity, and religious preference, which has eroded meritocracy based on the competencies of public servants. Oyedele (2015) observed that public service is critiqued for its incompetence, indiscipline, and favoritism. Thus, the objective of public service, which is to serve the overall welfare of the masses, is diverted to serve the interests of a few bureaucrats. However, the possibility of subjective decision-making and human bias could be controlled using technology. Consequently, there could be employment equity and, in so doing, improvement in recruiting skilled and qualified candidates for needed positions. Diverse AI-Human Resource Management (HRM) applications have been developed to solve various multifaceted organizational challenges, such as decision-making and operational and strategic HRM elements (Malik et al., 2020).

Infrastructural and Innovation Gaps: Although technological advancement is key to achieving optimum performance of public sector institutions, it has not been wholly embraced or maximized to improve public service delivery (Adejuwon, 2018). Ajibade et al. (2017) noted that the emergence of e-governance in response to the technological revolution in the Nigerian public sector had been characterized by a passive approach to acquiring and developing emerging technologies to boost the required governance strategies. It has amplified institutional corruption, wastages, and avoidable delay and error. Lou et al. (2019) stressed that the Nigerian government has no clear plan to consider the 4IR technologies as the major necessities for skilled human capital, stable power supply, and fast internet connectivity, which indicates that the country's readiness to embrace the 4IR is questionable. Ultimately, realizing a successful transition into adopting the 4IR might be a mere aspiration and a gimmick considering the current appalling delivery of the major public necessities. Digital public service can be reached when there is a convergence of citizens' demand for greater transparency and speed in service delivery with the enthusiasm and innovation of the public sector to render public service responsively using emerging technologies. It is not feasible in the Nigerian context as indispensable sectors such as power, education, and security are yet to be reformed and revitalized despite their huge financial commitments. Significantly, the power sector is central to the maximum exploitation of the opportunities of emerging technologies (Nnaeto, 2017). Lawan et al. (2020) acknowledged that the Nigerian e-governance project had yet to record a significant development as the country ranked 143rd on the United Nations (UN) e-government global ranking and assessment of 193 United Nations (UN) member states in 2018. Some highlighted impediments to e-government implementation in Nigeria are data privacy, corruption, security concerns, Information Communication and Technology (ICT) illiteracy, and infrastructural deficits.

Harnessing the Potentials of 4ir To Improve Service Delivery. Given the highlighted challenges of the Nigerian public sector service delivery, harnessing the potential of 4IR would require a receptive and enabling environment such as government policies, strategies, and frameworks to embrace innovation in the public sector.

Investment in Skilled Human Capital. Human capital refers to an individual's ability and output partly based on skills, knowledge, and experience acquired from training and education (Lenihan et al., 2019). Human capital is crucial in the public sector to deliver public services to the populace. The effective operation of the public sector depends on human resources, knowledge, attitudes, and skills. Low Information Technology (IT) literacy and other relevant skills in the Nigerian public sector have undermined the implementation of e-governance in the country (Lawan et al., 2020). Thus, it ranks low (143rd) in the e-government development index of the United Nations Development Economic and Social Affairs (UNDESA, 2016).

Exploiting or participating in the 4IR requires acquiring new relevant skills and a different approach to education. Data and computation heavily drive the 4IR. Therefore, The public sector needs to include well-trained personnel that can interact with relevant information and produces and engage the right data to enable decision-making. Nigeria has extremely poor record-keeping and database systems. It has jeopardized efficient and effective service delivery to citizens immensely. Therefore, there is a need to consider the investment in the training and development (T&D) of talents to equip the workforce and to build their competence as an approach and response to the current dynamic setting (World Economic Forum, 2016). Appropriate systems are needed, and people should be trained to digitize and manage important records and process information as needed. It requires a more careful and deliberate process that promotes appointing the right people to the right positions and providing others with the training they need to upgrade their skills and acquire new ones. Prisecaru (2016) maintains that it is vital for the government to attract talents on merit to boost expertise and professionalism.

The 4IR offers many opportunities for rethinking training and education and how these are delivered. Online courses by reputable organizations and individuals are easily accessible at affordable rates (Ilori & Ajagunna, 2020; Kolog et al., 2022). Learners today can also choose courses that specifically address their needs. Coursera, an American massive open online course provider founded in 2012 by Stanford University computer science professors Andrew Ng and Daphne Koller, offers several reputable, certified courses and micro-degrees that provide needed skills. Several other platforms, such as the W3Schools, Massive Open Online Education, and several online consortiums, offer key skills at little or no cost (Welsh & Dragusin, 2013). Civil servants must be encouraged to embrace a culture of continuous learning and take advantage of these resources to improve their skills and remain relevant.

Reliable Internet Coverage. State institutions' involvement in harnessing the full potential of the 4IR will be evident in their reception of innovations and strategic change. Emerging technologies from the 4IR, such as the Internet of things, big data/Cloud computing, 3D printing, AI, and blockchain, can only function optimally with secure, reliable, high-speed internet connectivity. There is a need to focus on data protection and cyber security while boosting proficiency in emerging technologies (Markowitz, 2019).

The Nigerian government policy response is responsible for addressing anticipated challenges of inequitable access and affordability. It is best approached through the collaboration of multi-stakeholders, including the public, private, non-governmental, businesspersons, and civil society organizations, to ensure quality access to the internet (Prisecaru, 2016). A community-based approach to ensure national ICT coverage is important for equitable access and improved coverage. Public sector capacity could be enhanced with facilitated workshops covering advanced technological knowledge and practices, including cybersecurity strategies, beyond regular workshops to guide handling new digital procedures. It requires a national vision that involves digitalization, industrialization, and socio-economic development and having a strong leader who inspires change (Nhede, 2018).

Steady Power Supply. Stable and reliable electricity is non-negotiable for the smooth delivery of services and for harnessing the advantages of the 4IR. Transforming service delivery is only possible with reliable basic infrastructures such as electricity. The erratic power supply in Nigeria has negatively affected the country's economic development, despite diverse efforts to reform the power sector, including privatization (Lawan et al., 2020). The power sector is considered core to a nation's development. It is a utility that enhances and sustains the private and public sectors of the economy. Explaining the emergent smart grid technology against the traditional grid is imperative to increase the sector's efficiency (Bogdanov et al., 2019; Faheem et al., 2018). The smart or intelligent grid is an innovative electric power system incorporating diverse power electronics, cyber technologies, computers, and communication. A smart grid is intended to provide advanced energy efficiency, advanced system reliability, economical electricity supply to consumers, advanced system security, and ideal resource utilization (Bose, 2017). The challenges of the power sector, such as old equipment, insufficient capacity generation, and delayed facility maintenance, would be fixed with the smart grid and the existence of an effective energy management system (Amuta et al., 2018). Oladipo et al. (2018) submit that more investments are needed, particularly in renewable energy resources, to appreciate the innovations from emerging technologies.

Receptive Government Policies and Strategic Leadership. Li et al. (2017) admitted that adapting to 4IR might be expensive and difficult, but it will ultimately be worth the investment. The government's political will should well support it. The government's political will and readiness to evolve and adapt to advanced technology are critical to its embrace. The leadership is challenged to

embrace the 4IR and adapt to the changing environment by prioritizing technological advancement. Shava and Hofisi (2017) maintained that the prospect of 4IR to achieve economic development in a country requires a supportive government policy. It is supported by Myers' (2016) observation that policies implemented by countries should support the global initiative in connection with adopting the United Nations' Sustainable Development Goals (SDGs) to protect the planet and alleviate hunger and poverty, amongst others. Paunova (2016) found that governments face huge pressure to reform their approaches to policy-making issues and public actions as the 4IR slowly relegates the policy-making role of government to its new sources of power decentralization and redistribution.

The 4IR is predicted to influence national and international security, which will help bridge the existing confidence gap between the state and the citizens. Schwab (2017) holds that the history of technological invention is traceable to the history of international security and warfare. Nevertheless, while diverse methods of protection could be developed to reduce the impact of violence, it is equally able to develop biological weapons capable of mass destruction (Jones & Hildreth, 2019). Government policies should be drafted to include a different focus on technological advancements while creating economic inducements that will encourage the precise form of technological advances to meet global goals.

CONCLUSION

Nigerian public service delivery has been plagued by underperformance that has eroded the citizens' confidence in most of the services offered. The poor service delivery is blamed largely on insufficient high-tech adoption by public institutions. The 4IR offers a viable and credible means of tackling some of the public service challenges of inefficiency, unaccountability, ineffectiveness, and the main cankerworm of corruption.

Recommendation. The 4IR is not a technology that is beyond human control. Humans are responsible for choosing what to do with the developing technology and have control over how it is used. Hence, the opportunity to understand the technicality of the 4IR and to use its potential advantages to plan for the future should be noticed. Globally, technology has reshaped human lives and continues influencing social, economic, political, and cultural environments. Therefore, there is a need for Nigeria to think of tomorrow today by strategically fitting into the present world of innovation and by forming values that translate to excellence and that reflect improved service delivery. Regardless of its impending negative impact, the positive influence of 4IR could be exploited to change humanity for the better. All stakeholders from local, state, and federal government levels, particularly with the involvement of law enforcement agencies, should collaborate so that, while harnessing the potentials of the 4IR, the effect on the economy should be manageable. Moreover, good governance earnestly desired by citizens and governments is determined by improved service delivery. It is recommended that the major requirements and infrastructures of skilled human capital, stable power supply, and fast internet connectivity should be concentrated on to indicate Nigeria's readiness to embrace the 4IR.

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