Fourth Industrial Revolution Skillsets and Employability Readiness for Future Job

iD **Waliu Mulero Adegbite**[1] ⊙

iD **Oluyemi Theophilus Adeosun**[2]

(⊙ Corresponding Author)

[1] *Department of Industrial Psychology and People Management, School of Management, University of Johannesburg, South Africa.*
Email: adegbitewaliu@gmail.com Tel: +234(0)8051933633
[2] *Department of Economics, University of Lagos, Nigeria.*
Email: oluyemiadeosun@gmail.com Tel: +234(0)8025320606

ABSTRACT

This paper explores the employees' readiness in the manufacturing sector for the fourth industrial revolution (4IR) vis a vis the 10 critical skill-sets identified by the World Economic Forum (WEF). We took a critical review of relevant theories and highlighted pragmatic solutions. Data collection for this study was obtained through a questionnaire among the employees of a brewing production plant in Nigeria. Using the 5-point Likert scale, 231 copies of the questionnaire were administered to workers on site. The study results are reported using a sample t-test to represent the values of Mean (M), Standard Deviation (SD), and Cronbach Alpha to test for the instrument's internal consistency. The analysis results revealed that most skillsets that require continuous career and employability in the 4IR are seen as low among the sampled organization employees, with an average mean score of less than 3.41. Interestingly, service orientation and people management skills are ranked the highest readily available skill among the workers. Many studies look at graduate work readiness, while attention to current employees' context is just beginning to gain traction.

Keywords: 4IR, Employee's skillset, Employability, Readiness, Future job, Nigeria.

Highlights of this paper

- The article aims to ascertain employees' readiness for the future job using the ten critical skillsets for employability in the Fourth Industrial Revolution (4IR) proposed by World Economic Forum (WEF).
- The article revealed that 4IR skillsets among the employees in the sampled organisation are low except for service orientation and people management skills.
- The paper recommends the need to enroll employees in structured training through multiple channels to develop 4IR competencies and skillsets.

1. INTRODUCTION

The Fourth Industrial Revolution (4IR), also known as industry 4.0, is fast becoming a reality in today's world. This has made expedient the need to reappraise the intricacies of employment and employability. Already, there is a wave of technological disruption sweeping through the globe. The occurrence of this disruption has birthed changes in the various facets of human endeavors. Expressing this reality, Fajaryati and Akhyar (2020) state that "Disruption brings into existence novel business model and almost put an end to the traditional means of doing businesses, leading to technology and digitalization of human activities. Needless to say, this paper will critically evaluate what the fourth industrial revolution embodies while gauging the level of employability readiness of the Nigerian workforce. In his work (Schwab, 2016) titled "The Fourth Industrial Revolution," it was highlighted that the emerging trends at the workplace are often described as the 4IR and additionally, important technologies such as genetics, artificial intelligence, cloud computing, nanotechnology, biotechnology and 3D printing to state a few, characterizes the 4IR. It is also pertinent to give some consideration to what the industrial revolution as a whole connotes. Modern history holds that the process from an agriculture-based economy to one driven by technology depicts the industrial revolution. There is a world of difference between the 4IR and the industrial revolutions. Giving credence to this, Frey and Osborne (2017) stated that economically and technology-wise, changes that occurred in the last centuries represent three major industrial revolutions, with the first occurring in the late 18th century and characterized by mechanical production. Next was the era of production on a large industrial basis in the late 19th century and in the 1960s marked the third major industrial revolution, which has the advent of personal computers and the internet as its attribute. Fourth Industrial Revolution (4IR), a paradigm of machine-human relations, connected to the digitization of products and services, as well as creating a new market model has birthed interconnectivity of several communication systems, leading to technologies of Internet of Things (IoT), Internet of Service (IoS) and Internet of People (IoP) (Narula, Prakash, Dwivedy, Talwar, & Tiwari, 2020). Scholars that seek to understand the relationship between science, technology, and society (technoscience) have argued that the fusion of scientific knowledge has practical intervention in people's everyday lives, hence the magnificent change in production systems in the 4IR (Santos & Martinho, 2019). The inclusion of human and non-human agents in the production system with more emphasis on the latter (IoT) indicates a post-human and post-social world of work. A network of machines and computers is considered the only means of efficiency, innovation, and profitability. The pervasiveness of computing connection will require creating what scholars termed the Internet of People (IoP), where real change is expected in the organization structure to facilitate the exchange of information in the manufacturing process (Kazancoglu & Ozkan-Ozen, 2018; Rubmann et al., 2015). Within the educational systems and in the workplace, the fourth industrial revolution has ignited full disruptions in learning and production systems. Workers are expected to acquire relevant skill sets to remain relevant to become more competitive (Rahmat, Adnan, & Mohtar, 2019). Awareness about the fourth industrial revolution is fast gaining ground. Likewise, numerous predictions have come to light explaining what the 4IR holds for the world's economies. Frey and Osborne (2017) report a prediction that an estimated 47% of employment in the United States are at risk of

36

experiencing automation. Narrowing the scope to Nigeria, where unemployment is an issue of great concern (23%), and another 20% of the entire workforce underemployed (World Development Report, 2018). This may further worsen and soon become an emergency with the 4IR's emergence and digitization of production systems. The current transformation experienced in most developed countries due to 4IR (Industry 4.0) is expected to diffuse globally during the next decades due to technological advancement and change in the production value chain. The nature of the revolution bestowed on employers', demand for different expectations from employees due to inadvertently change like work. Nigeria, a developing country with economic and political instability; inadequate infrastructure for information and communication technology; and a challenging educational system expectedly may face difficulties in transitioning into a 4IR economy due to lack of competencies and skillsets expected from the employees of the future. The World Economic Forum (WEF) has identified the top ten work-related skills require in industry 4.0 as complex problem solving, critical thinking, creativity, people management, coordinating with team, emotional intelligence, judgment and decision making, service orientation, negotiation, and cognitive flexibility (World Economic Forum, 2017). Hitherto, these skillsets are seen as inferior, non-technical core skills that an organization requires to survive (Rahmat et al., 2019). The emergent of 4IR in the wake of the twentieth century has, however, placed the so-called inferior soft skills in the circle of critical skills required in the future workplace, without which workers may find it difficult to retain and secure future employment (Rahmat et al., 2019). Accordingly, these critical skills are quite challenging for the existing workers to acquire due to the complexity of the computing involve in the 4IR production system. Hence, organizations need to assess the availability of their competencies and skillset in transitioning to the production systems of 4IR. Most importantly, workers' failure to acquire these skills may mean that they are not fit into the 4IR workforce and not readily employable. Although the manufacturing sector's innovation level in Nigeria has improved recently, the type of education and training offered to Nigeria's potential and existing workforce does not suggest readiness for effective transitioning to the fourth industrial revolution economy (Adegbite & Okafor, 2018). Advanced economies such as Germany, the United States of America, Canada, Switzerland, Singapore, and Japan have since recognized and prepared their workforce ahead for the revolution. Others have favorably structured their production base for potential development in line with the 4IR through a change in the education curriculum in response to the skills requirements of 4IR, to facilitate their transition to a circular economy (Kazancoglu & Ozkan-Ozen). There seem to be no standardized strategies and roadmap to alter the current competence to prepare the Nigerian workforce for the future job, since education is essential for nations to leapfrog to 4IR refocusing to train towards the future job.

Also, in many developing countries in Africa, there is a remarkable number of organizations and workers in Nigeria who are not aware of the impact 4IR could have on their job and competitiveness; hence they are lackluster towards preparing for the disruption of the revolution. Most organizations do not prioritize conducting a gap analysis of their workers' current skillsets to determine the availability of requisite skill sets needed to survive in the 4IR as a priority. Similarly, many of the employees are not aware of the essential competence and skillsets required to be employable in the 4IR. Many studies look at graduate work Readiness (Citations) while attention to current employees is yet in infancy. Based on the above, this study aimed to assess the competence and skillsets possessed by employees of a manufacturing plant in Nigeria to examine their employability readiness in the 4IR manufacturing setting using the essential top ten work-related skill sets identified by the WEF.

2. LITERATURE REVIEW

As mentioned earlier, the intricacies of employment and employability are worth reappraising due to the reality of the fourth industrial revolution that is fast dawning on economies and nations the world over. This gives rise to a

need to give rapt attention to the concepts that drive employment and employability. There is a vast spectrum that employability fits into, and as such, a single or unifying definition cannot be given to it. However, going by the definition provided by the Confederation of British Industry (CBI), employability is comprised of a set of attributes, knowledge, and skills which participants of the labor market should possess to guarantee their capability to be effective in the workplace, in order yield benefit for themselves, their employer and the economy at large (Miranda et al., 2015). Yet, another approach to employability is in the context of higher education. "Robbin report" established employability as one of the four major objectives of higher education (Robins Report, 1963). Harvey (2005) also lends his weight to how employability should be viewed. Employability does not end with getting a job; rather, it extends to developing attributes, experience, and techniques for life.

On the other hand, there are diverse frameworks that give varying considerations to employability. However, a popular employability framework is a career-edge framework, pioneered by Pool and Sewell (2007), which proposed five employability skillsets. According to Erabaddage, Sumanasiri, Shukri, and Ali (2015), the career-edge framework comprises the following categories: career development learning, work and life experience, degree subject knowledge and understanding, generic skills, and emotional intelligence. Further, the research by Erabaddage et al. (2015) reveals that the career-edge framework merges the process of learning, environment, and learning outcomes, with employability.

Although the workplace peculiarities of the fourth industrial revolution differ from previous industrial revolutions, it is worthy of mention that certain skill sets (i.e. affective skill and implied cognitive skills - development of knowledge and intellect) that were in demand in the current work environment will remain sought after, even as we fast transit into the 4IR (Anderson, 2012). According to Bandaranaike and Willison (2015), affective skills are majorly based on the concept of emotional intelligence - as proposed by Coleman in 1998. In a research title building capacity for work-readiness, Bandaranaike and Willison (2015) conjoined the cognitive and affective skills to produce the concept of emotional work-readiness. This concept integrates the work environment's emotional and social characteristics while helping students grow their work readiness capacity in anticipation of future employability. With an overview of employment and employability, it is now consequential to look into what employability stands for in the fourth industrial revolution. Each industrial revolution surfaces with peculiarities, which hitherto were not obtainable. Likewise, the fourth industrial revolution possesses peculiarities that the previous three industrial revolutions are void of. For this reason, in particular, the nature of employability in the fourth industrial revolution is bound to differ from what the norm was. A further reflection of what the stark reality will be decades from now was stated in a report by the World Economic Forum (2016). The report estimates that 35 percent of children's current generation will hold job types that exist presently when they become adults. While the larger percentage left will hold job types that are yet to exist. With the possibility of most jobs becoming automated, it is necessary that the workforce brace up and get suited for the inevitable changes en-route. Speaking of inevitable changes, the Bureau of Labor Statistics (2015) analysis in the United States reveals that a great percentage of jobs relating to office and administrative support such as service and production and sales will most likely become automated shortly. The fourth industrial revolution is characterized by sophisticated technologies such as artificial intelligence, virtual realities, big data analytics, and the internet of all things. These technologies, when adopted, are capable of enabling new ways to execute work, bringing new opportunities for value creation to businesses and organizations (El Mansour & Dean, 2016; Narula et al., 2020; Zang & Ye, 2015). Without cynicism, the 4IR is transforming the manufacturing processes and how workers are expected to perform their tasks using computer-enabled robots and other machines to drive production. It is not clear whether most workers are career-ready for the industry 4.0 workplace as employers are demanding a mixture of skillsets (a combination of soft and

hard skills). According to Deloitte (2016), the need for essential human skills generally referred to as soft skills: creativity, complex problem solving, relationship building, communication, emotional intelligence, and critical thinking are the hallmark of major skillsets that employer seeks for in the organization of 4IR.

World Economic Forum (2016) stated that five years from now, more than one-third of skillsets (35%) considered imperative in the present workforce would have changed. The report identified 10 skills that need to thrive in the 4IR, consisting of complex problem solving, critical thinking, creativity, people management, coordinating with others, emotional intelligence, judgment and decision making, service orientation, negotiation, and cognitive flexibility. Based on the WEF report and emphasis on change in the current competence to prepare for the future jobs, several studies conducted revealed that for an employee to be employable and enjoy continuous employment in the 4IR, it is important to provide a foundation to develop the relevant skillsets that will support fit into 4IR (Flores, Xu, & Lu, 2020; Jamaludin, McKAY, & Ledger, 2020; Santos & Martinho, 2019).

Undoubtedly, there would be challenges for the current workforce, especially in countries still struggling to catch up with the third industrial revolution and globalization technologies and infrastructure. Having altered the technologies of the third Industrial Revolution (3IR), the 4IR has redefined the organization architecture where the typical pyramid of management structure and hierarchy has been viewed as not compatible with the ideal vision of smart industry (Flores et al., 2020; Rojko, 2017). Ochs and Riemann (2017) have, however, argued that the fourth industrial revolution is reshaping the organizational structure towards self-organized, flexible, and decentralized hierarchy, an organic type of organization designed to be adaptive, freer, and free-flowing (Adegbite, Okafor, Adedeji, & Akintelu, 2020; Daft, 2015). It is important to assess the three functional areas believed to be critical to organizational transformation, as identified in previous studies. Further, studies have identified personal development of employees (competencies), team building and development (collaboration), and organizational development (processes and structure) as entirely important in the management of firm resources in the fourth industrial revolution (Narula et al., 2020; Rana & Sharma, 2019). As long as the assertion is valid that the fourth industrial revolution's technologies will increase competitiveness, enhance profitability, and improve products' quality, organizations would always want to opt for a smart-industry operation. It then means that the entire human resource must transform and become smart (Smart HR).

As emphasized, the logistic process and production layers (Bag, Telukdarie, Pretorius, & Gupta, 2018); software machine tools (Teng, Ma, Pahlevansharif, & Turner, 2019); and the whole reconfigurable self-organized production and service systems (Zheng, Xie, Dai, Chen, & Wang, 2017) through the introduction of several components such as cyber-physical production systems (CPPS) would impact all aspect of organization differently by the change that will accompany the 4IR. While all aspect of an organization including the structure and management is expected to change, getting the appropriate workforce structure to counter the negative effect of the transformation on performance and jobs is critical; otherwise, the belief that human is the leading component in any revolution may be erroneous (Liboni, Cezarino, Jabbour, Oliveira, & Stefanelli, 2019). If job loss will be averted, the next generation of workers must be technologically savvy, combined with soft skills fit for industry 4.0. Hirschi (2018) reiterates that current employees will be devasted by job loss due to a lack of knowledge and competence required to operate in industry 4.0. Sivathanu and Pillai (2018) explained that the existing organizational culture and management expectation of workers from different generations are clear challenges associated with managing human resources during the revolution. Interestingly, a successful transition to the smart human resource will lead to developing and retaining younger talent, dynamic and smarter quicker human resources (HR) operation, and leaner HR department (Sivathanu & Pillai, 2018). With the emergence of industry 4.0, HR is at the center of organization activities engaging in recruitment, training, and skill development would have to replace the

conventional method of managing people with modern, relevant methods for sustainable implementation of performance during the revolution. Crawford-Lee and Moorwood (2019) recently highlighted the importance of industry 4.0 on workforce features, stressing that the fourth industrial revolution's change requires workers to prepare for the occupational shift. Also, as the production process is structured for compatibility with 4IR, it is essential to identify and define the necessary competence and skills in need of employees since the typical job profile of workers in the fourth industrial revolution will be different from what was obtainable in previous revolutions. As pointed in a study by Pejic-Batch, Bertoncel, Mesko, and Krstic (2019) jobs related to manufacturing will reduce significantly by 2025; meanwhile, data scientists and information technology professionals will be in high demand during the period and beyond. By implication, workers with low skills engaging in physical and monotonous tasks will experience diminishing employment prospects, while high-skilled workers will experience higher demand and numerous professional possibilities (Rampasso et al., 2020).

Accordingly, workers' job profiles and skill set in the 4IR would be multiskilled, and organizations in this revolution will require ample interdisciplinary knowledge for competitiveness (Kazancoglu & Ozkan-Ozen, 2018). Beyond technology and computing skills, there are numerous sets of soft and cognitive skills required by employees to function properly in the 4IR. In this context, the challenge of preparing workers for the reality of 4IR is an important task, especially in the manufacturing sector in developing countries like Nigeria. For many human resource professionals in Nigeria, the role of recruitment, selection criteria, and processes to support the 4IR is still unclear. For instance, Lasi, Fettke, Kemper, Feld, and Hoffmann (2014) noted that the fourth industrial revolution presents a distinctive feature by centralizing production and service delivery through IT and automation using the cyber production systems leading to change in job requirements. While the third industrial revolution encompasses technology oriented-task, the fourth industrial revolution is about a process-oriented task, integrating the entire manufacturing systems leading to high human-machine interaction (Kazancoglu & Ozkan-Ozen, 2018). Many studies have suggested that it will be better for employees to focus on capabilities rather than qualifications (Rubmann et al., 2015). The reality of the workforce of 4IR suggests that there will be a variety of tasks associated with real-time technology, and the requirement for emerging skills may not have been present in the employee's formal education. Simultaneously, some former skills may have also become obsolete (Kazancoglu & Ozkan-Ozen, 2018).

3. THEORETICAL REVIEW

This research's theoretical aspect will dwell extensively on the structural transformation synonymous with the workplace in the fourth industrial revolution. The advancement in technology paves the way for job polarization. In a publication by Hirschi (2018) job polarization occurs when middle-skilled jobs are phased out, while jobs in the lower-skill and high-skill categories witness a relative increase. The ease of automating middle-skilled jobs, mainly comprised of machine operation and office administration, makes it highly prone to being hollowed out. Aside from job polarization, the fourth industrial revolution will also take a detour from the conventional full-time work placement. In essence, it will give rise to the advent and rapid increase of a gig economy. De Stefano (2016) describes a gig economy as one which involves crowd work and works on-demand through an app. Providing a distinction between crowd work and work on-demand, Hirschi (2018) revealed that crowd work involves online tasks such as data entry, reviewing documents, etc. Work on-demand, on the other hand, involves getting physically demanding jobs via apps. Examples of jobs in this category are transportation, running errands, etc. Interestingly, De Stefano (2016) reports that there are currently many people in the gig economy. The career models befitting the fourth industrial revolution are enormous. The foregoing will consider the career models to

identify with them and glean their underlying phenomena and aid the making of predictions. Based on critical evaluation, the model that best suits the fourth industrial revolution related to Nigeria will be dwelled upon. Subsequently, its underlying theories will be expounded upon.

3.1. Career Models befitting the Fourth Industrial Revolution

Career construction: Di-Fabio and Maree (2013)established that the career construction theory holds that careers develop with time and as individuals begin to attach meaning to their work experiences. Savickas (2013) opined that career construction theory is a grand theory centered on career development. Furthermore, the theory embraces a developmental, differential, and dynamic view of vocational behavior. Central to the career construction theory is a model of adaptation. The model of adaptation implies that people take control of their careers by adaptively making use of a set of psychosocial resources that helps in the management of their expectations (Rudolph, Zacher, & Hirschi, 2018). In the same vein, the proximity of the model of adaptation to career construction was further iterated by Savickas (2013). According to her, the career construction theory identifies differences in individual characteristics, propelling people to integrate their self-concepts more or less with their work role. The outcome of this integration is labeled as adaptation results. Rudolph and colleagues expressed aptly that "as a phased sequence of interrelated processes, the model of adaptation suggests that adaptivity influences career adaptability, which in turn influences adapting responses and, ultimately, adaptation results.

Protean and boundaryless careers: There is a growing concern about what the future of work holds. Blustein, Kenny, Di Fabio, and Guichard (2019) identified with this growing concern by stating that "humanity is at a key point concerning the future of work, with outcomes that may, if not carefully and thoughtfully managed, evoke growing levels of unemployment, underemployment, inequality, and instability across parts of the world." However, for decades, protean and boundaryless career models have tackled the challenges that arise from new careers. The protean and boundaryless career models two outstanding frameworks addressing the emergence of new careers that have risen in the past three decades (Sullivan & Arthur, 2006). It is worth mentioning that the protean and boundaryless careers have varying natures, but they are united on the basis and assumption that careers are highly driven by personal flexibility, psychological and physical mobility within and between organizations (Hirschi, 2018). Likewise, Briscoe and Hall (2006) mentioned that the protean and boundaryless career perspectives have in the last decade gained popularity. To simply put it, a Protean career is driven by persons and not the organization (Briscoe & Hall, 2002). On the other hand, a Boundaryless career, according to Arthur and Rousseau (1996), is" independent from and not dependent on, traditional career arrangements." The protean and boundaryless careers, along with their theories, will dwell upon the technological advancements that characterize the fourth industrial revolution and the careers therein have greater chances of soaring in a protean and boundaryless setting for reasons to be unraveled going forward.

3.2. The Protean Career

To begin with, protean as a term, emerges from the name Proteus, which belonged to a Greek god that could change form at will (Ruth, 2007). A person can be said to have a full protean career orientation when in possession of two attitudes. The first being a value-driven attitude, and the second attitude being self-directedness in one's career. Briscoe and Hall (2006) refers to the value-driven attitude as "a person's internal values that provides the guidance and measurement of success for the individual's career". In the same vein, Briscoe and Hall (2006) revealed that the medley of the two aforementioned attitudes, births four major career orientations. For Baruch (2004) the "protean career linked to the boundaryless career, with the protean career, being an extreme form of the

41

boundaryless career, that also bears strong inner motivations. For Ruth (2007) the protean career involves a "psychological contract with one's self rather than an organisation(s).

3.3. Protean Career and the Fourth Industrial Revolution

There is no need to re-emphasizing that digitization and automation of work will characterize the fourth industrial revolution. As a result of the possibility of thousands of jobs being eliminated, and the emergence of changes in the fundamentals of current occupations, there is bound to be new industries and occupations. "Traditional career models have focused on the work organization, its structures, and hierarchy in guiding the individual's vocational behaviors. Career success is measured by advancement in the organization and the monetary gains that come with it Bernardo and Salanga (2019). The industrial revolution, what it stands for, it's challenging, and inherent opportunities are best addressed with the adaptation of a protean career. Beginning with what the 4IR stands for, Min-Xu, Jeanne, and Suk (2018) state that the fourth industrial revolution has as its attribute a combination of technologies that blurs the lines in between the physical, digital, and biological spheres. Additionally, Min-Xu et al. (2018) made predictions about the opportunities rooted in the 4IR. The predicted opportunities are as follows (1) Upsurge of artificial intelligence (2) Minimal barriers between inventors and the market (3) Enhancement in the quality of lives (4) A fusion of diverse domains and techniques.

Rampasso et al (2020) opined that the disruption that the 4IR holds would inevitably reshape businesses' operations. New markets are bound to be created, as well as new products formed. Researches have forecasted that automation and digitization will put many out of jobs in the 4IR; however, manufacturing jobs and transportation and storage jobs bear a larger risk of automation. Therefore, it is evident that a protean careerist has a better chance of being up to the task with the challenges of the 4IR.

3.4. The Relationship Between Protean Career and Employability

It is safe to say that the relationship between the protean career and employability is a direct one. To prove this proposition true, let's analyze an instance in the 4IR, where only a paltry number of the workforce can be classified as a protean careerist. Undoubtedly, if the dynamics of the 4IR are full-fledged, and only a few members of the workforce are equipped with the protean career orientation, then only a few will be fit for employability. Reitman and Schneer (2008) also gave credence to the protean career by mentioning that the protean career is an emerging career pattern that is important to career development in the dynamic business environment. The direct relationship existing between the protean career and employability was also stressed by Lin (2015) "Protean talents usually have a strong protean mindset that allows them to work with numerous organizations throughout their career in transactional relationships, which allows them to remain employable and valuable to current and future employers."

3.5. Protean Career and its Underlying Model

The model that underlies the protean career illustrates the unique interplay between a person and factors, such as job-related factors and organizational factors. Chin and Rasdi (2014) impression of the earlier mentioned unique interplay or interaction existing between a person and the organizational and job-related factors was expressed in the study titled "Protean career development: Exploring the individuals organizational and job-related factors." Based on their research, the interaction process between a person and factors, such as job-related factors and organizational factors, influences career development, which by extension, affects career goal choice and the pursuit of choice action in a manner deemed proactive. Eventually, this will result in enhanced performance and the

attainment of satisfaction on the job. Better explaining the interaction between a person and the aforementioned factors is a model known as the integrative model. The integrative model in Figure 1 examines the protean career by considering organizational-related variables, job-related variables, and individual-related variables.
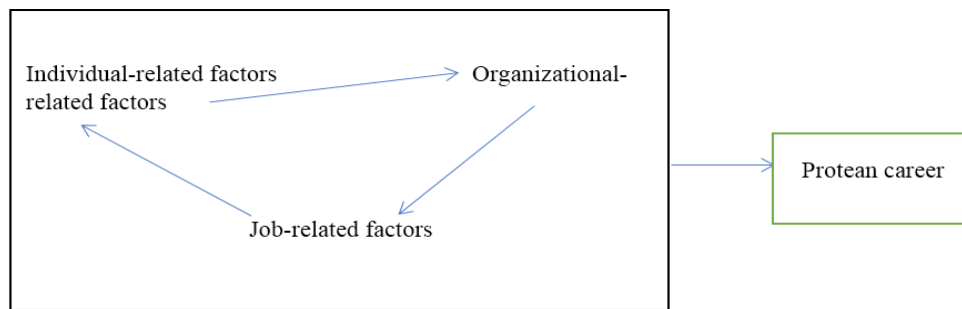

Figure-1. An integrative model of protean career.
Source: Chin and Rasdi (2014).

Boundaryless Career: There are two sides to the boundaryless career. "Similar to the new conceptualization of the protean career model, the boundaryless career model has two axes on which it is built." Segers, Inceoglu, Vloeberghs, Bartram, and Henderickx (2008). The more popular of these two axes is physical mobility, and the other is psychological mobility. Physical mobility focuses on mobility across organizations. Sullivan and Arthur (2006) consider physical mobility as the occurrence of movement between firms, jobs, countries, and occupations. Further, Sullivan and Arthur (2006) state that psychological mobility is "the capacity to move as seen through the mind of the career actor". Lending more weight to psychological mobility, Arthur and Rousseau (1996), provided examples of boundaries that are not necessarily physical, but which individuals can cross. They include creating marketability beyond a present employer and creating work networks beyond a single organization, social expectations of vertical career progression. Because these boundaries do not demand physical mobility to be crossed, they are deemed psychological. "A career agent with a "boundaryless" orientation might obtain support through extra-organizational networks and manipulate a much larger repertoire, including personal boundaries, to engage with various careers" (Buchner, 2007). Inkson (2006) concluded that the protean and boundaryless career models as "metaphorical compass allowing for more direction on what is to come in the world of work".

3.6. The Boundaryless Career and Employability

Already, advanced economies of the world can attest to the changes in the work environment and the new requirement that concerns employability. These changes are responsible for advancements in technology, the deregulation of the labour markets, globalization, changes in workforce demographics, and post-compulsory education (Niles, Edwin, & Hartung, 2001). The changes in the world of work are fast increasing and are soon to be a global phenomenon. It is, therefore, inevitable for the nature of employability to remain as it were. McMahon, Patton, and Watson (2003) opined, "work is often no longer characterized by a set of tasks which are mastered once, and a career is no longer characterized by a vertical process of advancement within one organization". As a result of the new norm in the world of work, employability will depend on the ability to be ready, and suitable for the changes already predicted to occur in the work environment and the 41R especially.

4. METHOD

Data collection for this study was done through the use of a questionnaire among the employees of the brewing production plant in Nigeria. Using the 5-point Likert scale, 231 copies of the questionnaire were administered to

workers on site. A total of 200 respondents managed to complete the questionnaire, representing an 86.9% response rate, which is considered good enough for analysis. The survey instrument was designed to assess the workers' fourth industrial revolution skillsets to determine their readiness and employability status for future jobs. The study adapted and modified the WEF top ten work-related skillsets: complex problem solving (4 items); critical thinking (5 items); creativity (4 items); people management (5 items), coordinating with the team (4 items), emotional intelligence (4 items), judgment and decision making (4 items), service orientation (4 items), negotiation (5 items), and cognitive flexibility (4 items). Participants were asked to use a self-assessment approach to evaluate their level of 4IR skillsets and employability readiness. The study results are reported using a sample t-test to represent the values of Mean (M), Standard Deviation (SD), and Cronbach Alpha to test for the instrument's internal consistency.

Table-1. Participant's Profile.

Description of Respondents	Categories	Frequency N=200	Percent (%)
	Female	54	27
Gender	Male	146	73
	18-22	9	4.5
	23-27	29	14.5
	28-32	87	43.5
Age (years)	33-37	41	20.5
	38-42	21	10.5
	Above 42	13	6.5
Marital Status	Single	56	28
	Married	131	65.5
	Separated	13	6.5
Qualification	Secondary Level	39	19.5
	Bachelor	108	54
	Postgraduate	53	26.5
	Below 3	54	27
	3-5	90	45
Years of Experience	6-8	20	10
	9-11	21	10.5
	Above 11	15	7.5

Source: Field survey, 2019.

5. RESULTS

Employees comprising engineers, brewers, sales representatives, human resource professionals, and machine operators were solicited for feedback via a self-assessment questionnaire. Table 1 revealed that male (73%) dominated the workforce, 43.5% of the workers are between the age of 28-32 years, 65% are married, 64% with a bachelor degree, 26.5% having postgraduate education, and 45% had spent between 3-5 years working within the brewing plant. This study sought to measure the fourth industrial revolution skillsets among the workers of a brewing firm in Nigeria as part of their employability readiness for continuous employment in the future job market, using a sample t-test. The mean represents the average score of the variables obtained from the top ten skill-related competencies considered important for 4IR. Table 2 shows the descriptive analysis of the employees' readiness level concerning the skills needed to operate in the industry 4.0 type of organization. The sample's cognitive flexibility skill is the lowest compared with the other skillsets, interpreted as poor from the average mean (M=2.49; SD=0.879). Low cognitive flexibility skill among workers generally indicates that the workers' ability to identify or implement varying options of guidelines for managing things in various ways is lacking (World Economic Forum, 2016). It then means that the workers' capacity to change the cognitive patterns to enhance

mental capacity, facilitate decision-making, and increase creativity capacity is low in the organization (Kim, Torneo, & Yang, 2019; Ritter et al., 2014).

Table-2. Descriptive statistics of workers' skillsets and employability readiness.

Skillsets	Number of Items	Mean	Standard Deviation	Cronbach's Alpha (α)	Interpretation
Critical Thinking	5	3.04	0.775	0.67	Fair
Creative Thinking	4	3.87	0.843	0.86**	Good
Complex Problem Solving	4	2.91	0.994	0.80**	Fair
People Management	5	3.96	0.782	0.67	Good
Coordinating Skills	4	2.79	0.853	0.76	Fair
Emotional Intelligence	4	3.18	0.798	0.73	Fair
Decision Making	4	3.01	0.688	0.81**	Fair
Service Orientation	4	4.30	0.761	0.80**	Excellent
Negotiation Skill	5	3.79	0.597	0.84**	Good
Cognitive Flexibility	4	2.49	0.879	0.87**	Poor

Note¹: The Likert Scale is interpreted as $1.00 - 1.80$=very poor; $1.81 - 2.60$=Poor; $2.61 - 3.40$=Fair; 3.41- 4.20=Good; $4.21 - 5.00$-Excellent.
Note²: The value marked with ** indicates a high-reliability coefficient (α); where Alpha value > 0.80 is a good indication for the internal consistency of the instrument

In all, the highest mean of 4.30 suggests that the workers believe that they possess service orientation skills; the only skill set in the excellent category. The majority of the skill sets are not in abundance, according to the findings from the survey. For instance, five of the skillsets (critical thinking, complex problem solving, coordinating, emotional intelligence, and decision making) have their means between 2.61 and 3.40. With a mean of 3.92 and 3.87, people management skills and creative thinking are among the skillsets categorized as good, while the survey also shows that the employees have a good knowledge of negotiation skills with a mean of 3.79. The internal consistency test outcome shows that cognitive flexibility, which measures the adaptability and responsibility of workers in experiencing new roles and opportunities, has a reliable score of 0.87. Also, creative thinking, complex problem solving, decision-making, and negotiation skills all show a reliability coefficient equal to 0.80.

6. CONCLUSION

The purpose of this study was to assess the readiness and employability level of employees in line with the top ten skill-related competence for the fourth industrial revolution. The analysis results revealed that most of the skillsets required for continuous career and employability in the 4IR are seen as low among the employees in the sampled organization with an average mean score of less than 3.41. Interestingly, service orientation and people management skills are ranked the highest readily available skills among the workers. We found that critical thinking readiness, decision making, emotional intelligence, and coordinating skill obtained from the sample are all available in fair proportion. All variables conclude that the study organization employees possess a relatively low-to-fair proportion of skillsets required for 4IR, except for people management skill, negotiation, and creative thinking skills. The overall result of this study shows that except for three out of the top ten skillsets, the majority do not possess an adequate proportion of 4IR skillsets that can sustain their career in the future. From the findings of this study, employees in the sampled organization do not possess the required skillsets in the right proportion to guarantee their continuous employment in the future labor market. This could also mean that the majority of the workers in the brewing plant are not ready in terms of skills necessary to remain in employment in the era of 4IR.

7. RECOMMENDATION

Organizations should get their employees enrolled in structured training via multiple channels using different techniques. In other words, adopting simulations and case studies to develop employee capacities and their competencies in the ten WEF identified skills should be given consideration. Not to forget cognitive flexibility, this also should be put into consideration. Furthermore, employees can be exposed to job rotation and job enrichment schemes. This will enable them to get more attuned to ambiguity and volatility, hence accelerating their appreciation for cognitive flexibility. Incentives that reward and recognize employees who demonstrate the new skillsets should be adopted as well.

8. THEORETICAL AND PRACTICAL IMPLICATIONS

This research extends the theory of Protean and Boundaryless careers. We draw attention to the implications of the 4IR, vis a vis the theories, and its implication on sustainable employability and career development in the context of an emerging nation like Nigeria. Within the Nigerian context, there is a focus on its manufacturing sector. The 4IR also reinforces the boundaryless opportunities. To this end, no nation will want its workforce to lag in terms of acquiring in-demand skillsets. The failure of a nation's workforce to acquire the necessary skills suitable for the 4IR will amount to other nationalities picking their jobs, which will inherently worsen the country's employment situation in focus.

The research shows that the skills required at the workplace are dynamic, and the workforce's preparation for the impending and the already existing changes is a function on which human resources and approach should be centered upon. Likewise, there is a dire need for organizations to evaluate the selection criteria and the assessment tools that will aid in identifying candidates who possess the capacity and will to adapt, relearn and unlearn on the go. In the same vein, employees need to maintain a connection with strategies that are long-termed. This can be affected by creating relevant readiness programs. The importance of speed cannot be underplayed either. Speed is of the essence in skill acquisition as it eliminates obsolescence and ensures quick returns on investment.

9. LIMITATION

With regard to the limitation of this study, it is acknowledged that the sampling approach carries the limitation that only employees from the brewing plants were considered in this study. A further limitation of the study is that the study could have benefitted from including a rigorous methodological analysis with a qualitative dimension. This, however, could be explored in future studies with a larger sample across multiple sectors.

REFERENCES

Adegbite, W. M., & Okafor, E. E. (2018). Developing organizational innovation capabilities through human resources management practices: Evidence from Nigeria's Brewery industry. *International Journal of Advanced Academic Research (Social & Management Sciences), 4*(4), 357-379.

Adegbite, W. M., Okafor, E. E., Adedeji, O., & Akintelu, O. S. (2020). Managing sustainable innovation in the organisation: The role of workers' autonomy and knowledge management. *Nile Journal of Business and Economics, 6*(14), 3-22.

Anderson, C. (2012). *Makers: The new industrial revolution.* New York: Crown Publishing.

Arthur, M. B., & Rousseau, D. M. (1996). *The Boundaryless career: A new employment principle for a new organisational era.* Oxford: Oxford University Press.

Bag, S., Telukdarie, A., Pretorius, J., & Gupta, S. (2018). Industry 4.0 and supply chain sustainability: framework and future research directions. *Benchmarking International Journal (Toronto, Ont.).*

Bandaranaike, S., & Willison, J. (2015). Building capacity for work-readiness: Bridging the cognitive and affective domains.

Baruch, Y. (2004). *Managing careers: Theory and practice*. Harlow, Essex: Prentice Hall.

Bernardo, A. B., & Salanga, M. G. C. (2019). Validating the protean and boundaryless career attitudes scales with Filipino young adults. *Cogent Psychology, 6*(1), 1671133.

Blustein, D. L., Kenny, M. E., Di Fabio, A., & Guichard, J. (2019). Expanding the impact of the psychology of working: Engaging psychology in the struggle for decent work and human rights. *Journal of Career Assessment, 27*(1), 3–28. Available at: https://doi.org/10.1177/1069072718774002.

Briscoe, J. P., & Hall, D. T. (2002). *The protean orientation: Creating the adaptable workforce necessary for flexibility and speed.* Paper presented at the In Annual Meeting of the Academy of Management, Denver.

Briscoe, H. P., & Hall, D. T. (2006). The interplay of boundaryless and protean careers: Combinations and implications. *Journal of Vocational Behavior, 69*(1), 1-3.

Buchner, M. (2007). *The protean career attitude, emotional intelligence and career adjustment.* Doctoral dissertation, University of Johannesburg.

Bureau of Labor Statistics. (2015). *Number of jobs held, labor market activity, and earnings growth among the youngest baby boomers: results from a longitudinal survey*: The United States.

Chin, W. S., & Rasdi, R. M. (2014). Protean career development: Exploring the individuals, organizational and job-related factors. *Asian Social Science, 10*(21), 203-215. Available at: https://doi.org/10.5539/ass.v10n21p203.

Crawford-Lee, M., & Moorwood, S. (2019). Degree apprenticeships: delivering quality and social mobility? *Higher Education, Skills and Work-Based Learning, 9*(2), 134-140.

Daft, R. L. (2015). *Organization theory and design* (12th ed.): Cengage Learning.

De Stefano, V. (2016). *The rise of the "just-in-time" workforce: On-demand work, crowdwork and labour protection in the "gig-economy".* ILO Conditions of Work and Employment Series (Vol. 7). Geneva: International Labour Office.

Deloitte. (2016). *Global manufacturing competitiveness index: report.* London: Deloitte Touche Tohmatsu Limited. Department of Industrial Policy and Promotion – DIPP. (2014). Make in India. India: DIPP.

Di-Fabio, A., & Maree, J. G. (2013). *Career construction and life design: Heralding a new beginning to career counseling in the 21st century. In A Di Fabio & JG Maree (eds). Psychology of career counselling: New challenges for a new era.* Hauppauge, NY: Nova Science.

El Mansour, B., & Dean, J. C. (2016). Employability skills as perceived by employers and university faculty in the fields of human resource development (HRD) for entry level graduate jobs. *Journal of Human Resource and Sustainability Studies, 4*(01), 39-49. Available at: https://doi.org/10.4236/jhrss.2016.41005.

Erabaddage, G. T., Sumanasiri, M., Shukri, A. B., & Ali, K. (2015). Review of literature on graduate employability. *Journal of Studies in Education, 5*(3), 75-88.

Fajaryati, N., & Akhyar, M. (2020). The employability skills needed to face the demands of work in the future: Systematic Literature Reviews. *Open Engineering, 10*(1), 595-603.

Flores, E., Xu, X., & Lu, Y. (2020). Human Capital 4.0: A workforce competence typology for Industry 4.0. *Journal of Manufacturing Technology Management, 31*(4), 687–703. Available at: https://doi.org/10.1108/JMTM-08-2019-0309.

Frey, C., & Osborne, M. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change, 114*, 254-280. Available at: 10.1016/j.techfore.2016.08.019.

Harvey, L. (2005). Embedding and Integrating Employability. *New Directions for Institutional Research, 128*, 13-28. Available at: https://doi.org/10.1002/ir.160.

Hirschi, A. (2018). The fourth industrial revolution: Issues and implications for career research and practice. *The Career Development Quarterly, 66*(3), 192–204. Available at: 10.1002/cdq.12142.

Inkson, K. (2006). Protean and boundaryless careers as metaphors. *Journal of vocational behavior, 69*(1), 48-63.

Jamaludin, R., McKAY, E., & Ledger, S. (2020). Are we ready for Education 4.0 within ASEAN higher education institutions? Thriving for knowledge, industry and humanity in a dynamic higher education ecosystem? *Journal of Applied Research in Higher Education, 12*(5), 1161-1173. Available at: https://doi.org/10.1108/jarhe-06-2019-0144.

Kazancoglu, Y., & Ozkan-Ozen, Y. D. (2018). Analyzing Workforce 4.0 in the Fourth Industrial Revolution and proposing a road map from operations management perspective with fuzzy DEMATEL. *Journal of Enterprise Information Management, 31*(6), 891–907. Available at: https://doi.org/10.1108/JEIM-01-2017-0015.

Kim, J., Torneo, A. R., & Yang, S.-B. (2019). Philippine readiness for the 4th industrial revolution: A case study. *Asia-Pacific Social Science Review, 19*(1), 139-153. Available at: https://doi.org/10.5539/ass.v17n2p31.

Lasi, H., Fettke, P., Kemper, H.-G., Feld, T., & Hoffmann, M. (2014). Industrie 4.0. *Wirtschaftsinformatik, 56*(4), 261-264.

Liboni, L. B., Cezarino, L. O., Jabbour, C. J. C., Oliveira, B. G., & Stefanelli, N. O. (2019). Smart industry and the pathways to HRM 4.0: implications for SCM. *Supply Chain Management: An International Journal, 24*(1), 124–146. Available at: https://doi.org/10.1108/SCM-03-2018-0150.

Lin, Y.-c. (2015). Are you a protean talent? The influence of protean career attitude, learning-goal orientation and perceived internal and external employability. *Career Development International, 20*(7), 753–772. Available at: https://doi.org/10.1108/CDI-04-2015-0056.

McMahon, M., Patton, W., & Watson, M. (2003). Developing qualitative career assessment processes. *The Career Development Quarterly, 51*(3), 194-202. Available at: https://doi.org/10.1002/j.2161-0045.2003.tb00601.x.

Min-Xu, Jeanne, M. D., & Suk, H. K. (2018). *The fourth industrial revolution: Opportunities and challenges department of finance, college of business administration.* Detroit, MI, USA: University of Detroit Mercy.

Miranda, J., Makitalo, N., Garcia-Alonso, J., Berrocal, J., Mikkonen, T., Canal, C., & Murillo, J. M. (2015). From the internet of things to the internet of people. *IEEE Internet Computing, 19*(2), 40-47. Available at: https://doi.org/10.1109/mic.2015.24.

Narula, S., Prakash, S., Dwivedy, M., Talwar, V., & Tiwari, S. P. (2020). Industry 4.0 adoption key factors: An empirical study on manufacturing industry. *Journal of Advances in Management Research, 17*(5), 697-725. Available at: https://doi.org/10.1108/jamr-03-2020-0039

Niles, S., Edwin, L., & Hartung, P. J. (2001). *Achieving life balance: Myths, realities, and developmental perspectives.* Columbus, Ohio: ERIC Clearinghouse on Adult, Career and Vocational Education.

Ochs, T., & Riemann, U. (2017). Industry 4.0: How to manage transformation as the new normal. *The Palgrave Handbook of Managing Continuous Business Transformation*, 245-272. Available at: 10.1057/978-1-137-60228-2.

Pejic-Batch, M., Bertoncel, T., Mesko, M., & Krstic, Z. (2019). Text mining of industry 4.0 job advertisements. *International Journal of Information Management, 50*, 416-431. Available at: 10.1016/j.ijinfomgt.2019.07.014.

Pool, D. L., & Sewell, P. (2007). The key to employability: Developing a practical model of graduate employability. *Education+ Training, 49*(4), 277-289. Available at: https://doi.org/10.1108/00400910710754435.

Rahmat, A. M., Adnan, A. H. M., & Mohtar, N. M. (2019). *Industry 4.0 skillsets and career readiness: Can Malaysian University students face the future of work? In MNNF Network (Ed.)*. Paper presented at the Proceedings of the International Invention, Innovative & Creative (InIIC) Conference, Series 2/2019, 28-37. Senawang: MNNF Network.

Rampasso, I. S., Mello, S. L., Walker, R., Simão, V. G., Araújo, R., Chagas, J., . . . Anholon, R. (2020). An investigation of research gaps in reported skills required for Industry 4.0 readiness of Brazilian undergraduate students. *Higher Education, Skills and Work-Based Learning, 11*(1), 34-47. Available at: https://doi.org/10.1108/heswbl-10-2019-0131

Rana, G., & Sharma, R. (2019). Emerging human resource management practices in Industry 4.0. *Strategic HR Review, 18*(4), 176–181. Available at: https://doi.org/10.1108/shr-01-2019-0003.

Reitman, F., & Schneer, J. A. (2008). Enabling the new careers of the 21st century. *Organization Management Journal, 5*(1), 17-28.

Ritter, S. M., Kuhn, S., Muller, B. C. N., van-Baaren, R. B., Brass, M., & Dijksterhuis, A. (2014). The creative brain: corepresenting schema violations enhances TPJ activity and boosts cognitive flexibility. *Creativity Research Journal, 26*(2), 144-150. Available at: https://doi.org/10.1080/10400419.2014.901061.

Robins Report. (1963). Oxford. Retrieved from: https://www.oxfordreference.com/view/10.1093/oi/authority.20110803100423751.

Rojko, A. (2017). Industry 4.0 concept: background and overview. *International Journal of Interactive Mobile Technologies, 11*(5), 77-90. Available at: https://doi.org/10.3991/ijim.v11i5.7072.

Rubmann, M., Lorenz, M., Gerbert, P., MANUELA, J., JAN, E., & PASCAL, H. (2015). Industry 4.0: World economic forum. *The Boston Consulting Group*, 1-20.

Rudolph, C. W., Zacher, H., & Hirschi, A. (2018). Empirical developments in career construction theory. *Journal of Vocational Behavior*. Available at: 10.1016/j.jvb.2018.12.003

Ruth, B. (2007). *Success in the protean career: A predictive study of professional artists and tertiary arts graduates.* Doctoral Dissertation, Queensland University of Technology.

Santos, R. C., & Martinho, J. L. (2019). An industry 4.0 maturity model proposal. *Journal of Manufacturing Technology Management, 31*(5), 1023-1043. Available at: https://doi.org/10.1108/JMTM-09-2018-0284.

Savickas, M. L. (2013). Career construction theory and practice. In S. D. Brown & R. W. Lent (Eds.), Career development and counseling: Putting theory and research to work (2nd ed., pp. 42-70). Hoboken, NJ: Wiley.

Schwab, K. (2016). *The fourth industrial revolution.* New York: Crown Business.

Segers, J., Inceoglu, I., Vloeberghs, D., Bartram, D., & Henderickx, E. (2008). Protean and boundaryless careers: A study on potential motivators. *Journal of Vocational Behavior, 73*(2), 212-230.

Sivathanu, B., & Pillai, R. (2018). Smart HR 4.0 – how industry 4.0 is disrupting HR. *Human Resource Management International Digest, 26*(4), 7–11. Available at: https://doi.org/10.1108/HRMID-04-2018-0059.

Sullivan, S. E., & Arthur, M. B. (2006). The evolution of the boundaryless career concept: Examining physical and psychological mobility. *Journal of Vocational Behavior, 69*(1), 19-29. Available at: https://doi.org/10.1016/j.jvb.2005.09.001.

Teng, W., Ma, C., Pahlevansharif, S., & Turner, J. J. (2019). Graduate readiness for the employment market of the 4th industrial revolution: The development of soft employability skills. *Education and Training, 61*(5), 590–604. Available at: https://doi.org/10.1108/ET-07-2018-0154.

World Development Report. (2018). World bank. Retrieved from: https://www.worldbank.org/en/publication/wdr2018.

World Economic Forum. (2016). Annual meeting. Retrieved from: https://www.weforum.org/events/world-economic-forum-annual-meeting-2016.

World Economic Forum. (2017). *The future of jobs and skills in Africa - preparing the region for the fourth industrial revolution.* Geneva: World Economic Forum.

Zang, S., & Ye, M. (2015). Human resource management in the era of big data. *Journal of Human Resource and Sustainability Studies, 3*(01), 41-45. Available at: https://doi.org/10.4236/jhrss.2015.31006.

Zheng, Z., Xie, S., Dai, H., Chen, X., & Wang, H. (2017). *An overview of blockchain technology: Architecture, consensus, and future trends.* Paper presented at the In 2017 IEEE International Congress on Big Data (BigData congress). IEEE.