African Journal of Accounting and Financial Research
ISSN: 2682-6690
Volume 7, Issue 4, 2024 (pp. 140-151)
www.abjournals.org

THE EMERGING INDUSTRIAL REVOLUTION AND THE FUTURE OF THE ACCOUNTANT IN NIGERIA

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Cite this article:

Odogu, T. K. Z. (2024), The Emerging Industrial Revolution and the Future of the Accountant in Nigeria. African Journal of Accounting and Financial Research 7(4), 140-151. DOI: 10.52589/AJAFR-KW6ISKXJ

Manuscript History

Received: 15 Sep 2024

Accepted: 13 Nov 2024

Published: 25 Nov 2024

ABSTRACT: *The study was inspired by the concern for the next industrial revolution of artificial general intelligence with respect to the career of the accountant, given the continuous and increasing automation of the accounting process and systems in the current industrial revolution. Consequently, the study adopted an ex-post facto design to fathom the career fortune of the human accountant in the emerging industrial era of artificial general intelligence, using ten years personnel cost and net assets data, from the annual accounts and reports of the 7 deposits money banks in Nigeria that had international authorization, as at 31st December, 2022. Linear regression analysis results from SPSS 20.0 disclosed that the effect of the deployment of artificial intelligence on the career of the accountant in the current industrial era is statistically low and insignificant. Accordingly, the study predictively concludes that the technological agenda of the emerging industrial revolution will not impair the job fortune of the accountant. However, the study recommends that accounting practitioners should proactively develop themselves with relevant soft skills, and deep learning, python and big data programmes in readiness for effective machine collaboration and synthesis, in the emerging industrial era.*

KEYWORDS: Artificial general intelligence, 5th industrial revolution, Career path of the accountant, Job shift, Intelligence equilibrium theory.

Article DOI: 10.52589/AJAFR-KW6ISKXJ
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www.abjournals.org

INTRODUCTION

A major concern in artificial intelligence (AI) research in accounting and other areas of human endeavour is the security of existing job in the next industrial era. Worryingly, Frey and Osborne (2013) reported about a decade ago that over 45 percent of jobs were susceptible to automation in the next ten to twenty years. The question therefore is, what would be the job fortune of the accountant in the emerging industrial revolution of artificial general intelligence? Contextually, artificial general intelligence (AGI) is the next phase of artificial intelligence where the conventional accounting system and process would be absolutely and fully automated and shifted to a more electronically digital system. Again, the fear is that the practice and career of the accountant might be taken over by super (advanced) artificial intelligence technologies and experts. This is because Alex et al. (2014) observed that even the current deployment of artificial intelligence technologies in accounting practice will eventually displace the accountant.

Alarmingly, McKinsey (2017) projected in a study titled "workforce transition" that a whopping 800 million jobs would be lost to automation by the year 2030. Analogously, Chukwudi et al. (2018) ominously adduced that just as the Automated Teller Machine (ATM) is gradually displacing the human cashier in the banking industry, AI-technologies in the accounting domain is subtly impairing the career of the professional accountant and might lead to income inequality and unemployment. Affirmatively, Greenman (2016) and Griffin (2016) similarly noted that the gradual ceding of the number crunching and data analysis role of the accountant to AI-machines in accounting practice is gradually rendering the accountant irrelevant and redundant in his profession. And appositely, Odoh et al. (2018) categorically said that AI is taking over the core financial accounting functions from the accountant. This is sickening and seems to shift the accounting career from the professional accountant to artificial intelligence experts, hence the anxiety about the fortune of the accountant in the next industrial era of artificial general intelligence.

Explicitly, the problem of and motivation for this study stems from the disturbing and disruptive observations and reports about the capacity, power and advantage of AI over human intelligence and manual (traditional) accounting, as computerized machines are basically designed to perform the three Ds which are the dull, dirty and dangerous jobs that humans cannot effectively perform (Lin et al., 2011). Muller (2012) describes the whole concept of artificial intelligence as a technological agenda in the air for the forthcoming years. More appropriately, Faggella (2016) views humans, particularly the accountant in the current era of artificial intelligence, as people moving between their fears and futurologists' visions. This is because Professor Stephen Hawking remarked that the development of full AI could spell the end of the human race, as they cannot compete with sophisticated super AI-machines due to their slow biological evolution (Cellan-Jones, 2014). On this premise, Makridakis (2017) believed that humans might have little or nothing to do in the near future when AI finally substitutes or supplements their tasks. Therefore, the objective of this study is to fathom the career fortune of the human accountant in the emerging industrial era of artificial general intelligence, as it will significantly move the hands of the accountant to the wheel of proactive and forward thinking.

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LITERATURE AND HYPOTHESIS FORMULATION

The underlying concepts, beliefs and assumptions surrounding and necessitating this study are discussed as follows:

The Future of the Accountant in the Emerging Industrial Revolution

The 4th IR is fast approaching a 5th revolution called Industry 5.0 (Dimitrakopoulos et al., 2023). Given the disruptive and displacing tendencies and characteristics of the current 4th IR of artificial intelligence, the emerging industrial era constitutes a great concern particularly to accounting scholars and practitioners (Camarinha-Matos et al., 2022). Convincingly, industrial revolutions are eras that witness modest technological capabilities that are capable of shifting an entire system. Historically, each industrial revolution alters the relationship between humans and technology, to introduce unique changes that result in new ways of perceiving, approaching and doing things (Neokleous, 2016; Brynjolfsson & McAfee, 2011). Consistently, Hunton (2002) adduced that industrial revolutions are associated with new technologies that influence inconceivable ways that affect socio-economic activities and humans. Correspondingly, research on technology and accounting revealed that technological development back from the first industrial revolution to the (current) fourth industrial revolution has impacted and reshaped the procedure, scope and job of the accountant (Ricco et al., 2002). Emphatically, the global concern of the average accountant about the technological journey to the next industrial era is the possibility of job shift and loss. Justifiably, Manyika et al. (2017) projected that in no distant time, half of all existing work activities in accounting practice will be automated by AI technologies to create new types of jobs.

Affirmatively, the future of jobs (2019) reported that as AI continues to gain momentum towards the next level of artificial general intelligence, there will be substantial changes to jobs, and that about 65% of children presently in primary schools will end up performing jobs that do not exist now, just as many of the most in-demand jobs now never existed in the past two decades. Consequently, Anning (2019) expressed concern for junior accountants, as to how they will learn and acquire the required skills to develop their careers, because AI will alter the professional and employment requirement for both practicing and prospective accountants in the near future, as Leopold (2019) predicted that about 35% of current skills exhibited now in the workplace will be different in the near future. Justifiably, an inferential look at the works of Anderson (2012), Schwab (2016), Davis (2016), Prisecaru (2016), Jee (2017), Lambert (2017), Peters (2017), Xu et al. (2018), and Philbeck and Davis (2019) insinuates that the next industrial revolution (5IR) might be highly characterized by inequality and shift in employment. As in the case of previous industrial revolutions, their assertions congruously predict that the emerging industrial revolution might destroy existing jobs and create new ones in the accounting domain.

Another concern is, will the anticipated new jobs in the emerging industrial era of AGI be enough for and practicable by accounting practitioners? It must be noted at this juncture that Davis (2016) opined that new jobs created by past industrial revolutions were relatively fewer than old jobs destroyed, and Frey and Osborne (2013) observed that only 0.5% of the workforce of the United States was employed in industries that were not in existence at the turn of the third industrial revolution. This was comparatively lower than the estimated 8.2% new jobs created in new industries during the 1980s (Short, 2012). More importantly, Davis (2016) noted that the types of jobs created in the 21st century required higher levels of education and

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specialized study, while those destroyed by the prevailing technology involved physical (routine) tasks. This explains the concern of this study, as the overall idea of artificial general intelligence in the 5IR suggests absolute automation and shift of the conventional accounting system and process to an absolute digital-driven system. There is however a need to contextually appraise the conceptual predictions and submissions about the emerging fifth industrial revolution of artificial general intelligence by scholars.

The Fifth Industrial Revolution of Artificial General Intelligence

Evidently, the exponential automation and advancement of artificial intelligence and global connectivity in the current (4^{th}) industrial revolution that was orchestrated in Germany between 2011 and 2015 is now standing on the brim and verge of a 5^{th} industrial revolution of artificial general intelligence (Jasanoff, 2015; Schwab, 2016). The fifth industrial revolution (5IR) is an innovative idea of harmonious human-machine collaborations, with a deliberate emphasis on the well-being of the society, companies, employees, customers, etc. (Noble et al., 2022). Noble et al. (2022) described it as an ecosphere of harmonious human-machine collaborations with more emphasis on moral use of technology and human intelligence than ever before. Unlike the 4^{th} IR of general technological capability, Christian (2022) viewed the 5^{th} IR as a revolution in the knowledge creation process that will speedily expand the frontier of knowledge and increase the returns on investments in research. Christian (2022) saw it as a revolution that will radically solve the present experiential problems of climate change, disease outbreak and political crisis. Accordingly, the fifth industrial revolution popularly abbreviated as "industry 5.0" can be referred to as an era of digital transformation that represents a paradigm shift from the current inconsiderate and inhumane automation towards human-centricity, sustainability and resilience.

The descriptions and definition of the fifth industrial revolution seem to spell a distinction between the current industrial era and the anticipated 5^{th} industrial revolution. Remarkably, the descriptions and definition of the fifth industrial revolution further imply that the anticipated industrial era might not be an extension of the current industrial era in objective and approach. Apparently, the distinction between the 4IR and the anticipated 5IR is the emphasis on technological efficiency and competitive replacement in the former and the expected synergistic beneficial collaboration between humans and intelligent machines in the latter (Noble et al., 2022). Figuratively, the emerging industrial era can be appositely described as the synergistic and conjugal amalgamation of humans and machines that enables them to work together and build on each other's strengths for the well-being of a broader list of stakeholders in the society (Asaram, 2023). However, there is a need to further interrogate the nature of the technology in the emerging industrial era. This is because, just as the prevailing fourth industrial revolution is characterized and driven by artificial intelligence, the fifth industrial revolution is anticipated to be characterized and driven by artificial general intelligence (AGI).

Artificial general intelligence is considered higher than artificial narrow intelligence (ANI), though considered less than Strong AI or Super AI by some scholars. This is because ANI is a is a specialized-domain-specific innovation and is considered weak and less ambitious, whereas AGI is broader in scope and application and is considered more ambitious with latest approaches such as deep learning and big data (Fjelland Noble et al., 2022). Precisely, artificial general intelligence can be contextually considered as the peak of artificial intelligence, where the accounting systems and practice are absolutely automated with robotic intelligent machines that have the (diverse cognitive) human capabilities to understand, absorb, and apply

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information throughout a wide (general) range of tasks (McLean et al., 2023; Salmi, 2023). As an anticipated ecosphere and scenario, Salmi (2023) opined that the concept of AGI is attainable within the foreseeable future, and that it will establish enough human-like-democratic characteristics for intelligence coordination and coexistence. Evidence from the views and predictions of Xu et al. (2021), Christian (2022), Camarinha-Matos et al. (2022), Alves et al. (2023) suggested that AGI is an emerging technology that will ensure unparalleled human-machine collaboration and deliberate (new) research efforts to promote workforce and societal well-being. This is contrary to the narrative in the current industrial era that informs the concern and anxiety of scholars and practitioners in the accounting domain. Accordingly, the hypothesis of this study is stated in the null form as:

H0: Artificial general intelligence will not impair the career fortune of the accountant in the emerging industrial revolution.

Theoretical Framework

This study is underpinned by intelligence equilibrium theory. This is a new theory formulated and postulated to situate the concern of the study in fathoming the career fortune of the human accountant in the emerging industrial era of artificial general intelligence. This theory argues that the fortune of the accountant's career is a function of his conscious and proactive effort to acquaint himself with relevant prevailing technological and digital skills and knowledge in the emerging AGI era to equilibrate and or cushion the speculated effect. Thus, this theory practically posits that, for the accountant to perpetually practice his career and remain relevant in the present industrial era and the foreseeable future, he must perpetually acquaint himself with relevant AI skills and knowledge at all times, to equilibrate and souse the destructive influence of AI technologies deployed in his domain of operation.

Relevantly, the word "intelligence" is the capacity for learning, reasoning, thinking, understanding, awareness, knowledge, creativity, planning and problem-solving (Goh et al., 2003). Equilibrium, on the other hand, is a state in which opposing forces or influences are balanced (Oxford Languages, n.d). Thus, intelligence equilibrium is a state in which the human ability to perceive, infer and retain information is at par with the destructive force or influence of artificial intelligence technologies and machines. Relative to accounting practice and practitioners, it is a state where the reasoning, understanding, creative and problem-solving capacity of the accountant balances the creative power and application requirement of prevailing AI technologies deployed in the accounting domain. It is a state where human intelligence and artificial intelligence, like the two parts of a scissors, relate mutually to facilitate and enhance accounting practice.

This theory is empirically justified by the studies of Oladipupo and Ajabe (2013), Harris (2014), and Murungi and Kayigamba (2015). Evidence from the findings, conclusions and recommendations of the empirical studies of these scholars summarily imply that the application of AI in the accounting process requires and implies urgent and constant training and retraining, and it is the responsibility of the accountant to develop and acquaint himself with relevant AI techniques and skills to equilibrate its negative effect on the career of the accountant. They explicitly expect the accountant to continually and progressively hone his skills to sustain his career and relevance in his domain of practice. Conclusively, the intelligence equilibrium theory pertinently proposes that the leeway for existing and prospective practitioners in the accounting profession to escape the looming destructive force

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of artificial general intelligence in the emerging industrial revolution is to take a proactive-innovative step away from the trench and stronghold of the founding tenets, principles, methods, techniques, conventions and concepts of the accounting practice and profession, toward a sustainable contemporary domain relevant technological concept and innovation, for professional and career resilience and survival.

Empirical Review

Remarkably, research on the 5th industrial revolution or artificial general intelligence and the job of the accountant lacks empirical literature. However, Crnobrnja et al. (2023) did a systematic empirical literature exploration titled digital transformation towards industry 5.0, to identify, synthesize and analyze gaps and data in existing studies. The study adopted and used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) design and method. The study followed a systematic process of identifying, screening, and inclusion of relevant data, concepts and theories. The study appraised 26 publications written by 83 different authors from European, Asian, American and Oceanian geographical regions of the globe. Empirical evidence from the 26 studies explored indicated that all the authors submitted that Industry 5.0 epitomizes a paradigm shift from a technology-centred approach to a human-centred approach that integrates human experience and skills with contemporary technologies to produce smarter and more resilient systems, as against the absolute reliance on advanced automation technologies. Importantly, the analytical review also discovered that Russia, Brazil and the USA are the top proponents and advocates of the industry 5.0 paradigm, with China and India showing great interest. The study further revealed that new research endeavors in the emerging industrial era will be focused on studies that prioritize human-machine collaborations. More so, the study discovered that sustainability in manufacturing endeavors in the emerging industrial era needs collaborative participation and co-responsibility of several stakeholders, such as manufacturers, suppliers, customers, and regulatory bodies.

Furthermore, McLean et al. (2023) also did an empirical study to systematically ascertain the risks associated with artificial general intelligence, using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) design and approach. The study consulted 16 articles that are related to AGI in terms of philosophy, model, technique, current framework and process. The findings of the study revealed that artificial general intelligence machines, models and techniques are capable of separating themselves from the control of their human owners and managers, if carelessly allowed to operate under unsafe, immoral and unethical goals and conditions. This implies that AGI machines and techniques are a potential threat to the job function and security of the human accountant if deliberate timely control measures are not premeditatively taken to check and equilibrate their potency. This is perhaps the re-directional human-machine collaborative and synthesizing advocacy and objective of the emerging industrial era, which of course explains the underpinning theory of this study. The study further found some limitations in AGI literature, such as inadequate peer reviewed articles, lack of specific domain risk modelling techniques, lack of specific definitions of AGI functionality and lack of standardized AGI terminology. In conclusion, the fifth industrial revolution and the perception of artificial general intelligence are philosophical, perceptional and notional, and therefore lack good empirical studies, which is a gap for further studies.

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METHODOLOGY

This study adopted an ex-post facto research design to fathom the career fortune of the human accountant in the emerging industrial era of artificial general intelligence in Nigeria. The research design covers a (ten-year) period of 2013 to 2022, and is suitable because the aim is to predict the effect of AGI on the career of the human accountant, based on the prevailing situation in the banking sector of Nigeria. The study began in 2023, and judgementally conducted a census on all deposit money banks (DMBs) with international authorization in Nigeria as at 31st December, 2022, to obtain desirable (secondary) data on personnel cost and net assets. The choice of DMBs with international authorization was premised on and informed by their international status and the possibility of greater deployment of AI technologies for international transactions.

Personnel cost was used to mirror the current level of engagement of human labour in the 4th IR to predict the career fortune of the accountant in the 5th IR, while net assets was used to reflect the advantages and progressive deployment of AI technologies relative to firms' efficiency and growth in the 4th IR, as a proxy for AGI in the 5th IR. This was premised on the notion that if the change in personnel cost in the financial statements of the selected deposit money banks over the period is not proportional with the net assets for the period, then deposit money banks are reducing human labour costs in favour of AI technologies due to their efficiency and cost advantage.

Data were collected from the annual accounts and reports of DMBs published and documented in the Fact Book of the Nigerian Exchange Group (NGX) and the Statistical Bulletin of the Central Bank of Nigeria (CBN). The study used a linear regression analysis to test the hypothesis with SPSS 20.0, under the following model:

$PCOS = f(NASS)$……. …….. (1)

$PCOS = \beta 0 + NASSt\beta 1 + \mu t$……..…….. (2)

where

PCOS = Personnel Cost (as proxy for Career Fortune of the Accountant in the 5th IR),

NASS = Net Assets (as proxy for AGI in the 5th IR), and

μt = Error term.

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DATA PRESENTATION AND ANALYSIS

The regression analysis on secondary data extracted from the annual accounts and reports of the seven DMBs with international authorization as at 31st December, 2022 (Access Bank Plc., Fidelity Bank Plc., First City Monument Bank Limited, First Bank of Nigeria Limited, Guaranty Trust Bank Plc., United Bank for Africa Plc., and Zenith Bank Plc.) are presented in Table 1:

Table 1: Regression Analysis of 10 Years Personnel Cost and Net Asset

	B	Std. Error	β	t	Sig.
(Constant)	8524342.252	2625343.888		3.280	.001
NASS	.032	.017	.154	1.890	.064
R=.154	**R^2 = .024**		**F=3.55**		

Source: *Author's Computation from SPSS 20.0 (2024)*

a. Dependent Variable: PCOS
B = Unstandardized Coefficients, β = Standardized Coefficients

Test of Hypothesis

The null hypothesis of the study was tested with Linear Regression Analyses obtained from SPSS 20.0 test results in Table 1. The decision rule is to reject the null hypothesis if the p-value is less than the predetermined alpha value of 0.05, and to accept null hypotheses if the p-value is greater than the alpha value of 0.05.

Table 1 shows a 10-year inferential statistics of personnel cost and net assets of the fifteen quoted deposit money banks in Nigeria, as at 31st December, 2022. The result indicates that in the ten-year period, the R^2 which is the coefficient of determination that measures the proportion of variation in the dependent variable (explained by the independent variable) is 0.024 (2.4%). This implies a 0.024 (2.4%) variation in job function and shift by the current deployment of AI technologies (as a predictive proxy for AGI) in accounting practice. This indicates a positive effect though statistically low and insignificant, and predictively implies that the deployment of AGI technologies in accounting practice will not significantly impair the job fortune of the accountant in the next industrial revolution.

Furthermore, the beta coefficient (0.15) indicates that the current deployment of AI technologies (as a predictive proxy for AGI) has a positive effect on the job function and career of the accountant in the banking sector of Nigeria. However, the p-value (0.06) is greater than the chosen alpha value of 0.05, and is not statistically significant. Moreover, the t-value (1.89) is also not statistically significant ($t = 1.89$, $p > 0.05$). These suggest an acceptance of the null hypothesis of this study, and implies that, by extension, "artificial general intelligence will not impair the career fortune of the accountant in the emerging industrial revolution."

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DISCUSSION OF FINDINGS

The findings drawn from the R^2 and beta coefficient in Table 1 indicate that the current deployment of AI technologies (as a predictive proxy for AGI) in accounting practice, which though positively affects the career of the accountant, is statistically too low and insignificant to impair his career, and therefore might not significantly affect the career fortune of the accountant in the fast emerging industrial era, considering the degree of effect from its commencement to date, and the (close) predicted time of commencement of the next industry era. This is in line with the conceptual postulation and projection of Noble et al. (2022) which says the fifth industrial revolution is an innovative idea of harmonious human-machine collaborations, with a deliberate emphasis on the well-being of the society, companies, employees, customers, etc. The findings of this study further confirm the conceptual supposition of Asaram (2023) which says the technological approach and model of the fifth industrial revolution is to enable humans and machines to work together and build on each other's strengths for the well-being of a broader list of stakeholders in the society. They also validate the views and predictions of Salmi (2023) and Alves et al. (2023) which concisely state that the AGI concept in the fifth industrial revelation is envisaged to understand, absorb, and apply information throughout a wide (general) range of tasks, as well as to ensure unparalleled human-machine collaboration and deliberate (new) research efforts to promote workforce and societal well-being.

Ultimately, the p and t values in the linear regression outcome in Table 1 which required the acceptance of the null hypothesis of this study, that says, “artificial general intelligence will not impair the career fortune of the accountant in the emerging industrial revolution,” is in agreement with the empirical findings and position of Crnobrnja et al. (2023) which propose that the fifth industrial revolution will occasion a paradigm shift from a technology-centred approach to a human-centred approach that integrates human experience and skills with contemporary technologies to produce smarter and more resilient systems, and that new research endeavors in the emerging industrial era will be focused on studies that prioritize sustainability and collaborative participation and co-responsibility of several stakeholders. However, the null hypothesis of this study contradicts the empirical results of McLean et al. (2023) which indicate that artificial general intelligence machines, models and techniques are capable of separating themselves from the control of their human owners and managers, and are therefore a potential threat to the job function and security of the human accountant. This further explains the problem and motivation of this study. Nevertheless, AGI machines, models and techniques would not be destructive if they are carelessly allowed to operate under unsafe, immoral and unethical goals and conditions, and the technological agenda and focus of the emerging industrial era is in tandem with the equilibrium theory of this study which proposes and advocates for the collaboration and synthesis of human and machine intelligence and strengths.

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CONCLUSION AND RECOMMENDATION

From the findings and the analytical discussions of this study, which summarily state that the effect of the deployment of artificial intelligence on the career of the accountant in the current industrial era is statistically low and insignificant, this study predictively concludes that the technological agenda of the emerging industrial revolution will not impair the job fortune of the accountant. However, this study recommends that accounting practitioners should proactively develop themselves with relevant soft skills and deep learning, python and big data programmes in readiness for effective machine collaboration and synthesis, in the emerging industrial era.

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