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REVISITING NIGERIA BUREAUCRACY IN ERA OF INDUSTRY 4.0: THE NEED FOR SYNERGY

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Abstract

This paper is titled Revisiting Nigeria Bureaucracy in Era of Industry 4.0: the need for synergy. The aim is to determine the benefits and challenges of fourth industrial revolution and the need for the government further adopt measures to embrace the new innovations. The paper argues that the survival of bureaucracy as the Fourth Industrial Revolution gains momentum requires modern technological governance which is regularized by new technologies. This is a library research and a descriptive approach is used, with literature as the object of analysis, namely journals, online news, and books. The stakeholder theory is adopted as the theoretical framework of the study. The paper found among others that as new technological devices tend to replace human labour, the future of public administration is threatened. In conclusion, the paper is of the opinion that as the digital debate rages on, Nigeria governments should follow suit and voice their concerns rather than simply letting developed states dictate the developmental path to them. The papers therefore recommends that government needs to conduct skills training initiatives to capacitate civil servants on the use of modern technology; and civil servants need to be ready to adapt to changes presented by the Fourth Industrial Revolution. It is also recommended that government bureaucracies should be able to integrate relevant stakeholders including private sector organization and map the way forward in terms of how the Fourth Industrial Revolution should be adopted and to what extent by both public and private sectors.

Keywords: ***Bureaucracy, Industry 4.0, Nigeria, Public sector.***

Introduction

The quality of a country's bureaucracy is vital to its economic performance and the well-being of its citizens. An effective and efficient bureaucracy serves the needs of its citizens. It is essential that the bureaucracy is able to adjust to changing circumstances, especially technological advances (Williams, 2020). Citizens are becoming ever more concerned about the effectiveness of their government, on all administrative levels. Knowledge is becoming obsolete increasingly quickly. As a result, lifelong learning is a necessity to promote workability at every phase of life. The demand for highly skilled workers has increased while the demand for workers with less education and lower skills has decreased and the part in between them is beginning to wear thin. So this could also lead to potential job losses in the bureaucracy. Bureaucracy is an organizational structure characterized by rules and standardized procedures. According to Max Weber, the ideal bureaucracy produces decisions made by professional bureaucrats, based on rules and legitimate procedures instead of sentiments or favoritism. Bureaucratic performance is closely connected to state capacity, institutional development and economic growth (Williams, 2020). Real-world bureaucrats, as opposed to Weber's ideal type notion, bring

with them their own values, beliefs and preferences, in short their own view of the world (Kaufman, 1956) and 'the existence of these "predilections" creates challenges for the leaders of the bureaucracy, who want to ensure consistency in policy implementation' (Keiser, 2010).

The Fourth Industrial Revolution is characterized by the unprecedented advances in technology transforming the way individuals and groups across society live, work and interact. New principles, protocols, rules and policies are needed to accelerate the positive and inclusive impacts of these technologies, while minimizing or eliminating their negative consequences. The institution that has traditionally had the responsibility of shaping the societal impacts of these technologies – especially the bureaucracy is struggling to keep up with the rapid change and exponential impact. At the same time, an implosion of confidence is occurring around the bureaucracy as trust in mainstream institutions, from companies and governments to media and NGOs, is at its lowest point. There is an urgent need for a faster, more agile approach to administering. As traditional policy development processes lag behind the rapid pace of technology innovation, citizens increasingly expect the bureaucracy to take on new responsibilities and develop new approaches to support the diversification and speed of administration.

The Fourth Industrial Revolution requires the transformation of traditional administrative structures and policy-implementation models. There are varied concerns about the kinds of trends and the impact that the 4IR will create for the bureaucracy. The most common concern is technological progress that is feared to substitute human labour with machines, which could lead to technological unemployment (i.e. the loss of jobs caused by technological change), resulting in increased inequality in the short-term, regardless of the long-term beneficial effects (Mokyr, Vickers & Ziebarth 2015, Xing et al. 2018). Despite the negative concerns, Xing et al. (2018) believe that the new technologies introduced will always need humans to coordinate implementation tasks and perform maintenance duties. According to the most recent survey conducted by the WEF in 2016, the 4IR is to significantly impact on job creation and job displacement, heighten labour productivity and widen skills gaps (WEF, 2017). According to this survey, a wide variety of jobs, not limited to a given geographical location, are likely to be created while more than five million jobs are likely to have been lost to disruptive labour market changes globally by 2020 (WEF, 2017).

Nigeria is already witnessing the innovations brought forth by the 4IR, and has appreciated the ability of the designed tools to solve various societal challenges. However, while the 4IR clearly presents various opportunities with regard to timely and less costly services, it also poses challenges to the existing regulatory frameworks of Nigeria, especially in the spheres of 'data security, cyber security, consumer protection, and laws on technology use' (Martin 2019). There has not been much research or insights on the precise effects of this change on public bureaucracy. Hence, the article presents a discussion on the benefits and challenges of 4IR and the need for synergy between 4IR and Nigeria bureaucracy. The discussion in this article results from a perceived need to improve the status of Nigeria bureaucracy by taking advantage of the opportunities presented by the 4IR.

Methodology

This is a library research and a descriptive approach is used. This study uses literature as the object of analysis, namely journals, online news, and books, which were interpreted to provide understanding. The technique used to obtain data is the technique of critical reading. The data analysis method used is descriptive analysis.

Conceptual Review

Bureaucracy

Bureaucracy is a body of non-elected governing officials or an administrative policy-making group. Historically, a bureaucracy was a government administration managed by departments staffed with non-elected officials (Richard and Ola, 2005). Today, bureaucracy is the administrative system governing any large institution, whether publicly owned or privately owned (Weber, 2015) The public administration in many jurisdictions and

sub-jurisdictions exemplifies bureaucracy, but so does any centralized hierarchical structure of an institution. The German sociologist Max Weber (1864–1920) argued that bureaucracy constitutes the most efficient and rational way in which human activity can be organized and that systematic processes and organized hierarchies are necessary to maintain order, to maximize efficiency, and to eliminate favoritism. On the other hand, Weber also saw unfettered bureaucracy as a threat to individual freedom, with the potential of trapping individuals in an impersonal "iron cage" of rule-based, rational control. In modern usage, modern bureaucracy has been defined as comprising four features (Richard and Ola, 2005); hierarchy, continuity, impersonality (prescribed rules and operating rules rather than arbitrary actions), expertise (officials are chosen according to merit, have been trained, and hold access to knowledge).

Industry 4.0

The term fourth industrial revolution coined by Klaus Schwab, founder and executive chairman of the World Economic Forum, describes a world where people move between digital domains and offline reality with the utilization of connected technology to modify and manage their lives (Puhovichova &Jankelova, 2020). The first Industrial Revolution began in the 18th century with the invention of the steam engine and characterised by steam and water. It is widely taken to be the shift from our reliance on animals, human effort and biomass as primary sources of energy to the use of fossil fuels and the mechanical power. The second Industrial Revolution was the introduction of electricity to create mass production. It occurred between the end of the 19th century and the first two decades of the 20th century and brought major breakthroughs in the form of electricity distribution, both wireless and wired communication, the synthesis of ammonia and new forms of power generation.

The third industrial revolution is characterised by the internet, communication technologies, and the digitalisation of everything. It began in the 1950s with the development of digital systems, communication and rapid advances in computing power, which have enabled new ways of generating, processing and sharing information. It used electronics and information technology to automate production. Schwab (2016) posited that these three previous industrial revolutions liberated humankind from animal power, made mass production possible and brought digital capabilities to billions of people. The main differences between previous revolutions and the 4IR is the pace of change. Thus, while this industrial revolution builds strongly on the preceding digital revolution, the pace and scope of technological innovation makes it distinct (Genesis Analytics, 2017).

Industry 4.0 or Fourth industrial revolution refers to developing an environment in which disruptive technologies and trends are changing the way people live and work. It builds on the foundations laid by the first three industrial revolutions. It is a concept regarding the use of automation and both data processing and exchange, as well as the implementation of various new technologies that allow the creation of so-called cyber-physical systems and changes in manufacturing processes. It also concerns the digitization of production, where devices and technological systems are connected with each other- including the Internet of Things, cloud computing, Big Data analysis and artificial intelligence, as well as incremental printing, augmented reality or cooperating robots. The objective is to make for a more flexible and efficient management and the interconnection of companies, that are able to make decisions based on more detailed information (Latham, 2019). This would require the bureaucracy to play a more strategic role.

The 4IR is ‘a fusion of disruptive technologies that are blurring the lines between the physical, digital, and biological spheres’ (WEF 2017). These fusions of disruptive technologies are mainly the transformative, scientific and technological advances presented in various fields such as advanced robotics, AI, drones, the IoT, wearables, additive manufacturing or three-dimensional (3D) printing, driverless cars, blockchain technologies, bioscience technologies, augmented reality (AR) and virtual reality (VR), to mention but a few, which are reshaping the way people live, work and relate to one another (WEF 2017; Xing & Marwala 2017; Xing, Marwala & Marwala 2018). The 4IR promises to bring about an age of abundance based on the predictions of it being one of the most disruptive and transformative eras in world history (Jarbandhan, 2017; Xing &

Marwala 2017; Xing et al. 2018). It is therefore important that the bureaucracy is armed with all the necessary intelligence to envision and implement policies in this techno-economic paradigm. However, to be able to prepare for and to cope with the 4IR, it is important that deliberate efforts are made to understand the 4IR.

Unlike past industrial revolutions, the 4IR calls for deep integration and collaboration on long-term technology and capability development, and is globally focused (Davis 2016). During the 1IR, which was characterized by rapid industrialization, the main innovations were mainly steam and water power, which replaced human and animal power with machines (Davis 2016; Jarbandhan 2017; Marwala & Hurwitz 2017; Rifkin 2012; Xing & Marwala, 2017). These innovations started in Great Britain around the 1760s and then spread throughout continental Europe and the United States of America (USA). During the Second Industrial Revolution (2IR), which began in the 1850s, the main innovations were electricity, internal combustion engines, aeroplanes, telephones, cars, radio and mass manufacturing or production (Davis 2016; Gordon 2016; Jarbandhan, 2017; Marwala & Hurwitz, 2017; Rifkin 2012; Xing & Marwala 2017). The 2IR was marked by a transition of technological leadership from Britain to the USA and Germany. The Third Industrial Revolution (3IR), which is believed to have started in the 1950s, was characterised by the invention of electronics, the Internet and the use of information technology (IT) to automate mass production (Davis 2016; Gordon 2016; Jarbandhan 2017; Marwala & Hurwitz 2017; Rifkin 2012; Xing & Marwala, 2017). The Internet, which was invented in the mid-1990s, and Marc Andreessen's Mosaic/Netscape system have led to faster growth rates of computing and IT (Jarbandhan, 2017). This further reduced the costs in generating and disseminating information and gave rise to Internet technology companies like Apple, Google, Amazon, Facebook and many others. According to Rifkin (2012), the 3IR led to the democratisation of information, energy, manufacturing, logistics and marketing highly required new high tech skills in IT and embedded computing, nanotechnology, sustainable chemistry, etc.

Bureaucracy and Industry 4.0 and the need for synergy

The complex, transformative and distributed nature of the Fourth Industrial Revolution demands a new type of administration to address the interlinked dynamics of the pace and synergistic nature of emerging technologies; the transnational impact of technologies and broader societal implications; and the political nature of technologies. Developed and developing countries seem to embrace the innovative technologies ushered in the 21st century by the Fourth Industrial Revolution. These technologies as McKinsey (2016) observes can assist local & central governments to accelerate service delivery in their constituents. OFE (2015) states that, new technologies brought by the Fourth Industrial Revolution can be used to improve the management of public finances in a transparent and accountable manner. Kemp (2016) argues that, local governments need to query its capability on how it can use the current technology to mitigate public sector challenges. Kemp reiterates that, various, strategies need to be devised to implement the changes emanating from the Fourth Industrial Revolution.

The pace of technological development and the characteristics of technologies render previous pattern of policy implementation inadequate (McKinsey, 2016). Emerging technologies scale much quicker than in previous industrial revolutions. They build on and diffuse over digital networks, which enable them to mature at a pace and on a scale previously unseen. These emerging technologies are rapidly developing around, irrespective of whether new administrative systems are developed to manage their use. Moreover, as these technologies mature, they converge and combine, creating ever stronger and impactful ecosystems, which can become self-governing by algorithms, coding rules and internal dynamics independently of human action and decision. Therefore it is high time decisions are made and actions taken to shape the configuration and impact of technologically driven systems for a shared common objective.

Again, as these technologies diffuse exponentially so does their impact on surrounding systems, including investments, organizational strategies, productivity, consumption and human behaviour. Emerging technologies challenge not only the governance of technologies themselves but also require new policies, approaches and social protection mechanisms to manage, for example, the disruptions to labour markets, the environment and human interactions (McKinsey, 2016). This includes rules and policies to ensure that human labour and

creativity are augmented rather than replaced, and legislation that preserve democratic participation and citizen agency in the light of the influencing power of emerging technologies. New processes need to be developed within both national and international contexts that can provide opportunities to facilitate synchronization and learning between governments tackling similar issues.

The new technologies embody values, assumptions and principles that effect how and who they impact in society. The effect of the application of these technologies is, therefore, more than as neutral tools. The ideas going into them, the ideologies of the developers creating them, the norms and values in the context within which they are developed and deployed all have an impact on their applications and outcomes. For example, whether artificial intelligence (AI) has racial biases; gender assumptions such as service robots with female characteristics while industrial robots have more male characteristics; or ethical questions concerning genome editing on humans and animals. Nigerian bureaucracy ought to proactively help shape and direct how technologies impact people and communities in a malleable way through an iterative process.

The pace, scope, scale and political nature of the Fourth Industrial Revolution and the aspirations of the bureaucracy that it impacts should be human-centred (Magyar, 2016). The power of technology, with its abundant promise, has accelerated due to dramatic gains in data storage, processing power and algorithm-driven analytics. Month after month, new systems, applications and business models surface and then explode into the market, offering radical new solutions in domains such as health and transport, even while disrupting long-established businesses and throwing countless people out of work. In a fraught period that has been dubbed the Fourth Industrial Revolution, governments, civil society and the private sector have a duty to ensure that nations such as Nigeria are prepared for this new world and its dizzying challenges (Magyar, 2016). The alarming job-loss scenarios have also prompted warnings and calls for corrective policy. Tesla founder, Elon Musk wants governments and civil society actors to ensure that machine learning systems are deployed ethically. Microsoft founder, Bill Gates wants governments to tax robots to compensate for mass worker displacement.

Positive effects of the Industrial Revolution 4.0 on Bureaucracy

Notwithstanding the disruption of social interactions, the advancement of latest information technologies may pose a serious threat to the privacy of individuals. This is due to cyber related crimes such as hacking which is now a major threat to governments across the world (Magyar 2016). On Governments, the advent of new technologies enables citizens to express their opinions through social networks (facebook, whatsapp, twitter,) and other online platforms which are fundamental in facilitating e-participation, thereby, enhancing the social accountability of governments. Schwab (2016) argues that, the introduction of modernised technologies enables governments to increase their technological powers whilst maintaining control over populations through pervasive surveillance systems which control digital infrastructure.

IR4.0 contributes to changing the thinking and perception of administrators as about the development and changes of the economic, political and social fields and the impacts on the state administration, thereby, helping administrators provide orientations and solutions for administrative reform in accordance with the technological requirements of society (Schwab, 2016). This creates favorable conditions for state administrative agencies to promote the application of technological achievements to improve administrative. The achievements of IR 4.0 especially achievements in information and communication technology development, creates favorable conditions to ensure democracy and transparency in most activities of the state apparatus. Digital infrastructure technology and equipment enable two-way interaction between citizens and government. For example, people can contribute ideas and critique drafts of institutions and policies in many different ways, especially through the internet, which is very convenient.

In the organization of policy and law enforcement (Schwab, (2016), citizens can participate in monitoring the implementation through the openness, transparency and accountability mechanism for the activities of state administrative agencies. The implementation of this mechanism is very convenient and effective thanks to the Internet and communication. Many places have applied modern electronic and information technology facilities

to improve the quality of public services, such as granting business registration certificates, investment licenses, motorbike registrations, identity cards, organize bidding for public expenditure projects, shorten service delivery time. In a market economy, like Nigeria, the provision of public services to satisfy people's needs is not only undertaken by the State, but is gradually socialized with the participation of other economic sectors under the control of the State. In principle, the State is not required to directly provide public services but is responsible for ensuring that such services are actually provided.

Smart city technology is increasingly being used to improve public safety, from monitoring areas of high crime to improving emergency preparedness with sensors (Schwab, 2016). For example, smart sensors can be critical components of an early warning system before droughts and floods; smart bins to notify collection crews when they're full, allowing them to send rubbish trucks to areas where they're needed, rather than having to stick to set routes. Smart technology will help cities sustain growth and improve efficiency for citizen welfare and government efficiency in urban areas in the years to come. Water meters and manhole covers are just a couple of the other city components monitored by smart sensors. Indeed, the 4IR in smart cities will enable a city that uses information and communication technologies to increase operational efficiency, share information with the public and improve both the quality of government services and citizen welfare.

Thus, the central governments departments, provincial governments and local municipalities may be able to provide more and better services for less. The 4IR could, thus, lead to improved policymaking and policy, increased effectiveness and efficiency and better programmes and services for citizens. The possibilities of citizens connected by mobile devices, with unprecedented processing power, storage capacity, and access to knowledge, are unlimited. These possibilities are multiplied by the emerging technology breakthroughs in fields such as AI, VR, BI, IoT, Robotics, 3-D printing, Nanotechnology, Mobile Supercomputing, and Data Analytics. Schwab (2016) highlighted that new technologies and platforms will increasingly enable citizens to engage with governments, voice their opinions, coordinate their efforts, and even circumvent the supervision of public authorities. As a result, embracing the 4IR and implementing related technologies to automate public services, will allow for greater numbers of citizens to interact with government via ICT and lead to higher levels of "interactive dialogues" and greater levels of accountability.

Challenges of the Industrial Revolution 4.0

As the digital divide is fast encroaching, technologists and analysts have predicted the devastating consequences of this global transformation process. Schwab (2016) claims that ''the Fourth Industrial Revolution may affect the identity, privacy, ownership and consumption patterns of humans'' The process may be disastrous to how people work or enjoy leisure, cultivate skills, and meet new people or nurture relationships. The reason is that everything in the aspect of human life will be digitised leaving no room for physical operation by the people thereby compromising the social relations of people which will impact negatively on social capital. Schwab endorses further that, presently, the Fourth Industrial Revolution is already determining people's health leading to what he called a 'quantified' self which degenerates into human augmentation. The World Economic Forum (2016) points out that, the Fourth Industrial Revolution if unchecked can diminish the functioning of public administration and some of the quintessential human capacities inter-alia compassion and cooperation. Notable examples are the human interaction with smartphones, tablets, ipods etcetera. The authors' argument stems from the fact that, constant connection to digital technologies can deprive human beings of the spirit of association and interaction with other humans, time to reflect, pause and engage in meaningful conversation (World Economic Forum, 2016)

In practical terms, technological disruptions mean growing automation. As a result, a number of unintended, yet critical, consequences are likely to emerge. For one, there is the issue of a disturbing skills gap between what the labour force has and what a technologically driven and competitive economy requires. Again, unemployment and unemployability can become a serious social phenomenon leading to loss of productivity and effectiveness within the public sector. While it is possible that the public sector could procure equipment that could make employees in the back office redundant or supernumeraries, for example, those that are

working on human resource processes, transcription, accounting, and a range of clerical jobs at the low-end of the professional services. If the Fourth Industrial Revolution leads to processes that displace labour in the bureaucracy, (World Economic Forum, 2016), this could mean sudden increase in demand for pension pay out, in ways that could pose risk to the sustainability of the public sector pension fund.

Paunova (2016) claims that ‘‘due to the Fourth Industrial Revolution, governments are increasingly being subjected to immense pressure to restructure and re-align their approaches to public engagements and policy making matters’’. There are also indications that, some public policy making institutions in various governments still subscribe to the Second Industrial Revolution which is an obstacle they need to tackle to increase decision making using modern technological devices alongside regulatory frameworks. Some institutions are scared to embrace the much popularized Fourth Industrial Revolution due to the high rate of perceived job losses associated with the concept. As alluded by Paunova (2016) if successfully implemented the Fourth Industrial Revolution can contribute to demographic changes that seek to transform labour markets paving way to major job losses in the industrial sector of developing and developed countries. The main challenge is that every industry and geographical region will suffer from such huge skills and jobs displacement in the process, destabilizing the economies of countries. Coleman (2016) contends that, the use of robotics and artificial intelligence, quantum computer, sensors and nanotechnology reduces human labour paving way to disruption of household income.
Mesnard (2016) concurs that ‘‘all revolutionary technologies that change industrial production drastically, can put jobs at risk. Mesnard’s argument emanates from the view that, the Fourth Industrial Revolution can narrow labor demand or impose new requirements for education’’. Thus, if administrators do not have appropriate orientations and solutions in promoting the application of modern technology to the activities of state administrative agencies, the administrative activities will become stagnant and inefficient.

Davidow (2014) argues that due to the technological changes as a result of the Fourth Industrial Revolution, chaos is inevitable. His reasoning stems from the fact that, ‘Machine intelligence is already having a major effect on the value of work and for major segments of the population, human value is now being set by the cost of equivalent machine intelligence’. Similarly, Colvin (2015) disputes that only those people with high capacity empathy will benefit because robots cannot entirely replace human to human interaction. kaplan (2015) denote that, the transformation process through new technologies can be challenging to public administration due to the inability of states especially third world countries to adapt to changes due to insufficient human and material resources. These notions, pose a risk to public administration as governments need to conduct skills assessment programmes that promote huge development of technological know-how among officials.

Empirical Review
Mathebula **(**2021**)** studied public administration practice within the praxis of the Fourth Industrial Revolution (4IR).The aim of this paper is to interrogate the state of the public administration practice within the praxis of the Fourth Industrial Revolution (4IR). Central to the interrogation is the question; what implications does the 4IR have on the public administration practice, particularly the provision of basic services such as education, water and sanitation and healthcare among-st others? Simply put, the paper attempts to determine how the Internet of Things (IoT), Robotics, Artificial Intelligence (AI) and Virtual Reality (VR) can be utilized in government to improve service delivery and deal with inefficiencies as is currently the case in the South African context. The paper relies on literature review and empirical evidence to argue and come to conclusion about the future of government operations and its employees during this period of mass disruptive technologies. Inasmuch as there exist mixed feelings and levels of (un)acceptance of the 4IR particularly due to massive potential job losses, the paper argues that there is a plethora of other benefits associated with this era. The paper therefore is of the view that governments particularly in developing countries gear up in preparation for this era if the 4IR is to confer maximum benefits in relation to the delivery of public goods and services.

Derriansya, Rudy, Chairun, Andries, and M Chairul (2021) studied Challenges of Public Administration Reform in the Industrial Age 4.0 (2021). The paper maintains that the history of the industrial revolution starts

from industry 1.0 to 4.0, increasing digitization of manufacturing supporting factors such as increased data, computing power and connectivity, analytics, business capabilities and intelligence, changing human-machine interactions, and improving digital changes to the physical world, such as robotics and 3D printing. This paper describes how the basic principle of industry 4.0 is the amalgamation of machines, workflows and systems by implementing an intelligent network along the production chain and process to control each other independently. The research findings show that transparency of information is the ability of information systems to create cyber knowledge by enriching digital models with data sensors including data analysis and information provision. There is an aid system to support humans by combining and taking information consciously to make informed decisions and solve proximity problems in a short time.

Similarly, Teddy, (2019) studied Public sector monitoring and evaluation in the Fourth Industrial Revolution: Implications for Africa. This article explores the implications of the Fourth Industrial Revolution (4IR) on current public sector monitoring and evaluation (M&E) in Africa. The paper states that the 4IR (also called Industry 4.0) is thought to bring about enormous benefits associated with increased efficiency and effectiveness in service delivery. Using the documentary review method to collect data, this research answers the following guiding questions: (1) How has the 4IR been harnessed in Africa to improve public sector service delivery? (2) How can the 4IR be harnessed to improve M&E in the public sector in Africa? and (3) What are the implications of the 4IR technologies on public sector M&E in Africa? Findings reveal that various 4IR disruptive technologies have already been fully adopted in public service delivery in Africa. The paper concluded that deep integration, collaboration and embracing change are needed to efficiently manage and control the multi-stakeholder nature of the 4IR innovative technologies. This article asserts that policies on the 4IR technologies need to be adaptive, inclusive, sustainable and human centred in order to efficiently regulate or guide these innovative technologies without curtailing the future opportunities.

Shava and Hofisi (2017) studied challenges and Opportunities for Public Administration in the Fourth Industrial Revolution. The paper opined that the world is at the brink of the much anticipated digital transformation orchestrated by the Fourth Industrial Revolution. Despite the perceived benefits of increased efficiency and effectiveness in service delivery, the fourth industrial revolution largely presents numerous challenges to public administration in developing countries that lack enough human and material resources to execute the ensuing huge technological advancements. Using eclectic literature sources, the article examines the opportunities for and challenges confronting governments in the fourth industrial revolution. The examination focuses on disruption of societal values and restructuring of economy, poor infrastructural development, lack of skills capacity to integrate new technologies, fear of losing jobs, poverty and inequalities threaten the success of Public Administration in the Fourth Industrial Revolution. The article recommends governments to embrace new technologies based on their capacity of a well-equipped workforce which caters for the future shrinking of global economies.

Also, Liao, Loures, Deschamps, Brezinski, & Venâncio, (2017) wrote on the impact of the fourth industrial revolution: a cross-country/region comparison. The main objective of this research is to provide a global panorama of the most relevant public policies in the emerging fourth industrial revolution by analyzing their similarities and differences. A mixed systematic literature review method is applied to conduct such analysis, in which, a sample of 67 papers and 18 government plans were first qualitatively and then quantitatively analyzed. More precisely, the comparison of these public policies' duration, objectives, available funding, areas for action, focused manufacturing sectors, and prioritized technologies was performed. The paper opines that the fourth industrial revolution stimulates the advances of science and technology, in which the Internet of Things (IoT) and its supporting technologies serve as backbones for Cyber-Physical Systems (CPS) and smart machines are used as the promoters to optimize production chains. The aim of this paper, therefore, is to bridge this gap through a systematic literature review that identifies the most influential public policies and evaluates their existing differences. This cross-country/region comparison provides a worldwide panorama of public policies'. Findings of this review according to the author can be used as the basis to analyse the position of a country

against the existing challenges imposed towards its own industrial infrastructure and also to coordinate its public policies.

Theoretical Framework

This research work is anchored on the ‘‘stakeholder theory’’. The stakeholder theory was defined by Edward Freeman and detailed in his work, “Strategic Management: A Stakeholder Approach” (Pitman Publishing, Boston, 1984). Freeman argued that a company should create value for all parties integral to its livelihood (stakeholders), not just those who stand to profit (shareholders). His stance was a counterpoint to economist Milton Friedman’s shareholder theory, which argued that companies should maximize shareholder value. The Stakeholder Theory is a view of capitalism that stresses the interconnected relationships between a business and its customers, suppliers, employees, investors, communities and others who have a stake in the organization. A stakeholder is any individual, entity, or group impacted by a company’s operations. This could include workers, suppliers, customers, and more.The theory maintains that a company wouldn’t exist without stakeholders, thereby presenting the corporate world as an ecosystem of interconnected groups. In this sense therefore, Edward Freeman’s stakeholder theory holds that a company’s stakeholders include just about anyone affected by the company and its workings. This view paints the corporate environment as an ecosystem of related groups, all of whom need to be considered and satisfied to keep the company healthy and successful in the long-term.

Summary and Conclusion

The impact of digital disruption has been a subject of discussion especially as it affects the bureaucracy in Nigeria. Technological innovations in 4IR are driven by AI and machine learning; mobile phones and the Internet; the IoT and GPS devices; advanced manufacturing and 3D printing; new energy supplies and technologies; and advanced materials, biotechnology and genomics. It is important that the bureaucracy strives to harness the opportunities for skills and capability upgrade, and create an environment where machines work alongside human beings to enhance efficiencies and overall well-being. Governments remain central actors in policy development and enforcement as they define the parameters of governance protocols for technology innovations thereby identifying the outcomes worthy of striving for as a collective endeavour. Many innovations in the bureaucracy will require tailored legal, cultural, technological, and economic infrastructure to enable efficient control and management because of their highly complex and interdependent nature. Therefore, emerging policies aimed at regulating or guiding the 4IR innovative technologies need to be adaptive, inclusive, sustainable and human centred in order to address the increasing challenges of these new technological changes.

Finally, it should be appreciated that as disruptive innovations and technologies are set to replace many of the tasks previously performed by humans, these applications also require humans to be operationalized. Thus the design of the public sector for the age of the Fourth Industrial Revolution should show greater sensitivity to the labour factor, the social utility of the public service, and the need to preserve jobs. This therefore means that introduction of machine learning processes should be designed in a way that preserves greater utilization rather than displacement of labour.

References

Basrun, U. (2021). Challenges of Public Administration Reform in the Industrial Age 4.0, Proceedings of the International Conference on Industrial Engineering and Operations Management Sao Paulo, Brazil, April 5 - 8, 2021

Dahlström, C., and Lapuente, V. (2022). "Comparative Bureaucratic Politics". *Annual Review of Political Science.* 25 (1): 43–63. doi:10.1146/annurev-polisci-051120-102543. ISSN 1094-2939. S2CID 246605188.

Derriansya, P.J., Rudy, K., C. N., Andries, L., and Chairul, M. (2021). Conference: International Conference on Industrial Engineering and Operations Management At Singapore, Proceedings of the 11th Annual International Conference on Industrial Engineering and Operations Management

Genesis Analytics, (2017). The impact of the 4th industrial revolution on the South African financial services market report, Centre of Excellence in Financial Services. Available from https://www.coefs.org.za/reports/research-reports/impact-4th-industrial-revolution-south-african-financial-services-market-report/

Joel, M.,Chris, V., and Nicolas, L. Z. (2015).The History of Technological Anxiety and the Future of Economic Growth: Is This Time Different? *Journal of Economic Perspectives* 29(3) pp. 31-50

Kaufman, H. (1956), 'Emerging Conflicts in the Doctrines of Public Administration', *American Political Science Review*, 50 (4): 1057–1073.

Keiser, L. R., Mueser, P.R. and Choi, S.W. (2004), 'Race, Bureaucratic Discretion, and the Implementation of Welfare Reform', *American Journal of Political Science,* 48(2): 314–327.

Kenneth Allan; Kenneth D. Allan (2005). Explorations in Classical Sociological Theory: Seeing the Social World. *Pine Forge* pp. 172–76. ISBN 978-1-4129-0572-5.

Liao, Y., Loures, E. R., Deschamps, F., Brezinski, G., & Venâncio, A. (2017). The impact of the fourth industrial revolution: a cross-country/region comparison. DOI: 10.1590/0103-6513.20180061. The impact of the fourth industrial revolution: a cross-country/region comparison

Marshall, S. and Molly. G. (2003). Leadership that matters: the critical factors for making a difference in people's lives and organizations' success. ISBN 978-1-57675-193-0.

Mathebula, N.E. (2021). Public Administration in the Fourth Industrial Revolution *Gender and Behaviour* 19 (2)

Mckinsey, C. (2016). Public Sector–Information Technology. Chicago: McKinsey & Company.

Nalubega, T. & Uwizeyimana, D.E., (2019). Public sector monitoring and evaluation in the Fourth Industrial Revolution: Implications for Africa, *Africa's Public Service Delivery and Performance Review* 7(1), 318. https://doi.org/10.4102/apsdpr.v7i1.318

NPC (National Planning Commission). (2012). National Development Plan 2030 - Our Future-make it work. Available from http://www.nationalplanningcommission.org.za/Pages/Downloads.aspx/ndp-2030-our-future-make-it-work.pdf

Richard, S., Ola, A.l (2005). The Max Weber dictionary: key words and central concepts. Stanford University Press. pp. 18–21. ISBN 978-0-8047-5095-0.

Schwab, K. (2016). The Fourth Industrial Revolution, The World Economic Forum. Available from http://www.weforum.org/pages

Shava. E., and Hofisi, C. (2017). Challenges and Opportunities for Public Administration in the Fourth Industrial Revolution, 9(9), Department of Public Management and Administration, School of Basic Sciences, North West University

Vogler, Jan P. (2023). "Bureaucracies in Historical Political Economy". *The Oxford Handbook of Historical Political Economy*: C19.S1C19.N41. doi:10.1093/oxfordhb/9780197618608.013.19. ISBN 978-0-19-761860-8. SSRN 4105786.

Weber, M. (2015), p. 76, in Weber's Rationalism and Modern Society: New Translations on Politics, Bureaucracy, and Social Stratification, edited and translated by Tony Waters and Dagmar Waters. New York: Palgrave Macmillan

West, D. M. (2015). What happens if robots take the jobs? The impact of emerging technologies on employment and public policy, Centre for Technology Innovation at Brookings Institute. Available from https://www.brookings.edu/wp-content

Williams, M. (2020), 'Beyond State Capacity: Bureaucratic Performance, Policy Implementation and Reform', *Journal of Institutional Economics*: 1–19.

World Economic Forum's Global Agenda Council on the Future of Software Development and Society, A Call for Agile Governance Principles, elaborated on the principles codified in the Agile Manifesto and reframed their application in the policy-making sphere. http://www3.weforum.org/docs/IP/2016/ICT/Agile_Governance_Summary.pdf