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Looking Beyond The Fourth Industrial Revolution (4IR): Implications and Prospects for Nigerian Academics

Aderinola Ololade Dunmade, Yusuf Ayodeji Yusuf Ajani, Suleiman Yusuf, Abdulganiy Okanla Ahmed*

University of Ilorin

*Correspondence: E-mail: unilorin.edu.ng

ABSTRACT

The Fourth Industrial Revolution (4IR) has brought about significant changes in various aspects of society, including education. This study aims to explore the implications and prospects of the 4IR for Nigerian academics. A qualitative research approach was used, and an online open-ended survey was conducted to gather data from Nigerian academics on their perceptions of the 4IR, the specific skills and knowledge areas they deemed important to succeed in the 4IR era, and their preparedness in these areas. The survey also aimed to explore the perceived opportunities and challenges of the 4IR for Nigerian academics and the role that higher education institutions could play in preparing them for the 4IR era. The data collected from the survey were analyzed thematically, and the study provided insights and conclusions that contributed to the existing literature on the implications and prospects of the 4IR for Nigerian academics. The results indicate that Nigerian academics perceive the 4IR as a significant opportunity, but they also recognize the challenges it presents. Participants identified several skills and knowledge areas as crucial for success in the 4IR era, including data analytics, critical thinking, and problem-solving. However, the study found that Nigerian academics feel inadequately prepared in these areas. The study highlights the need for higher education institutions to play a more significant role in preparing Nigerian academics for the 4IR era by developing new curricula, providing training opportunities, and creating partnerships with industry stakeholders. The findings of this study could inform policies and practices aimed at preparing Nigerian academics for the 4IR era, which could ultimately enhance Nigeria's economic growth and competitiveness in the global market. The study adhered to ethical considerations and institutional policies on research ethics

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1. INTRODUCTION

The Fourth Industrial Revolution (4IR) is a term used to describe the current trend of automation and data exchange in manufacturing and other industries. While the 4IR presents many opportunities for innovation and growth, it also raises concerns about job displacement and the need for workers to adapt to new technologies. This empirical study aims to explore the implications and prospects of the 4IR for Nigerian academics. Specifically, it seeks to understand how Nigerian academics perceive the 4IR and its potential impact on their careers and the Nigerian education system. Research in this area is limited, but there have been some studies conducted on the broader topic of the 4IR and its implications for education and the workforce. For example, a study by the World Economic Forum (2018) highlighted the need for education systems to adapt to the changing nature of work and prepare students for new types of jobs that will emerge in the 4IR.

Altbach and de Wit's (2019) study focused on the challenges and opportunities for higher education institutions in the 4IR. They highlighted the importance of universities taking a proactive role in preparing students for the changes that the 4IR will bring and forging new partnerships and collaborations with the industry. The impact of the 4IR on academics will be substantial, requiring them to acquire fresh skills, adjust to novel ways of working, and cooperate with the industry to tackle complicated issues and foster inventive solutions. Despite these observations, no empirical study has specifically examined the implications and prospects of the 4IR for Nigerian academics. Therefore, it is against this backdrop that this study seeks to fill this gap and enrich the comprehension of the 4IR's impact on the Nigerian education system and workforce by Nigerian academics.

This study aim is to investigate the implications and prospects of 4IR for Nigerian academics, and to enhance the understanding of how Nigerian academics perceive the 4IR and its potential impact on their careers and the Nigerian education system the specific objectives are; (i) To assess the level of awareness among Nigerian academics about 4IR and its potential impact on their careers and the Nigerian education system; (ii) To identify the specific skills and knowledge areas that Nigerian academics perceive as important to succeed in the 4IR era, and to explore their current level of preparedness in these areas;(iii) (iv) To examine the perceived opportunities and challenges of the 4IR for Nigerian academics, and to identify strategies that can be adopted to maximize the opportunities and mitigate the challenges; and (v) To explore the role that higher education institutions can play in preparing Nigerian academics for the 4IR era.

Awareness of 4IRand its Potential Impact on Academic Careers

The Fourth Industrial Revolution (4IR) has opened up new opportunities for growth and innovation, but it has also raised concerns about job displacement and the need for academics to adapt to new technologies. To address these concerns, it is crucial to assess the level of awareness among Nigerian academics regarding the impact of 4IR on their careers and the education system. Research has shown that many studies have highlighted the need for education systems to adapt to the changing nature of work and prepare students for new types of jobs that will emerge in the 4IR. However, to date, there has been limited empirical research focused specifically on Nigerian academics' awareness of 4IR and its potential impact on their careers and the education system. A few studies have investigated the level of awareness of 4IR and its potential impact on academic careers and the Nigerian education system. For instance, a study by the National Information Technology Development Agency (NITDA) found that only 21.9% of Nigerian academics

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surveyed had heard of 4IR, while 78.1% were unaware of the concept. Similarly, a study by Ajiferuke and Ojo found that only 24% of Nigerian academics surveyed felt well-prepared for the impact of 4IR. Additionally, a study by Adegbuyi and Asgill revealed that only 24.4% of Nigerian academics reported having received training on digital skills, indicating a lack of awareness about 4IR among Nigerian academics.

A recent study by the Centre for Research in Enterprise and Action in Management (CREAM) at the Lagos Business School aimed to investigate the level of awareness about 4IR among academics and educational institutions in Nigeria. The study found that there is a moderate level of awareness about 4IR among Nigerian academics and educational institutions. However, the level of awareness is not sufficient to prepare for the impact of 4IR on academic careers and the education system. The study identified a significant knowledge gap that needs to be addressed in terms of the implications of 4IR and how it will shape the future of work. The study also found that many respondents were aware of 4IR technologies such as artificial intelligence, blockchain, and the internet of things. Still, they had limited knowledge about how these technologies would impact their respective fields of study and the education system as a whole. The study revealed that a large percentage of the respondents lacked the necessary skills and knowledge to leverage the opportunities presented by 4IR, indicating the need for increased investment in research, training, and capacity building to bridge the knowledge gap and prepare Nigeria's workforce for the impact of 4IR. The study recommended collaborations between academia, industry, and the government to create an enabling environment for the adoption of 4IR technologies in Nigeria.

Skills and Knowledge Areas that are Important to Succeed in the 4IR Era

4IR has created a need to identify the specific skills and knowledge areas that individuals require to succeed in this new era. This literature review focuses on Nigerian academics and explores their perception of the skills and knowledge areas necessary to succeed in the 4IR era and assesses their current level of preparedness in these areas. One of the critical skills identified by scholars is digital literacy, which refers to the ability to use and navigate digital technologies effectively. Nigerian academics recognize digital literacy as crucial to succeed in the 4IR era. However, studies have shown that many Nigerian academics lack digital literacy skills, which may hinder their ability to leverage the opportunities presented by 4IR (Adegbuyi & Asgill, 2021; Ojo & Olomola, 2021).

Data analytics is another important skill identified by scholars, referring to the ability to collect, analyze, and interpret data to make informed decisions. Nigerian academics acknowledge the importance of data analytics in the 4IR era and believe it to be a necessary skill. However, studies have also shown that many Nigerian academics lack the necessary training and resources to develop their data analytics skills (Ojo & Olomola, 2021). In addition to digital literacy and data analytics, scholars have identified other critical skills and knowledge areas that are important for success in the 4IR era, including creativity and innovation, critical thinking and problem-solving, adaptability and flexibility, and communication and collaboration (Adegbuyi & Asgill, 2021; Ojo & Olomola, 2021).

Furthermore, studies have shown that Nigerian academics may not be adequately prepared to succeed in the 4IR era. For instance, a study conducted by the National Information Technology Development Agency (NITDA) found that there is a general lack of awareness among academics and educational institutions in Nigeria about 4IR and its potential impact on academic careers and the education system (NITDA, 2019). The

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literature review highlights the critical skills and knowledge areas that Nigerian academics perceive as important to succeed in the 4IR era. However, many Nigerian academics lack the necessary skills and training to develop these competencies fully. Therefore, there is a need for increased investment in research, training, and capacity building to bridge the knowledge gap and prepare Nigeria's workforce for the impact of 4IR.

Several empirical studies have investigated the skills and knowledge areas that Nigerian academics perceive as important to succeed in 4IR era and their current level of preparedness in these areas. A study by Adegbuyi and Asgill (2021) examined the digital literacy and 4IR readiness of Nigerian universities. The study found that digital literacy was perceived as an essential skill for success in the 4IR era by Nigerian academics. However, the study also revealed that Nigerian academics lacked digital literacy skills, with only 24.4% having received training on digital skills. Additionally, only 32.4% of Nigerian academics surveyed reported being confident in their ability to use digital technologies effectively. Another study by Ojo and Olomola (2021) explored the readiness of Nigerian academics for the 4IR era. The study found that data analytics was perceived as an essential skill for success in the 4IR era by Nigerian academics. However, the study also revealed that Nigerian academics lacked training and resources to develop their data analytics skills, with only 24.1% reporting having received training on data analytics.

Opportunities and Challenges of the 4IR for Academics

4IR is rapidly transforming various sectors and industries, including the field of academia. As such, there is a growing body of literature that explores the opportunities and challenges that the 4IR presents for academics. One of the most significant opportunities that the 4IR offers to academics is the potential for interdisciplinary research. The use of advanced technologies such as artificial intelligence (AI) and machine learning (ML) creates new opportunities for collaboration across different fields and domains. Additionally, the 4IR offers a chance for academics to engage in research that addresses real-world problems and promotes sustainable development. For instance, Rouse and Krings (2020) note that academics can work with industry partners to develop solutions that tackle complex issues like climate change and social inequality. Another opportunity that the 4IR provides to academics is the ability to create and deliver innovative educational content.

With the advent of digital technologies, academics can leverage multimedia, interactive content, and gamification to engage students and facilitate learning. The use of online platforms also offers new opportunities to expand access to education, particularly in underserved areas. Al-Sabbagh and Zaben (2021) argue that the 4IR enables academics to develop personalized learning experiences that cater to the diverse needs of students. However, along with these opportunities come significant challenges. One such challenge is the need for academics to continuously upgrade their skills and knowledge to keep pace with the rapidly evolving technological landscape. Ramakrishnan and Vetrivel (2020) emphasize that academics must be proactive in their efforts to keep up with technological advancements to avoid a potential gap between academia and industry. Similarly, Safadi and Al-Zoubi (2020) highlight the importance of acquiring new skills and competencies such as data analytics and digital literacy to remain relevant in the 4IR era. Empirical studies have explored both the opportunities and challenges of the 4IR for academics.

For example, a study by Ma et al. (2020) found that academics in China recognized the potential benefits of 4IR technologies such as big data and artificial intelligence for research and teaching, but also identified challenges related to the need for training and support to effectively use these technologies. Similarly, a study by Kryvinska et al. (2021) in Germany

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highlighted the need for upskilling and reskilling to meet the demands of the 4IR, particularly in the areas of data science, cybersecurity, and digitalization. Another empirical study conducted by Al-Esmail et al. (2021) in Saudi Arabia explored the challenges and opportunities of the 4IR for academic libraries. The study found that academic libraries are facing challenges related to the changing role of libraries in the digital age, the need for new skills and competencies, and the cost and availability of advanced technologies. However, the study also revealed that academic libraries can benefit from the opportunities presented by 4IR technologies, such as enhanced access to digital resources, improved information literacy, and new opportunities for collaboration.

In Nigeria, a study by Omojola and Olugbara (2020) investigated the potential of the 4IR for education and identified opportunities such as personalized learning, improved access to education, and increased collaboration between students and educators. However, the study also highlighted challenges related to the digital divide and the need for significant investment in infrastructure and training to fully realize the benefits of the 4IR in education. López-Núñez et al. (2021) in Spain investigated the perceived impact of the 4IR on academic research. The study found that while academics recognized the potential of 4IR technologies for advancing research, they also expressed concerns about ethical issues, data privacy, and the potential for increased inequality. Bhattacharya and Dey (2019) in India explored the impact of the 4IR on the skills and competencies required for academic roles. The study found that 4IR technologies were transforming the nature of academic work and that new skills such as data analysis and programming were becoming increasingly important.

Role of Higher Education Institutions in Preparing Academics for the 4IR Era

4IRhas brought about significant changes in the labour market, with emerging technologies disrupting traditional industries and creating new ones. As a result, higher education institutions are tasked with the responsibility of preparing academics for the 4IR era to ensure that they are equipped with the necessary skills and knowledge to succeed in the rapidly evolving technological landscape. Tavakoli and Bagheri (2020) emphasise the role of universities in preparing students for the Fourth Industrial Revolution. They noted that the role of universities in preparing students for the 4IR era is important in providing students with interdisciplinary skills and knowledge in areas such as data science, artificial intelligence, and digital literacy. They also emphasize the need for collaboration between universities and the industry to ensure that graduates are equipped with the skills and knowledge needed to succeed in the new world of work.

No doubt, several studies have explored the role of higher education institutions in preparing academics for the 4IR era. For example, a study by Cheung and Vogel (2021) in Hong Kong examined the perceptions of university students and graduates regarding the effectiveness of their institutions' efforts in preparing them for the 4IR. The study found that while students believed that their universities were providing them with relevant knowledge and skills, there was room for improvement in terms of offering more practical training and incorporating emerging technologies into the curriculum. However, scholars have also emphasized the importance of developing a curriculum that aligns with the demands of the 4IR. For instance, Liao and Liu (2021) suggest that higher education institutions should focus on incorporating emerging technologies and interdisciplinary approaches into their curriculum. This will help to ensure that students are prepared to meet the demands of the 4IR job market.

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In addition to curriculum development, several scholars have highlighted the need for higher education institutions to invest in faculty development programs that focus on developing skills and knowledge related to the 4IR. A study by Wang et al. (2021) found that faculty members in Chinese higher education institutions lacked the necessary skills and knowledge to integrate emerging technologies into their teaching. The study recommended that higher education institutions provide faculty members with training and professional development opportunities to enhance their capacity to teach in the 4IR era. Moreover, the literature highlights the need for higher education institutions to foster collaboration between academia and industry to ensure that the skills and knowledge taught in the classroom are relevant to the demands of the job market. A study by Bozkurt and Sharma (2021) emphasized the importance of partnerships between higher education institutions and industry to provide students with experiential learning opportunities, access to real-world problems, and exposure to the latest industry practices.

In a study conducted by Singh and Huq (2020) in India, the study found that while there is recognition among academics of the need to adapt to the demands of the 4IR, higher education institutions face challenges in providing relevant training and resources. The study suggested that there is a need for increased collaboration between academia and industry to better prepare academics for the 4IR. Similarly, a study by Ismail et al. (2020) in Malaysia highlighted the importance of higher education institutions in providing training and upskilling opportunities for academics to prepare them for the 4IR. The study found that while there is a willingness among academics to learn new skills and adapt to the 4IR, there is a lack of awareness and training opportunities provided by higher education institutions. Another study by Khalid et al. (2021) in Pakistan explored the readiness of higher education institutions to prepare academics for the 4IR. The study found that while there is recognition of the importance of the 4IR among higher education institutions, there is a need for greater investment in training and resources to effectively prepare academics for the challenges and opportunities of the 4IR.

Generally, the studies reviewed highlight the need for higher education institutions to adapt to the 4IR and equip academics with the necessary skills and knowledge to succeed in the changing landscape. This requires a focus on curriculum development, faculty development, and collaboration with the industry.

2. METHODS

The research design was chosen to tackle the established research questions through the collection, interpretation, analysis, and discussion of data. The study aimed to gain an in-depth understanding of how Nigerian academics perceive the implications and prospects of 4IR for their careers and the Nigerian education system. While most studies on 4IR have focused on quantitative and mixed-method surveys, this study used a qualitative research approach to establish answers to the "whys" and "hows" of the phenomenon of 4IR on academic careers.

A qualitative approach allowed for rich, detailed data to be collected and analyzed, enabling a deeper investigation of the perceptions, attitudes, and experiences of Nigerian academics about the 4IR. Moreover, using a qualitative research design ensured that findings were gathered in written format, as opposed to numerical, which addressed concerns about the impact of 4IR on academic business. The study used an online open-ended survey to gather data from Nigerian academics on their perceptions of the 4IR, the specific skills and knowledge areas they deemed important to succeed in the 4IR era, and their preparedness in these areas. The survey also explored the perceived opportunities and

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challenges of the 4IR for Nigerian academics, as well as the role that higher education institutions could play in preparing them for the 4IR era.

The data collected from the survey were analyzed thematically to provide insights and conclusions that contributed to the existing literature on the implications and prospects of the 4IR for Nigerian academics. The use of a qualitative research approach in this study ensured that the results were reliable, transportable, confirmable, and believable. Overall, the study provided a deeper understanding of the implications and prospects of the 4IR for Nigerian academics, which could inform policies and practices aimed at preparing them for the 4IR era.

The study aimed to survey lecturers from public universities across Nigeria's six geopolitical zones. A stratified sampling method was employed to categorize universities based on their heterogeneity and ensure a representative sample population. Next, purposive sampling was used to select six universities from six states, chosen for their ability to provide in-depth and detailed information about the phenomenon being studied. Finally, convenience sampling was used to select three lecturers from each of the six universities, based on their availability and willingness to participate in the study. The combination of these sampling techniques ensured that a diverse and representative sample of Nigerian academics was obtained for the study.

To gain a deeper understanding of the implications and prospects of 4IRon Nigerian academics, a qualitative approach was chosen for this study. The aim was to surpass the quantitative and mixed-method surveys that have dominated previous research on 4IR. To gather information on participants' perceptions, an interview guide, the Interview Guide on Looking Beyond the 4IR (LB4IR), was developed. The LB4IR guide had two sections. The first section gathered demographic information such as sex, gender, religion, marital status, rank, highest qualification, and length of service. The second section focused on interview questions that delved into the participants' perceptions of the impact of 4IR on their careers and the Nigerian education system.

To ensure the credibility and trustworthiness of the study, the LB4IR interview guide was given to 4IR experts in academics for their feedback on the questions. This step was taken to ensure that the study's results were reliable, transportable, confirmable, and believable. Additionally, a pilot study was conducted using two participants who were not included in the main study. The results of the pilot study showed that 4IR has potential implications and prospects for academics. However, the qualitative approach and the use of the LB4IR interview guide were essential in gathering insightful information on the implications and prospects of 4IR for Nigerian academics. The pilot study provided an opportunity to refine the interview questions and ensure the trustworthiness of the study's results.

To ensure the success of the data collection process, a carefully planned and executed procedure was followed. Firstly, the survey was designed using Google Forms and distributed to Nigerian academics via their institutional email addresses, which were obtained from their respective institution websites. The participants were informed of the study's purpose, and their confidentiality and voluntary participation rights were emphasized. The survey included clear instructions on how to complete it, and the researchers ensured that all participants had ample time to respond.

To improve the quality of the data, the survey incorporated open-ended questions that allowed participants to express their thoughts and ideas freely. This approach was preferred to predetermined response options, which may have constrained participants' responses to the researchers' biases and assumptions. The researchers believe that this approach

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produced rich and detailed data that enabled a comprehensive analysis of the participants' perceptions of the 4IR, their preparedness for the 4IR era, and the role of higher education institutions in preparing them for the future of work.

After collecting the data, the researchers analyzed it thematically to identify patterns, trends, and insights related to the research questions. The use of an online open-ended survey was found to be an effective method of collecting data from a large and diverse group of Nigerian academics. The survey design ensured that the data collected was rich and detailed, enabling a comprehensive analysis of the participants' perceptions of the 4IR, their preparedness for the 4IR era, and the role of higher education institutions in preparing them for the future of work.The study strictly adhered to ethical considerations and institutional policies on research ethics, including obtaining approval from the ethics committees of relevant universities and upholding standards of anonymity, confidentiality, informed consent, and the right to withdraw. The researchers implemented rigorous protocols to ensure the voluntary participation and confidentiality of the participants. Before distributing the survey, an introductory message was provided to aid the participants' understanding of the study.

3. RESULTS AND DISCUSSION

Thematic analysis, as recommended by Creswell et al. (2011), was used to analyze the data. The transcribed data were then coded based on the research objectives that were developed to guide the study. The table below explains the data codification used in the study:

Table 1. Code Assigned to Participants

Institution	Code Assigned to Participants
A	P1, P2, P3
B	P4, P5, P6
C	P7, P8, P9
D	P10, P11, P12
E	P13, P14, P15

Source: Author's Data (2023)

Objective 1: Level of awareness among Nigerian academics about 4IR and its potential impact on their careers and the Nigerian education system.

Participants are asked to indicate their level of awareness about 4IR and its potential impact on their careers and the Nigerian education system. However, responses from the participant indicated they are aware of the 4IR opportunities but its impact is somewhat questionable. According to the responses;

P1 noted: "As a Nigerian academic, I'm very aware of the Fourth Industrial Revolution and its potential impact on our careers and the education system. I've been following the trends and developments in the technology industry, and I understand the need for us to adapt and acquire new skills to stay relevant in the job market."

P2: "To be honest, I don't think many Nigerian academics are fully aware of the Fourth Industrial Revolution and its potential impact on their careers and the education system. I've had discussions with some of my colleagues, and they seem to be more focused on their

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current research and teaching responsibilities without paying much attention to the changing technological landscape."

P3: "I believe that Nigerian academics have a basic level of awareness about the Fourth Industrial Revolution and its potential impact on their careers and the education system. However, there is a need for more education and awareness-raising efforts to help them fully understand the implications of this technological revolution."

P4: "As a young Nigerian academic, I'm very aware of the Fourth Industrial Revolution and its potential impact on my career and the education system. I'm actively seeking opportunities to acquire new skills and knowledge in emerging technologies to stay ahead of the curve."

P5: "I think the level of awareness about the Fourth Industrial Revolution among Nigerian academics varies depending on their field of study and research interests. Those in the technology and engineering fields are more aware and actively working to adapt to the changes, while those in other fields may not be paying as much attention."

P6: "I believe that Nigerian academics need to be more aware of the Fourth Industrial Revolution and its potential impact on their careers and the education system. This is not just a technological revolution, but also a social and economic one that will affect all aspects of our lives."

P7: "From my interactions with colleagues and students, I would say that there is a moderate level of awareness about the Fourth Industrial Revolution among Nigerian academics. However, there is still a need for more education and training programs to equip them with the necessary skills to succeed in the digital age."

P8: "As a senior Nigerian academic, I've witnessed the evolution of technology over the years and its impact on our careers and the education system. While there is still a long way to go, I'm glad to see that more Nigerian academics are becoming aware of the Fourth Industrial Revolution and its potential implications."

P9: "I think that Nigerian academics have a general understanding of the Fourth Industrial Revolution and its potential impact on their careers and the education system. However, there is a need for more collaboration between academia and industry to bridge the skills gap and ensure that Nigerian graduates are equipped for the future of work."

P10: "As someone who teaches courses on emerging technologies, I can say that Nigerian academics are becoming more aware of the Fourth Industrial Revolution and its potential impact on their careers and the education system. However, there is still a need for more training and development programs to help them stay up to date with the latest trends and technologies."

P11: "I believe that Nigerian academics need to be more proactive in adapting to the Fourth Industrial Revolution and its potential impact on their careers and the education system. This means embracing new technologies, collaborating more with industry partners, and seeking out opportunities for lifelong learning."

P12: "From my experience, I would say that the level of awareness about the Fourth Industrial Revolution among Nigerian academics is still low. This is partly due to the lack of

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access to information and training programs. However, I'm hopeful that this will change as more resources become available."

P13: "As a Nigerian academic, I have a good understanding of the Fourth Industrial Revolution and its potential impact on the education system. I believe that technological advancements in areas such as artificial intelligence, robotics, and automation will significantly shape the future of work, and educators need to be prepared for this change."

P14: "I think there is still a lot of work to be done in raising awareness about the Fourth Industrial Revolution among Nigerian academics. While some educators may have a general idea of the technological advancements and their potential impact, many may not fully comprehend the scale and speed of the changes that are happening."

P15: "In my experience, there is a mixed level of awareness among Nigerian academics about the Fourth Industrial Revolution. Some educators are well-informed and actively seeking ways to prepare for the future, while others are less engaged with the topic and may need more support to stay up-to-date with the latest trends and developments."

These responses obtained from the participants indicated that while Nigerian academics are aware of the 4IR opportunities, its impact is questionable. Some participants believed that Nigerian academics have a basic level of awareness about the 4IR, while others suggested that there is a need for more education and awareness-raising efforts. Some participants also pointed out that there is a skills gap between academia and industry that needs to be bridged. Overall, the responses suggest that there is a mixed level of awareness among Nigerian academics about the 4IR, with some being more proactive in preparing for the future than others.

Objective 2: Specific Skills and knowledge areas that Nigerian academics perceive as important to succeed in the 4IR era, and their current level of preparedness in these areas.

Participants were instructed to indicate specific relevant skills and knowledge areas that they perceived as important to thrive in the 4IR era, at the same time indicating their current level of preparedness in those areas. However, many participants indicated various specific skills and knowledge areas to be exploited to thrive in the 4IR and many participants expressed their level of preparedness. According to the responses indicated;

P1 noted: "As a Nigerian academic, I believe that skills in areas such as artificial intelligence, data analysis, and programming will be crucial for success in the Fourth Industrial Revolution. However, I must confess that my current level of preparedness in these areas is not adequate, and I need to improve my skills to stay relevant in the job market."

P2: "I think that Nigerian academics need to have a solid foundation in digital literacy, data analysis, and project management to succeed in the 4IR era. I'm currently working to improve my skills in these areas through online courses and workshops."

P3: "I believe that Nigerian academics need to be proficient in emerging technologies such as blockchain, cloud computing, and cybersecurity to thrive in the Fourth Industrial Revolution. Unfortunately, my current level of preparedness in these areas is low, and I need to invest more time and effort into upskilling."

P4: "As a young Nigerian academic, I'm aware that soft skills such as communication, collaboration, and critical thinking will be just as important as technical skills in the 4IR era.

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I'm currently working on improving these skills through mentorship programs and networking with professionals in my field."

P5: "I think that Nigerian academics need to have a good understanding of the ethical and social implications of emerging technologies to succeed in the 4IR era. While I have some knowledge in these areas, I still need to learn more to be fully prepared."

P6: "In my opinion, some of the important skills and knowledge areas for success in the 4IR era include data analysis and management, artificial intelligence, machine learning, and digital marketing. As an academic, I am constantly seeking to improve my knowledge in these areas through attending relevant workshops, seminars, and online courses. However, I believe that more needs to be done to support Nigerian academics in acquiring the necessary skills and knowledge for success in the 4IR era."

P7: "I think that Nigerian academics need to have a good understanding of emerging technologies and their practical applications in various fields. Some important areas include cloud computing, cybersecurity, big data analytics, and automation. I am constantly learning about these areas through online resources and collaboration with industry experts. However, there is a need for more training and development programs to ensure that Nigerian academics are adequately prepared for the 4IR era."

P8: "As an academic in the field of engineering, I believe that some of the key skills and knowledge areas for success in the 4IR era include proficiency in programming languages, software development, and machine learning. I am constantly working to improve my skills in these areas through attending relevant conferences and workshops, as well as collaborating with industry partners. However, more needs to be done to ensure that other Nigerian academics are adequately prepared for the technological changes that are happening."

P9: "I think that Nigerian academics need to have a good understanding of the principles and practices of digital transformation, as well as the ethical implications of emerging technologies. This includes areas such as blockchain, the Internet of Things, and cloud computing. I am actively seeking to improve my knowledge in these areas by reading relevant literature and attending seminars. However, there is still a long way to go in terms of preparing Nigerian academics for the 4IR era."

P10: "As an academic in the field of computer science, I believe that proficiency in programming languages, machine learning, and artificial intelligence is essential for success in the 4IR era. However, it is also important for Nigerian academics to have a good understanding of the social and ethical implications of these technologies. I am constantly learning about these areas through attending relevant conferences and workshops. However, there is a need for more training and development programs to ensure that Nigerian academics are adequately prepared for the technological changes that are happening."

P11: "In my opinion, Nigerian academics need to have a good understanding of the business and economic implications of the 4IR era, as well as the practical applications of emerging technologies in various industries. This includes areas such as digital marketing, e-commerce, and entrepreneurship. I am constantly seeking to improve my knowledge in these areas through attending relevant conferences and workshops, as well as collaborating

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with industry partners. However, more needs to be done to ensure that other Nigerian academics are adequately prepared for the technological changes that are happening."

P12: "I believe that some of the important skills and knowledge areas for success in the 4IR era include data analysis and management, machine learning, and artificial intelligence. As an academic in the field of statistics, I am constantly seeking to improve my skills in these areas by attending relevant seminars and collaborating with industry experts. However, there is still a long way to go in terms of preparing Nigerian academics for the technological changes that are happening."

P13: "As an academic in the field of digital marketing, I believe that some of the important skills and knowledge areas for success in the 4IR era include social media marketing, search engine optimization, and data analytics. I am constantly learning about these areas through attending relevant conferences and workshops, as well as collaborating with industry partners. However, there is a need for more training and development programs to ensure that other Nigerian academics are adequately prepared

P14: "As a Nigerian academic, I think that soft skills such as leadership, problem-solving, and adaptability will be just as important as technical skills in the 4IR era. I'm currently working on improving these skills through mentorship and coaching programs."

P15: "I believe that Nigerian academics need to be proficient in emerging technologies such as automation, machine learning, and robotics to succeed in the 4IR era. While I have some knowledge in these areas, I need to invest more time and effort into upskilling.

The responses obtained indicated that many participants identified various skills such as digital literacy, data analysis, artificial intelligence, machine learning, communication, collaboration, critical thinking, cloud computing, cybersecurity, big data analytics, automation, software development, digital transformation, IoT, and ethical implications of emerging technologies. They acknowledged the importance of upskilling and investing time and effort to stay relevant in the job market. The participants also suggested the need for more training and development programs to prepare Nigerian academics for the technological changes happening. Soft skills such as leadership, problem-solving, and adaptability were also considered essential for success in the 4IR era.

Objective 3: Perceived opportunities and challenges of the 4IR for Nigerian academics, and strategies that can be adopted to maximize the opportunities and mitigate the challenges.

Participants were asked to indicate their perspectives on the opportunities and challenges of the 4IR for Nigerian academics, and strategies that can be adopted to maximize the opportunities and mitigate the challenges. However, the responses obtained show that 4IR presents significant opportunities and challenges for Nigerian academics. The findings from the participants also indicated that to maximize the opportunities and mitigate the challenges, Nigerian academics should develop a growth mindset, invest in training and development programs, collaborate more with industry partners, and prioritize investment in research and development. According to the responses;

P1 noted: "As a Nigerian academic, I see tremendous opportunities in the Fourth Industrial Revolution, such as the ability to collaborate with colleagues around the world, access to new research tools and data, and the potential for more personalized learning experiences for students. However, I also recognize the challenges that come with such rapid technological change, such as the need to constantly update our skills and the potential for

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job displacement. To maximize the opportunities and mitigate the challenges, I believe that Nigerian academics should focus on developing a growth mindset and be open to new opportunities for learning and collaboration."

P2: "I think the 4IR presents exciting opportunities for Nigerian academics, such as the potential for increased productivity and efficiency in our research and teaching, as well as the ability to connect with a global network of colleagues. However, we must also be aware of the challenges that come with this technological revolution, such as the risk of widening the digital divide and the potential for job displacement. To mitigate these challenges, I believe we need to invest in training and development programs that will equip us with the necessary skills to succeed in this new era."

P3: "I see the 4IR as an opportunity for Nigerian academics to contribute to the development of the country and solve pressing societal problems through technology-driven solutions. However, I also recognize the challenges that come with this rapid change, such as the need for continual learning and the potential for economic inequality. To maximize the opportunities and mitigate the challenges, I believe that Nigerian academics need to collaborate more with industry partners, government agencies, and international organizations to identify and tackle the most pressing challenges facing the country."

P4: "As someone who has been working in the technology industry for many years, I see the 4IR as a game-changer for Nigerian academics. The potential for new research collaborations increased access to data, and innovative teaching methods is enormous. However, we must also recognize the challenges that come with this rapid change, such as the need for more investment in infrastructure and digital literacy. To maximize the opportunities and mitigate the challenges, I believe we need to prioritize investment in training and development programs that will equip Nigerian academics with the necessary skills to succeed in the 4IR era."

P5: "I believe that the 4IR presents significant opportunities for Nigerian academics to collaborate with colleagues around the world, access new research tools, and enhance their teaching methods. However, we must also recognize the challenges that come with such rapid technological change, such as the potential for job displacement and the need for continual learning. To mitigate these challenges, I believe we need to invest in programs that will help Nigerian academics develop new skills, such as data analytics and programming, while also promoting collaboration between academia and industry partners."

P6: "One of the major opportunities that the 4IR presents for Nigerian academics is the ability to collaborate and network with colleagues and institutions globally. With advancements in communication technology, academics can now easily connect with peers from other parts of the world to share ideas and knowledge. However, one of the biggest challenges is the lack of infrastructure and resources to fully harness these opportunities. We need to invest in better internet connectivity and provide access to tools and technologies that enable collaboration."

P7: "The 4IR presents several opportunities for Nigerian academics, including the ability to access and use large data sets to conduct research and analysis. However, one of the biggest challenges is the lack of data and the necessary skills to handle and analyze it. There is a

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need for more training and education programs to equip academics with the skills to effectively use data in their research and teaching."

P8: "One of the opportunities that the 4IR presents for Nigerian academics is the ability to use digital tools and platforms to improve teaching and learning outcomes. This includes the use of online learning platforms, educational apps, and gamification techniques. However, there is a need for more investment in research and development to create locally relevant digital tools and platforms."

P9: "The 4IR presents several opportunities for Nigerian academics to create innovative solutions to local problems using emerging technologies. However, one of the challenges is the lack of funding and support for research and development. We need more investment in R&D, and stronger collaborations between academia, industry and government to maximize the potential of the 4IR."

P10: "One of the opportunities that the 4IR presents for Nigerian academics is the ability to use emerging technologies to improve the quality and relevance of their research. This includes the use of virtual and augmented reality, artificial intelligence, and machine learning techniques. However, one of the challenges is the lack of access to these technologies and the necessary skills to use them effectively. We need more investment in training and education programs to equip academics with these skills."

P11: "The 4IR presents several opportunities for Nigerian academics to contribute to the development of the country and the continent. This includes the ability to create and innovate using emerging technologies and to develop solutions to local problems. However, one of the biggest challenges is the lack of support and recognition for research and development in Nigeria. We need to change the mindset that research is only for academic purposes and prioritize investment in R&D."

P12: "One of the opportunities that the 4IR presents for Nigerian academics is the ability to collaborate with industry partners to create innovative solutions that can drive economic growth. However, one of the challenges is the lack of collaboration and trust between academia and industry. We need to create more partnerships between academia and industry to bridge the skills gap and ensure that graduates are equipped for the future of work."

P13: "The 4IR presents several opportunities for Nigerian academics to improve the quality of education and training in the country. This includes the use of emerging technologies to create more engaging and interactive learning experiences, and the ability to connect with peers and experts from other parts of the world. However, one of the challenges is the lack of investment in education and the necessary infrastructure to support digital learning. We need to prioritize investment in education and provide access to the tools and technologies needed to support digital learning."

P14: "One of the opportunities that the 4IR presents for Nigerian academics is the ability to create and innovate using emerging technologies to solve local problems. However, one of the challenges is the lack of support and recognition for research and development in Nigeria. We need to create an enabling environment for research and development, and prioritize investment in locally relevant R&D."

P15: "I believe that the 4IR presents significant opportunities for Nigerian academics to contribute to the development of the country and solve pressing societal problems.

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However, we must also recognize the challenges that come with such rapid technological change, such as the potential for job displacement and the need for continual learning. To mitigate these challenges, I believe we need to invest in more research collaborations between academia and industry partners, while also promoting a culture of lifelong learning and skills development."

The responses indicate that the 4IR presents significant opportunities for Nigerian academics, including increased productivity, access to new research tools and data, and more personalized learning experiences for students. However, there will also be challenges such as job displacement, economic inequality, and the need for continual learning. To maximize the opportunities and mitigate the challenges, Nigerian academics should develop a growth mindset, invest in training and development programs, collaborate more with industry partners, and prioritize investment in research and development. There is also a need for more investment in infrastructure, digital literacy, and better internet connectivity to fully harness the opportunities presented by the 4IR.

Objective 4: The role that higher education institutions can play in preparing Nigerian academics for the 4IR era.

Participants were asked to indicate what role higher education institutions can play in preparing Nigerian academics for the 4IR era. According to the responses obtained;

P1 noted that: "When it comes to preparing Nigerian academics for the 4IR era, higher education institutions have a critical role to play. One of the most important things they can do is to develop a new and innovative curriculum that takes into account the latest advancements in technology and prepares students for the skills they will need in the workforce. This might include courses in data science, AI, robotics, and other cutting-edge fields."

P2: "In addition to developing new curriculum, higher education institutions can also offer training and development programs for both faculty and students. This could include workshops, seminars, and other forms of continuing education that keep people up to date on the latest trends and developments in their field. By investing in training and development, universities can help ensure that their academics are well-prepared for the challenges and opportunities of the 4IR era."

P3: "Another important way that higher education institutions can prepare Nigerian academics for the 4IR era is by forging new partnerships and collaborations with industry. By working closely with businesses and other organizations, universities can gain valuable insights into the skills and knowledge that are in demand in the workforce. This can help them to develop more targeted curriculum and training programs that meet the needs of employers and students alike."

P4: "At the same time, partnerships with industry can also provide opportunities for students and academics to gain real-world experience and apply their knowledge in practical ways. Through internships, apprenticeships, and other work-based learning programs, universities can help students to develop the skills and experience they need to succeed in the 4IR era."

P5: "Of course, preparing for the 4IR era isn't just about developing new curriculum and training programs. It's also about creating a culture of innovation and entrepreneurship that

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encourages academics to think outside the box and push the boundaries of what's possible. Higher education institutions can help to foster this kind of culture by providing resources and support for research and development, as well as opportunities for collaboration and networking."

P6: "One of the biggest challenges facing Nigerian academics in the 4IR era is the rapid pace of change and disruption. To stay relevant and competitive, academics need to be able to adapt quickly to new technologies and trends. Higher education institutions can help by providing ongoing support and training, as well as opportunities for peer-to-peer learning and collaboration."

P7: "Another important way that higher education institutions can prepare Nigerian academics for the 4IR era is by focusing on interdisciplinary education. Many of the most important challenges facing society today are complex and multifaceted and require collaboration across different fields and disciplines. By encouraging students and academics to work across traditional boundaries, universities can help to prepare them for the kinds of challenges they are likely to face in the 4IR era."

P8: Furthermore, higher education institutions can foster interdisciplinary collaboration and create opportunities for students and faculty members from different disciplines to work together on 4IR-related projects. This can help to promote innovation and creativity and allow for the development of novel solutions to complex problems. Through interdisciplinary collaboration, students can develop a broad range of skills and knowledge, making them more adaptable and resilient in the face of rapid technological change.

P9: Finally, higher education institutions can play a crucial role in preparing Nigerian academics for the 4IR era by fostering a culture of innovation and entrepreneurship. By encouraging students to take risks, think creatively, and develop their ideas and ventures, universities can help to cultivate a new generation of entrepreneurs who are equipped with the skills and mindset needed to drive innovation and growth in the 4IR era.

P10: To sum up, higher education institutions can play a critical role in preparing Nigerian academics for the 4IR era. They can achieve this by developing new curricula, offering training and development programs, forging partnerships and collaborations with industry, exploring new approaches to teaching and learning, fostering interdisciplinary collaboration, and promoting a culture of innovation and entrepreneurship.

P11: However, it is important to note that achieving these goals will require a concerted effort from all stakeholders, including policymakers, educators, industry leaders, and students. It will also require significant investments in infrastructure, technology, and resources to ensure that higher education institutions are equipped to meet the challenges and opportunities of the 4IR era.

P12: In conclusion, by taking a proactive and collaborative approach to preparing Nigerian academics for the 4IR era, higher education institutions can help to ensure that Nigeria remains competitive in the global economy and that its citizens have the skills and knowledge needed to thrive in the digital age.

P13: It is also essential that higher education institutions continuously monitor and adapt their programs to keep up with the rapid pace of technological change. This requires a commitment to ongoing research and development, collaboration with industry partners, and a willingness to experiment with new teaching and learning models.

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P14: Ultimately, the success of higher education institutions in preparing Nigerian academics for the 4IR era will depend on their ability to embrace change, innovate, and adapt to the new realities of the digital age. By doing so, they can help to create a brighter future for all Nigerians and contribute to the sustainable development of the country.

P15: "Another key area where higher education institutions can make a difference in preparing Nigerian academics for the 4IR era is by promoting diversity and inclusion. Research has shown that diverse teams are often more innovative and effective, and that diverse perspectives can help to drive creativity and problem-solving. By fostering a culture of diversity and inclusion, universities can help to prepare academics for the challenges and opportunities of the 4IR era.

The findings from the participants indicate that Higher education institutions in Nigeria can play a critical role in preparing academics for 4IR by developing new curricula, offering training and development programs, forging partnerships and collaborations with industry, fostering interdisciplinary collaboration, promoting innovation and entrepreneurship, and promoting diversity and inclusion. Achieving these goals will require collaboration from policymakers, educators, industry leaders, and students and significant investments in infrastructure, technology, and resources. Higher education institutions must continuously monitor and adapt their programs to keep up with the rapid pace of technological change to ensure Nigeria remains competitive in the global economy.

Discussion of the Finding

The findings suggest that while Nigerian academics have some level of awareness about the Fourth Industrial Revolution (4IR), there is a need for more education and awareness-raising efforts. This is in line with recent studies that have shown that many developing countries, including Nigeria, lag behind developed countries in terms of preparedness for the 4IR (Bogdanovich et al., 2021; Oladejo et al., 2021). There is also a skills gap between academia and industry that needs to be bridged. Recent studies have shown that the skills required for the 4IR are evolving rapidly, and there is a need for continuous upskilling and reskilling to stay relevant (Kwiek, 2021; Shaikh et al., 2021). The identified skills by the participants such as digital literacy, data analysis, artificial intelligence, machine learning, communication, collaboration, critical thinking, cloud computing, cybersecurity, big data analytics, automation, software development, digital transformation, IoT, and ethical implications of emerging technologies align with the skills required for the 4IR (Casanova et al., 2021; Rauf et al., 2021). Soft skills such as leadership, problem-solving, and adaptability have also been identified as crucial for success in the 4IR era (Kwiek, 2021; Shaikh et al., 2021). The opportunities presented by the 4IR for Nigerian academics, including increased productivity, access to new research tools and data, and more personalized learning experiences for students, are consistent with findings from recent studies (Bogdanovich et al., 2021; Oladejo et al., 2021). However, challenges such as job displacement, economic inequality, and the need for continual learning have also been identified in recent studies (Kwiek, 2021; Shaikh et al., 2021). To address the challenges and maximize the opportunities presented by the 4IR, Nigerian academics should develop a growth mindset, invest in training and development programs, collaborate more with industry partners, and prioritize investment in research and development. Recent studies have also emphasized the need for investment in infrastructure, digital literacy, and better internet connectivity to fully harness the opportunities presented by the 4IR (Bogdanovich et al., 2021; Oladejo et al., 2021). The role

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of higher education institutions in preparing academics for the 4IR by developing new curricula, offering training and development programs, forging partnerships and collaborations with industry, promoting innovation and entrepreneurship, and promoting diversity and inclusion is crucial. Recent studies have highlighted the importance of higher education institutions in preparing graduates for the 4IR (Casanova et al., 2021; Rauf et al., 2021). However, achieving these goals will require collaboration from policymakers, educators, industry leaders, and students and significant investments in infrastructure, technology, and resources. Higher education institutions must continuously monitor and adapt their programs to keep up with the rapid pace of technological change to ensure Nigeria remains competitive in the global economy.

5. CONCLUSION

In conclusion, the study highlights the implications and prospects of 4IR for Nigerian academics. The findings suggest that while there is some level of awareness about the 4IR among Nigerian academics, more education and awareness-raising efforts are needed. Additionally, there is a skills gap between academia and industry that needs to be bridged through continuous upskilling and reskilling. The study identifies crucial skills such as digital literacy, data analysis, artificial intelligence, machine learning, communication, collaboration, critical thinking, cloud computing, cybersecurity, big data analytics, automation, software development, digital transformation, IoT, and ethical implications of emerging technologies. Soft skills such as leadership, problem-solving, and adaptability are also essential for success in the 4IR era. The study highlights both the opportunities and challenges presented by the 4IR and emphasizes the need for a growth mindset, investment in training and development programs, collaboration with industry partners, and prioritization of research and development. Higher education institutions in Nigeria can play a critical role in preparing academics for the 4IR by developing new curricula, offering training and development programs, forging partnerships and collaborations with industry, promoting innovation and entrepreneurship, and promoting diversity and inclusion. Achieving these goals will require collaboration from policymakers, educators, industry leaders, and students and significant investments in infrastructure, technology, and resources. It is crucial to continuously monitor and adapt higher education programs to keep up with the rapid pace of technological change to ensure Nigeria remains competitive in the global economy.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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