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Digital Technologies: A Congregating pan-African Public Management on the Fourth Industrial Revolution for Employability and Sustainable Growth

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ABSTRAK

Revolusi Industri Keempat (4IR) merupakan konsep pengaburan dunia nyata dengan dunia teknologi dan ditandai dengan serangkaian teknologi baru yang memadukan dunia fisik, digital, dan biologis. Studi ini mengkaji praktik administrasi publik pan-Afrika dalam praksis Revolusi Industri Keempat (4IR) untuk meningkatkan kemampuan kerja dan pembangunan berkelanjutan. 4IR adalah konsep yang mengaburkan dunia nyata dengan dunia teknologi, dan serangkaian teknologi baru yang menggabungkan dunia fisik, digital, dan biologis menjadi ciri khasnya. Pada intinya, 4IR didorong oleh konvergensi teknologi fisik dan digital. Ini adalah lingkungan yang berkembang saat ini di mana teknologi dan tren disruptif seperti Internet of Things (IoT), robotika atau robot cerdas, superkomputer seluler, realitas virtual (VR), dan kecerdasan buatan (AI) mengubah cara orang hidup dan bekerja. Lebih jauh lagi, penelitian ini menginterogasi potensi kontroversial dan kontemporer dari administrasi publik pan-Afrika sehubungan dengan revolusi industri keempat saat kita semakin dekat dengan masa depan. Penelitian ini menggunakan desain penelitian deskriptif yang mengandalkan analisis isi. Sumber pengumpulan data sekunder digunakan. Beberapa temuan penting termasuk pembangunan berkelanjutan, Ketenagakerjaan, dan Revolusi Industri Keempat. Studi ini menganjurkan agar administrasi publik di Afrika relevan dengan kebutuhan tata kelola dan pembangunan berkelanjutan di benua tersebut, maka administrasi publik di Afrika harus merestrukturisasi kurikulum pendidikannya untuk memanfaatkan manfaat yang diberikan oleh kemajuan teknologi pada revolusi industri keempat.

ABSTRACT

The Fourth Industrial Revolution (4IR) is the concept of blurring the real world with the technological world and it is characterized by a range of new technologies that are fusing the physical, digital, and biological worlds. The study analyze the state of pan-African public administration practice within the praxis of the Fourth Industrial Revolution (4IR) to enhance employability and sustainable development. The 4IR is the concept of blurring the real world with the technological world, and a range of new technologies that are fusing the physical, digital, and biological worlds characterizes it. At its core, the 4IR is driven by the convergence of physical and digital technologies. It is the current developing environment in which disruptive technologies and trends such as the Internet of Things (IoT), robotics or intelligent robots, mobile supercomputing, virtual reality (VR), and artificial intelligence (AI) are changing the way people live and work. Furthermore, the study interrogates the contentious and contemporary potentials of the pan-African public administration vis-à-vis the fourth industrial revolution as we draw closer to the future. The study employed a descriptive research design, relying on content analysis. A secondary source of data collection was employed. Some of the significant findings include sustainable development, Employability, and Fourth Industrial Revolution. The study advocates that for African public administration to be relevant to the governance and sustainable development needs of the continent, it must restructure its educational curriculum to take advantage of the benefits that the technological advancement of the fourth industrial revolution provides.

1. INTRODUCTION

The Fourth Industrial Revolution (4IR) is the concept of blurring the real world with the technological world and it is characterized by a range of new technologies that are fusing the physical, digital, and biological worlds (Ojo, 2022; Serumaga-Zake & Poll, 2021). At its core, the 4IR is driven by the convergence of physical and digital technologies. It is the current developing environment in which disruptive technologies and trends such as the Internet of Things (IoT), Robotics or Intelligent Robots, Mobile Supercomputing, Virtual Reality (VR), and Artificial Intelligence (AL) are changing the way people live and work (Meyer et al., 2019; Pauceanu et al., 2021a).

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It can be described as the advent of cyber–a physical system" involving entirely new capabilities for people and machines, which needs special skill sets and employability readiness for future jobs. The 4IR is a revolution that is fundamentally changing the way people live, work, and relate to one another. Many of these technological innovations are at the primary levels at the moment, but they are already reaching an inflation point in their impact on development as they build on and amplify each other in a fusion of technologies across the physical, digital, and biological worlds (Oleribe & Taylor-Robinson, 2016; Sole & Anggraeni, 2018). In an era characterized by unprecedented technological advancements, the world finds itself at the precipice of the Fourth Industrial Revolution (4IR). This transformative phase is marked by the convergence of the physical, digital, and biological realms, ushering in a new paradigm that challenges established norms in various sectors (Ojo, 2022; Vargo et al., 2003). Within this context, the role of public administration in the African context takes on renewed significance. This study seeks to comprehensively examine the state of pan-African public administration practice, particularly within the praxis of the 4IR, with a primary focus on its potential to enhance employability and drive sustainable development across the continent (Fioletov et al., 2022; Vargo et al., 2003).

While research in the field of public administration has historically addressed issues of governance, policy implementation, and service delivery, the dynamic landscape of the 4IR has introduced novel dimensions and complexities. Traditional models and approaches may no longer suffice in this rapidly evolving environment. This study builds upon previous research in several ways, highlighting its novel contributions. 4IR Integration. Previous research in public administration often falls short in fully integrating the concept of the 4IR (Tsiligiris & Bowyer, 2021). Our study bridges this gap by placing the 4IR at the center of the discussion, recognizing it as a transformative force that necessitates a reevaluation of established practices. Employability in the 4IR: While employability within the public sector has been examined, there is a dearth of literature addressing how the 4IR is reshaping the skill sets required for public administration roles. This study delves into this crucial aspect, exploring how the 4IR is reshaping the employability landscape (Oke & Fernandes, 2020; Yusuf et al., 2020). Sustainable Development Nexus: Sustainable development remains a paramount goal for Africa, yet the role of the 4IR in achieving this objective has been underexplored. Our research not only identifies the potential synergies but also offers insights into how public administration can leverage 4IR technologies to drive sustainable development. Educational Restructuring: Recognizing the need for educational reform is not new; however, the specific ways in which African public administration curricula should adapt to the 4IR remain under-addressed. This study offers recommendations for restructuring educational programs to align with the demands of the 4IR, emphasizing their relevance to governance and development in Africa.

In essence, this research seeks to extend the boundaries of knowledge by examining the intersection of pan-African public administration and the Fourth Industrial Revolution comprehensively. By addressing critical questions related to employability, sustainable development, and educational restructuring, it aims to provide a holistic understanding of how African public administration can navigate the challenges and opportunities posed by the 4IR (Canter, 2019; Devi et al., 2020). Through these contributions, we hope to guide policymakers, educators, and practitioners in shaping the future of public administration in Africa within the context of the 4IR. We are yet to fully understand the pace and scale of this modern movement, considering the infinite possibilities of mobile devices linking billions of people, giving rise to unparalleled computing capacity, storage capacities, and access to information. Think about the emerging technological breakthroughs, covering wide-ranging fields such as 3D printing, nanotechnology, robotics, the Internet of Things (IoT), artificial intelligence (AI), autonomous vehicles, biotechnology, materials science, energy storage, and quantum computing (Miracle & Adaobi, 2022; Tessmer, 2013).

The 4IR represents an "era of data currency" characterized by the transformative, innovative, and digital revolution, which boils down to the utilization of processed information to aid tasks, be it in the deployment of robotics to speed up manufacturing, use of augmented reality by the military to practice combat procedure or use of genetic engineering in editing a fetus DNA to ensure a congenital disease is averted before birth. Previous study agreed with the above assertion when they stated that, "we stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another (Mohammed et al., 2020). In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before. We do not yet know just how it will unfold, but one thing is clear: the response to it must be integrated and comprehensive, involving all stakeholders of the global polity, from the public and private sectors to academia and civil society" (Hervé & Nkoudou, 2022; Pambayun et al., 2020).

Therefore, this exploratory study is trying to find the core value of blockchain and suggests its possible convergence with various administrative fields as well as directions for development, intending to predict its potential contribution to society (Carayannis et al., 2022; Yao et al., 2022). An analytical hierarchical process analysis is used to look at the priority of the blockchain administration determinants. Finally, the administrative changes are explored in connection to the formulation of public policy, openness, and public confidence in the executive branch. Currently, the blockchain and money debate may just concern the fundamentals of cryptography, like Bitcoin, but it might have a significant influence on speeding up society's decentralization. While the

centralized accounting system has historically been founded on a high degree of confidence and the resulting power, Bitcoin's usage of blockchain technologies implies that, because of decentralization and liberalization, the concentrated power concentration will be lessened. Blockchain's decentralization means that its applications go beyond the world of business. A blockchain can be used in different sectors even though cryptography-based blockchain technology has already been established (Bhushan et al., 2021; Lee et al., 2021). If blockchain technology is applied to state management, it might be possible to build more efficient and equitable systems. The World Economic Institute stated that, as polarization and inequality were some of the biggest global issues in 2018, we must improve efficiency in welfare administration and the delivery system by swiftly introducing blockchain technology.

Pan-African public administration missed the first era (steam and waterpower), the second industrial revolution (electricity and mass production), and, more recently, the third revolution to train and harness the potentials of her pupils and place them on par with her peers (IT, Computer systems, automation). The internet, 5G, and the internet of things, which have given rise to a borderless environment that made its adoption portable and speedier, emerged with the fourth industrial revolution as a leveler. To provide specialized skill sets and job preparation for future job seekers, Pan-African public administration must make use of the current ecosystem culture, which involves completely new capabilities for people and machines. As we go closer to the future, the research examines the controversial and modern potentials of the pan-African public administration concerning the Fourth Industrial Revolution. There this study aims to analyze the state of pan-African public administration practice within the praxis of the Fourth Industrial Revolution (4IR) to enhance employability and sustainable development.

2. METHOD

The research methodology utilized in this study is a descriptive research design, centered around the practice of content analysis (Lambert & Lambert, 2013). The data collection for this research involved the utilization of secondary sources, wherein information was drawn from a variety of authoritative sources such as textbooks, journals, historical documents, newspapers, online materials, and official government reports. Subsequently, a qualitative approach was employed to meticulously analyze and interpret these sources through content analysis techniques. To delve into the collected data, a qualitative analysis technique known as content analysis was employed. This method involves a systematic examination of the content within these sources, aiming to uncover underlying themes, patterns, and meanings. Through a meticulous process, the researcher sifts through the data to identify recurrent ideas, noteworthy trends, and significant points of discussion. This content analysis approach enables a deeper understanding of the subject matter, as it allows for the extraction of valuable qualitative insights. The researcher engages in careful coding and categorization of the collected data, ensuring that no important aspect goes unnoticed. This systematic analysis process adds rigor to the study and ensures that the findings are well-founded and representative of the content within the sources (Farquhar & Michels, 2016).

Content analysis often involves the creation of coding sheets or grids to systematically categorize and analyze data. Content analysis software tools like NVivo, MAXQDA, or Dedoose was used to facilitate the management and analysis of large datasets (Madadizadeh, 2022). These tools have built-in instruments for creating and applying coding schemes. We use recording sheets and templates to extract relevant information from the secondary sources. These sheets include fields for documenting the source's title, publication date, author, and key content that is being analyzed. Checklists are instruments used to ensure that specific criteria or elements are present or absent in the content being analyzed. We use checklists to record the presence or absence of particular themes, patterns, or features in the data. We gather metadata and descriptive information about the sources being analyzed in this study. This include information like the source's origin, context, publication outlet, and relevance to the study.

3. RESULT AND DISCUSSION

Result

Employability

A challenge to any educational institution is the ability to ensure flexibility and responsiveness in equipping young men and women with employable skills. Given the complexity surrounding employability, there is no single indicator that can capture the transition from schooling to labor markets. Employability Vitae is based on the collective experience of International Finance Cooperation (IFC) senior education specialists who have appraised education institutions across the world for several decades (Harlan, 2020; Pardo-Garcia & Barac, 2020). It measures the key processes and drivers of employability at the institution level and then provides recommendations and implementation support to institutions to adjust these processes, intending to improve career

outcomes for graduates. Institutions can identify gaps and practical interventions to shape their employability agendas.

An innovation of IFC, a member of the World Bank Group, Vitae empowers higher education institutions to improve their graduate employability. To help students flourish during times of change and increased digitalization, institutions must match the skills they teach to the demands of the labor market while preparing students for the global workforce of tomorrow. With Vitae, you can identify areas of strength and weakness and receive bespoke recommendations with the option for support (Cole et al., 2007; Succi & Canovi, 2020). It is imperative to effectively engage with employers and alumni, improve the quality of career services centers, and obtain baseline data to measure progress against employability goals. Benefits of an increased focus on employability include improved student outcomes by anticipating emerging trends and equipping students with the credentials and soft skills they need to jumpstart their careers. Strengthened linkages with employers by maximizing connections between students and employers through work-integrated learning and industry partnerships (Esmail et al., 2022; Faturohman & Suherman, 2022). Institutional self-improvement by preparing for tomorrow with an outcomes-based curriculum that integrates employability skills and industry inputs. Enhanced competitiveness by creating a winning scenario where students are guided through career services and alumni serve as employability agents.

Higher education is said to develop the whole person and an expected consequence of this is that graduates will be highly sought after as employees. However, the current situation globally is that many new graduates are underemployed, and higher education institutions are deploying various measures to increase the employability of their students, such as including more explicit employability-focused materials within the programmes of study, ranging from embedded or 'bolted-on' modules, to ensure that every student has the opportunity to experience the workplace through real-work projects, work placements, internships and other collaborations with businesses (Iqbal et al., 2022; Polter & Scherer, 2017). Growing numbers of higher education institutions are incorporating some kind of work placement within their programmes, or occasionally adding an internship scheme at the end of the programme, to further assist unemployed graduates with the benefits of experiential learning. Internships are well established, more so in certain sectors, and countries, and work experience has long played a vital part in the success of sandwich courses in higher education.

Previous study noted that employability is those basic skills necessary for getting, keeping, and doing well on a job (Robinson, 2009). He suggested dividing employability skills into three skill sets: basic academic skills, higher-order thinking skills, and personal qualities. Other study believed that employability is a combination of four different aspects such as knowledge regarding the subject, skillful practices or procedural knowledge, efficacy beliefs, and Metacognition (Potter & Thai, 2019). Teachable skills which are required to get, keep and do better at the workplace and which are referred to as core skills, basic skills, transferable skills, generic skills, key skills, soft skills, behavioral competencies skills, and cross-curricular skills. According to previous study the employability skills of the 21st century include a wide range of skills such as ICT literacy, problem-solving, critical thinking, innovation, decision-making, creativity, collaboration, and information literacy (Ybema et al., 2020). The following: 21st-century skills and digital skills include (computer knowledge, innovations, mathematical thinking, different programme knowledge, searching for information, understanding media, digital tools, and mobile and internet applications). Social skills (social awareness, response construction, empathy, social cognition skills, emotion label, inhibitory control, causal understanding, and identification). Core skills (education, lifelong learning and training, technical skills, information management, problem-solving, critical thinking, perspective-taking, communication, collaboration, and creativity).

The challenges of the fourth industrial revolution will be faced by the young generations; the labor market is expected to set much higher requirements for them concerning both career readiness and personal traits, i.e., the development of employability. It means that to build up employability and successfully compete in the labor market in the 21st century, the youth have to meet high labor market requirements and face professional challenges. Employability is multi-dimensional and there is a need to distinguish between factors relevant to obtaining a job and factors relevant to the preparation for work (Boselie et al., 2021; Nugraha et al., 2020). Being employed means having a job, but being employable means having the qualities needed to maintain employment and progress in the workplace. This means that employability is a prerequisite for employment. Employability is not just about preparing for employment. It is about developing a range of knowledge, skills, behaviors, attributes, and attitudes that will enable someone to be successful not only in employment but also in life. Previous study explain the most important 23 skills of the future and divide them into different areas (Römgens et al., 2020). The basis and foundations, which are necessary for work in the future.The job-specific skills and competencies to approach complex problems, and Personal qualities to improve over time to adapt as smoothly as possible to change. Demand in today's 4IR labor market is different and changing very rapidly, so the most important thing is to be able to adapt and keep up with the times, acquiring new employability skills and abilities that will be needed in the future labor market situation (Tsiligiris & Bowyer, 2021).

Sustainable Development

Sustainable development is development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of needs in particular, the essential needs of the world's poor to which overriding priority should be given, and the idea of limitation imposed by the state of technology and social organization on the environment's ability to meet present and future needs. Its core is an approach to development that tends to balance different and often competing needs against an awareness of the environmental, social, and economic limitations we face as a society. Sustainable Development Goals (SDGs) are a successor to the Millennium Development Goals (MDGs); both represent a development initiative, planned, designed, and expected to be implemented by member states of the United Nations under the supervision of the United Nations in collaboration with other regional and sub-regional agencies/organizations across the globe (African Union inclusive) (Jacob-John et al., 2021; Wang et al., 2020).

The Implication of 4IR on Public Administration Practice in Africa

The Fourth Industrial Revolution as "a mixture of hope and doubt." On the one hand, new technologies create opportunities for sustainable economic growth and reduction of unemployment; create new job positions in innovative sectors; contribute to the strengthening of competitiveness and productivity of workers and businesses; increase labor income and business gains; improve human life quality and physical and mental health, increasing life expectancy; allow for high levels of innovation and knowledge; facilitate access to quality education for all; and contribute to the early diagnosis of extreme weather events, sustainable urbanization, and the fight against inequalities, poverty, and hunger. On the other hand, the loss of millions of jobs due to automation, the invasion of artificial intelligence even in jobs where the human factor is critical, the potential income and socioeconomic inequality gap widening with the poor and developing economies being disproportionately affected, the gender gap widening, the increase in poverty and hunger due to potential job loss, the violation of personal data, the use of new technologies for illegal activities, the national and international security concerns.

Indicative key policies that governments could follow to deal with these challenges and take advantage from opportunities arising from the Fourth Industrial Revolution could be: Giving priority to the education and the training for people of all ages (with an emphasis to STEM issues) in order to obtain the cognitive and social skills required by the labor market and protect job positions from automation; Creating new well-paid jobs, so as to moderate the potential job loss (due to automation) and deal with income and socioeconomic inequality; Industrial Robotics - New paradigms to strengthen social security networks, especially for those who have difficulty to be adapted to new technologies; Application of tax transformations in order to increase tax revenue from workers whose earnings will increase due to the 4IR and apply a tax relief for workers whose income will be reduced; Support entrepreneurship by giving small and start-up businesses the chance to improve their efficiency and increase their revenue using new technologies; Promote women's participation in STEM programs and activities in order to reduce the gender gap; countries' cooperation, for a better diffusion of knowledge and best practices among national governments; Place emphasis on transparency through digital portals and accountability mechanisms; Impose strict rules to prevent the use of new technologies for illegal activities and protect people from a possible violation of their personal data; Institutionalize strict laws and regulations to protect people from a possible nuclear or chemical conflict with unpredictable consequences; Promote smart agricultural production in order to deal with hunger; and Support sustainable use of resources, protection of ecosystems, and new forms of "clean" energy as renewable sources of energy in order to deal with climate change and ensure energy autonomy. All these policies must be fully compatible with the Sustainable Development Goals of the United Nations to effectively deal with the challenges of the industry and ensure sustainable economic growth.

The Potentials of the 4IR for Employability and Sustainable Development in African Public Service

The fourth industrial revolution is unfolding and is mostly based on the automation and robotization of production processes, which radically change the nature of work; having a huge impact on society, on the processes taking place in the world, and on people's way of life, especially on the labor market. Human work is now directed to much more complex, automatable, meaningful, and creative processes, which cause significant changes in the spheres of employment, and contribute to the rapid growth of highly skilled workers in production, who both know how to work with these technologies and participate in their creation themselves. Thus, it can be said that in the next, few years, highly qualified specialists with exact knowledge and logical thinking will be needed in the labor market. At the same time, people with communication and social cooperation skills will also be needed. In addition, the nature of science and innovation is also changing significantly. For example, the use of big data, AI, interconnected networks, and high-speed computing could lead to discoveries, create new technologies, and bring them into production requiring specialized human capital (such as technologists and scientists). It means that advanced technologies impose high demands on people's education, professionalism, and competencies; demand is emerging for all people to build up employability and digital competencies/skills to be able to learn and implement new technologies**.**

The fast technological changes determine the immediacy of the needed changes in higher education for responding to the new and changing world. Digital technologies are beginning to facilitate skilled human capital development in new ways, leading to a focus on the development of competent individuals as the most important precondition of competitiveness. It envisages implementing competency-based education (Ariningsih et al., 2021; Hailikari et al., 2022). This requires a complex approach not only to tackling organizational problems in the learning/training process, placing the focus on the formation of personality and creating opportunities for self-realization but also to targeted education management. In addition, there is the need to implement studies remotely by carrying out a broader digitalization of the learning process, which is an essential investment in the future, so that the younger generation can gain invaluable experience in how to do things differently and more efficiently in everyday life using appropriate technologies. In the 4IR today, the hottest debate is that in the next 10 years, there will be professions that do not exist today. The question of how to prepare young people for it and how to ensure it is still yet unanswered. Pan-Africa public administration needs to build up relevant human capital competencies and employability skills, as well as be more successful in implementing the digital transformation in all areas; in particular, this is essential for the small and medium-sized business segment (Hidayat et al., 2022; Martins et al., 2019). To achieve this, policymakers need to create new directions to manage the transition toward new opportunities successfully. It is also important to mention that the future of work will largely depend on the policy decisions countries make today. A key challenge is to manage successfully the transition towards new opportunities for workers, industries, and regions affected by the megatrends of technological change and globalization. Pan-African public administration needs to change its curriculum and teaching to develop and focus on different modes of learning. Education based on innovative future breakthrough technologies increases the "market value" of specialists in the labor market (Nushi et al., 2022; Washbrooke, 2023). Digitalization of education is an integral part of the training of a modern specialist. These trends are associated with a repeated increase in the importance and volume of information and an increase in the number of interdisciplinary research and projects. If a person has interdisciplinary knowledge, he/she can acquire several other kinds of knowledge, i.e., become "overgrown with knowledge.

Policy Prescription

Skills are fundamental enablers in the 4IR era. Without the requisite skills, new basic sciences cannot be performed, and new technologies cannot be developed, adapted, or disseminated. If pan-African public administration must be relevant to the governance and sustainable development needs of the continent, it must restructure its educational curriculum to take advantage of the benefits of the technological advancement that the Fourth Industrial Revolution provides. In doing this, previous study advocates that the key to the successful adaption to the new technological conditions is the ability of governments to adopt the right policies (Thornberg et al., 2022). Governments that will not be able to follow the appropriate long-term policies will set their economies at risk, that is, when all the other economies will run with great speed, their inability to be adapted to the new reality will drive the deterioration of their competitiveness, the reduction of their revenues, and the increase in their spending with the possibility of bankruptcy to be increased. There are also severe social problems that may get bigger due to the Fourth Industrial Revolution making policy intervention crucial.

Pan-Africa public administration must implement policies that aim to restructure their curriculum to promote the development of human capital and the business environment. This should involve attracting financial resources for investments in human capital to promote start-ups and self-employment of young people as well as providing for the establishment of special financial and administrative support programs. Pan-Africa public administration should also encourage cooperation between educational institutions and entrepreneurs for the development of employability" (Kibirige & Teffo, 2014; Tatipang et al., 2022). This constitutes the involvement of entrepreneurs in the training of highly qualified and competitive specialists to ensure that young people are prepared for employability and to facilitate their integration into the labor market. It is crucial to educate kids on how to acquire a trustworthy compass and the navigational skills necessary to find their way in a world that is becoming more complicated, turbulent, and uncertain. Education is no longer only about imparting knowledge to pupils. To do this, pan-African public administration must develop and put into action policies that modernize the educational and training systems. This will ensure that the educational system is linked to changes in the labor market and that it can prepare a person for work in a variety of settings throughout their entire life.

Discussion

The fourth industrial revolution should be seen in the context of technical achievements with major effects on the economy and in accord with the characteristic stages of the Industrial Revolution from a historical perspective to the present day. Originally, the first industrial revolution occurred from 1760 to 1840 and was launched by the development of the steam engine, the mechanization of textile manufacture, and the use of coke instead of charcoal, followed by the mass production of steel and lastly, the development of railways (Aghem & Masumbe, 2022; Yusuf et al., 2020). Thus, it changed our lives and the economy from an agrarian and handicraft

economy to one dominated by industry and machine manufacturing. The second industrial revolution used electric power for the mass production of steel, electrification, telecommunications, and lastly the development of the motor car and the production line. The third industrial revolution began in the middle of the last century with the development of digital systems, communication, and rapid advances in computing power, which have enabled new ways of generating, processing, and sharing information. Thus, electronics and information technology were used to automate production (Irving, 2006; Liao et al., 2018).

The Fourth Industrial Revolution (4IR) is based on the Internet and green energies diminishing the energy impact on the environment. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres. Previous study posited that a staggering range of new technologies that are blurring the boundaries between people, the Internet, and the physical world is driving the fourth industrial revolution. It is a transformation in the way people live, work, and relate to one another in the coming years, affecting entire industries and economies (Ananyin et al., 2018; Nyadera et al., 2022).

The major features of the four industrial revolutions can be characterized by the following: radically different technologies for manufacturing and services: a digital economy, automation and robotization, impressive progress in artificial intelligence (AI), driven by exponential increases in computing power and by the availability of vast amounts of data (Grimes & Warschauer, 2010; Ihsan et al., 2020). AI-based systems can be purely software-based, acting in the virtual world, or embedded in hardware devices. Artificial intelligence is already all around us, from self-driving cars and drones to virtual assistants and software that translates or invests. Engineers, designers, and architects are combining computational design, additive manufacturing, materials engineering, and synthetic biology to pioneer a symbiosis between microorganisms, our bodies, the products we consume, and even the buildings we inhabit. AI provides new forms of work and organization, and new technologies have made it possible to use a new generation of autonomous robots. Equipped with cutting-edge software, AI, sensors, and machine vision, these robots are capable of performing difficult and delicate tasks and can recognize, analyze, and act on the information they receive from their surroundings (Pauceanu et al., 2021b; Serumaga-Zake & Poll, 2021).

Advanced robotics has the potential to create new types of jobs, and improve and change the quality of people's lives shortly. The impact of automation on hours worked by 2030 is expected to increase by 60% and 52%, with the highest demand for advanced IT and programming skills and basic digital skills. The demand for other skills that constitute this category will also grow, but not as strongly, impressive progress has been made by using 3D printing, which brings together computational design, manufacturing, materials engineering, and synthetic biology, reduces the gap between makers and users and removes the limitations of mass production (Miracle & Adaobi, 2022; Serumaga-Zake & Poll, 2021). In addition, 3D printing allows entrepreneurs with new ideas to establish small companies with lower start-up costs. The Internet of Things (IoT) is a suitable solution for fusing any kind of object into a single digital network through which the connectivity of contemporary devices, systems, and services takes place, which will provide automation in nearly all a business' processes (Chinaza Adaobi & Miracle, 2022; Nagy et al., 2021). The entrepreneur can bring the product with 3D printing, without the traditional time constraints but with a broader range of applications, from mass customization to distributed manufacturing. Devices and components are included in the virtual environment in a real environment in this manner. With the development of the Internet of Things (IoT), the number of everyday objects endowed with "smart" functions and able to seamlessly perform health monitoring and notice early signs of disease is increasing. For example, a smartwatch worn on the hand can monitor the heart rate and other health parameters (Al Mamun et al., 2022; Alakrash & Abdul Razak, 2021).

The Fourth Industrial Revolution is characterized by the fusion of physical, digital, and biological systems, leading to new ways of production, communication, and interaction. It is marked by the rapid development and integration of technologies such as big data analytics, the Internet of Things (IoT), cloud computing, 3D printing, nanotechnology, biotechnology, and machine learning. This revolution is expected to have a profound impact on various aspects of society, including industries, economies, jobs, education, healthcare, governance, and the environment. It has the potential to significantly increase productivity, efficiency, and innovation while disrupting traditional business models and job markets. The 4IR has the power to revolutionize industries by enabling automation, robotics, and AI-driven systems to perform tasks that were previously carried out by humans. It can lead to the creation of smart factories, where machines communicate and collaborate, and smart cities, where interconnected systems optimize resource allocation and enhance the quality of life for residents.

However, the 4IR also raises concerns about the impact on employment and income inequality. While it is expected to create new job opportunities, it may also render certain roles obsolete and require workers to acquire new skills to remain relevant in the workforce. Additionally, the rapid pace of technological advancements and the potential for algorithmic biases raise ethical and regulatory challenges that need to be addressed. To navigate the Fourth Industrial Revolution successfully, individuals, businesses, governments, and educational institutions must adapt and embrace the opportunities and challenges posed by emerging technologies. This includes fostering

digital literacy, promoting lifelong learning, investing in research and development, fostering collaboration between different stakeholders, and ensuring that the benefits of the 4IR are inclusive and sustainable.

4. CONCLUSION

The research evaluated the state of pan-African public administration practice within the praxis of the Fourth Industrial Revolution to increase employability and sustainable development (4IR). A range of cutting-edge technologies characterizes the 4IR, which refers to the concept of fusing the physical, digital, and biological worlds. The 4IR is fundamentally fuelled by the fusion and convergence of physical and digital technologies. The study also examined the current and constitutive potentials of the pan-African public administration. The study argues that for African public administration to be relevant to the governance and sustainable development needs of the continent, its educational curriculum needs to be restructured to take advantage of the advantages of the fourth industrial revolution's technological advancements. The concept of the Fourth Industrial Revolution (4IR) refers to the ongoing transformation of society and the economy brought about by advancements in digital technology, artificial intelligence (AI), automation, robotics, and other emerging technologies. It builds upon the foundations laid by the previous industrial revolutions, which include the advent of steam power, electricity, and the Internet.

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