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THE MODERATING ROLE OF INTELLECTUAL CAPITAL ON THE RELATIONSHIP BETWEEN ARTIFICIAL INTELLIGENCE AND EMPLOYEE PERFORMANCE OF THE COMMERCIAL BANKS IN NIGERIA

Original
Research

Keywords

Artificial Intelligence (AI);
Intellectual Capital (IC);
Human Capital (HC);
Employee Performance (EP);

Classification-JEL

D24; E24; O31; O34

Abstract

The world is rapidly changing due to technological advancement, which is affecting how organizations operate and impacting on corporate performance. “Artificial intelligence” is an emerging topic that has gotten a lot of attention globally. However, there is scarcity of literature on the subject, particularly in developing countries. This paper seeks to investigate the effect of “artificial intelligence” (AI) on employee performance (EP) of the commercial banks in Nigeria, using intellectual capital (human capital) as a moderator. A survey questionnaire was administered to 312 bank employees randomly. SPSS was employed to carry out a demographic statistic to have a better understanding and summary of the data. Additionally, a structural equation model (PLS-SEM) was employed and SmartPLS 3 professional version is employed for the analyses and testing of the formulated hypotheses. Findings prove a positive and significant correlation between artificial intelligence and employee performance. Also, intellectual capital (human capital) positively and significantly moderates the nexus between artificial intelligence and employee performance.

INTRODUCTION

The world is at a stage where technological advancements, ideas and inventions are rapidly evolving. John McCarthy coined the term Artificial Intelligence to describe the study of inventing and developing computer-based solutions that demonstrate some sort of intelligence for doing human tasks (Simon, 1980). The development of computer systems similar to a human intellect is the primary goal of “artificial intelligence” (O’Brien, 2003). “Artificial intelligence (AI) as a branch of computer science” focused on the study and development of intelligent computer systems, referred to as machine intelligence. Artificial Intelligence (AI) is a combination of “three cutting-edge technologies: machine learning, cognitive computing, and natural language processing” that allows machines to reason, comprehend, and execute tasks traditionally performed by humans, which has a significant impact on human existence (Mangani, 2017). Artificial intelligence is a “simulation of human intelligence” which assists in developing smart machines able to execute human tasks smartly. When it comes to thinking and making decisions, AI can be said to behave similarly to a human brain.

Evidence suggests that AI has the potential to contribute more than \$15 trillion to the global economy, with a 14 percent rise in global GDP by 2030 (Singh and Sharma, 2011). According to Oxford University research, “47% of jobs could be automated by 2033” (Ramaswamy, 2017). Furthermore, about 50% of financial services and insurance jobs dealing with data collection and processing are very likely to be enhanced by AI (He and Guo, 2018). “A report by Organization for Economic Co-operation and Development (OECD, 2016) shows that 9% of jobs could become automated in 21 countries”. A report by (Manyika, Lund, Chui, Bughin, Woetzel, Batra, Ko, Sanghvi, 2017) “predicts a loss of 5% of jobs caused by AI”. Therefore, AI remains an important subject that cannot be overstated.

The banking world is changing faster than ever before, with artificial intelligence (AI) leading the way in driving change and transformation in the financial sector (Schroer, 2020). In the banking industry, AI has been employed in areas such as Fraud detection and control, operational performance, tailored financial services, voice-aided banking, data-driven loaning decisions, customer assistance, and so on (Kaur, Sahdev, Sharma, Siddiqui, 2020; Noonan, 2018; Anant 2020). As traditional banking evolves, more banks have adopted new technologies to cut operating costs and improve efficiency (Jewandah, 2018). AI has been around for years, ever since John McCarthy

described it as “the science and engineering of making intelligent machines”. However, AI has only recently experienced rapid evolution and piqued the interest of the Banking Sector (Jewandah, 2018).

AI is an emerging field that is gaining momentum in most part of world. However, the literature on the subject matter remains scarce, particularly in developing/underdeveloped countries. From employees’ perspective, this study will explore how AI contributes to employee outcomes using intellectual capital as a moderator while focusing on the Nigerian banking sector. This study will be among the few to provide empirical evidence on the nexus between AI and employee performance, particularly in a case of a developing country. Thereby, filling a gap in literature.

Objectives

The study seeks to explore the application of AI in the banking sector. Specifically, this study will

- Investigate the nexus between artificial intelligence and employee performance, using the Nigerian commercial banks as a case study.
- To look at the effect of intellectual capital on employee performance.
- To examine the moderating role of “intellectual capital” on the nexus between artificial intelligence and employee performance.

The empirical framework illustrated in figure 1 further demonstrates the correlation between artificial intelligence and employee performance, while human capital moderates the existing relationship.

LITERATURE REVIEW

According to Singh and Sharma (2011), the most effective strategy to boost productivity is to minimize inefficiencies. The operational efficiency of enterprises can be enhanced with the application of AI (Russell and Norvig, 2016). Improving production efficiency is critical for improving performance and can be accomplished using advanced technology such as AI.

Ryzhkova, Soboleva, Sazonova, and Chikov (2020) revealed that implementing AI allows workers to boost the pace of service and save time for routine processes, consequently improving bank employee productivity. However, potential challenges such as technical breakdowns, errors, and a lack of readiness for change pose some barrier. Mor and Gupta (2021) investigated the impact of (AI) on the technical efficiency of Indian commercial banks and discovered that the application of AI in the Indian banking sector greatly reduced technical inefficiency, hence, improving the performance. According to Wisskirchen, Biacabe, Bormann, Muntz, Niehaus, Soler, Brauchitsch (2017), the

adoption of AI may result in a significant loss of jobs for individuals who lack the necessary skills to perform efficiently and effectively in the changing environment. Conversely, AI creates new prospects for businesses and individuals because the use of intelligent IT systems aids in improving efficiency and helps reduce the cost and time required to spend on the product or service. Employees may perceive AI as a threat, but once adopted, there are numerous benefits to new technology that employees can utilize to improve their job performance (Ryzhkova et al. 2020). Research by Soni, Sharma, Singh and Kapoor (2018) on the paper "Impact of artificial intelligence on business" indicated that a firm's use of AI will "increase productivity, time and cost efficiency, human error reduction, faster business decisions, customer preference, predictions, and sales maximization".

Similarly, Elegunde and Shotunde (2020) explored how AI affects corporate performance in the banking industry, in the context of employee efficiency and customers satisfaction. Using a survey research design, 200 respondents were randomly selected for the purpose carryout the analyses. According to the findings, the application of AI has been shown to improve employee performance, customers satisfaction and overall business performance.

According to Neelam (2021), the adoption and application of AI pose both opportunities and threat as shown in the table 1.

Intellectual Capital as a Moderator

According to "resource-based theory", IC plays a key role in improving business performance (Roos, Edvinsson, and Dragonetti, 1997). IC is a type of intangible asset focusing on employee knowledge, expertise, and brainpower that increases the organization's potential to generate profits (Bin Ahmad and Mushraf, 2011). A company's intellectual capital represents the power of its employees' ideas and their capacity to be innovative and consequently affects the company's future growth. (Choudhary, Deswal and Philip, 2013). Skandia (1994) "defines intellectual capital as the sum of intangible" value, which includes "human capital, structural capital, customer capital, and relational capital". IC is "the value of an employee's knowledge, skills, business training", or any other important information that could give the firm a "competitive advantage" (Edvinsson and Sullivan, 1996).

The concept of "intellectual capital" is linked to knowledge and the generation of value (Vishnu and Gupta 2014). Although such intangible assets are not completely reflected in a company's financial statements, they are still critical to its success. The inclination or capability of a firm to be innovative, build new processes, develop new technologies, and

introduce new procedures and programs is referred to as intellectual capital. With global trends changing, information and expertise/knowledge are two instruments that can aid any organization to acquire a competitive edge (Aftab, Aslam, and Majeed, 2021). Knowledge as an asset is critical in the development and implementation of a firm's strategy, which improves efficiency, thereby, gaining a competitive advantage. There is an assumption that "knowledge and brainpower" trump physical assets as the fundamental source of economic advantage (Youndt, Subramaniam, and Snell, 2004). Stewart model of Intellectual capital in 1997 proposed that intellectual capital consist of four vital intellectual materials as demonstrated in figure 2.

Scholars have previously demonstrated that intellectual capital influences employee performance (Tastan and Davoudi, 2015; Seleim, Ashour, and Bontis, 2007; Kemboi, 2015; Santos-Rodrigues, Dorrego, and Jardon, 2010; Shrader and Siegel, 2007; Hsu, Yeh-Yun Lin, Lawler, and Wu, 2007; Rehman, Chaudhary, Rehman, and Zahid, 2011; Selvarajan, Ramamoorthy, Flood, Guthrie, MacCurtain, and Liu, 2007; Wang and Chang, 2005).

Intellectual capital comprises of different components, such as "human capital, relational capital, and structural capital" (Aftab et al., 2021), however this study will solely focus on human capital. It includes components such as employee skills and knowledge. Most prior studies underlined the relevance of human resources in value creation (Bontis, 2001; Maciocha and Kisielnicki, 2011) Therefore, this study opted to concentrate on human capital.

Hypotheses

Based on the empirical review of the intended research and the research objectives, the hypotheses are therefore developed as follows:

- **Hypothesis 1:** Artificial intelligence significantly affects employee performance of the Nigerian commercial banks.
- **Hypothesis 2:** Human capital significantly affects employee performance of the Nigerian commercial banks.
- **Hypothesis 3:** Human capital moderates the relationship between artificial intelligence and employee performance of the Nigerian commercial banks.

RESEARCH METHODOLOGY

This study is centered on Nigerian Commercial Banks to better understand how AI affects employee performance. A survey questionnaire is used as the primary data source, and it is administered electronically to Bank employees

using Google Forms. The study used a likert scale (multiple choice) of 5 options, with a value of 5 denoting “strongly agree” to “strongly disagree”, which is represented by 1. A sample of 312 employees were chosen at random. To have a better understanding and summary of the data, a demographic statistic with the use of SPSS is carried out. This study adopts a structural equation model (PLS-SEM) in carrying out the analysis. After collecting valid data from 312 bank employees, the study considers PLS-SEM to be suitable for structural equation modeling. The “measurement model” is used to test the reliability and validity of the constructs, whereas the “structural model” is used to test the hypotheses under investigation. SmartPLS 3 professional version is used in the data analysis.

Demographic Statistics

Table 2, 3 and 4 gives a summary of the data used for better understanding. According to the survey, the descriptive statistics for gender show that is 63.8 percent of respondents are male with a sum of 199, while 36.2 percent are female with a total of 113. Over 60 percent of the respondents fall between the age of 18 to 30 while the rest of the respondents are over 30 years and above. A large percentage of the respondents (74.7%) have one to 5 years of experience working in the bank, while the rest have above 6 years of bank experience.

Reliability Statistics

“Cronbach's alpha reliability (Cronbach, 1951)” being one of the most extensively used measures of “reliability in social sciences”, evaluate the consistency and reliability of the measuring scale. According to (Hair Jr, Sarstedt, Ringle, and Gudergan, 2017), a reliability coefficient (alpha) “greater than or equal to” 0.7 is acceptable. As indicated in the table 5, the reliability test with a score above 0.7 proves that all items are reliable and valid to measure the effect of artificial intelligence on employee performance.

Similarly, the square root of AVE “(average variance extracted)” for a particular construct should be higher than its correlation with all other constructs under study (Fornell and Larcker, 1981). As illustrated in table 6, the square root of AVE for artificial intelligence is 0.798, which is higher than its “correlation with other constructs”. The same applies to employee performance and human capital. Thus, discriminant validity is established.

Structural model

Path coefficients are used to examine the relationship of the hypotheses as indicated in table 7. Following (Hair, Hult, Ringle, and Sarstedt, 2014), Bootstrapping incorporated 5000 samples for the path coefficients.

Where:

AI= Artificial Intelligence

EP= Employee Performance

HC= Human Capital

The significance of the correlation is determined by using both t statistics and p values. According to Hair et al. (2014), the “critical level of t statistics is 1.96. Whereas p values less than 0.005 are considered as significant”.

Hypothesis 1: Artificial intelligence has a significant effect on employee performance of the Nigerian commercial banks.

As shown in table 7 below on the relationship between AI and EP, the t statistics is at 10.938 which is greater than the significance level of 1.96. The p-values of 0.000 is also less than the significant level of 0.005. By implication, artificial intelligence does significantly affect employee performance. Therefore, an increase in the adoption and implementation of artificial intelligence by an organization will lead to an increase in performance.

Hypothesis 2: Human capital significantly affects employee performance of the Nigerian commercial banks.

The relationship between human capital and employee performance has a t-statistics of 3.064 above the significant level of 1.96, with a p-value of 0.002. This shows that human capital does significantly affect employee performance of the commercial banks in Benue state of Nigeria. An increase in employee knowledge, training and skills will lead to an increase in productivity and their overall performance.

Table 8 shows the relevance and the effect size of artificial intelligence on employee performance. The R2 value of 0.25 represents a “weak effect”, 0.50 R2 value stands for “moderate effect”, while 0.75 R2 value shows a “strong effect” on the endogenous construct. The R2 value for employee Performance is 0.597 is considered a strong impact as it is higher than 0.50 (moderate impact). Similarly, the moderating effect of human capital with R2 value of 0.615 represents a strong effect as is above 0.5 and closer to 0.75, as recommended by Hair, Sarstedt, Ringle, and Mena (2012).

Moderating effect

Hypothesis 3: Human capital moderates the relationship between artificial intelligence and employee performance of the Nigerian commercial banks.

The moderating effect of human capital on the relationship between artificial intelligence and employee performance as presented in table 9 shows a t statistic of 3.823 which is greater than the significance level of 1.96. The p-values of 0.000 is also less than the significant level of 0.005. By implication, human capital does significantly

moderate the relationship between artificial intelligence and employee performance. The structural model representing both the direct and the indirect measurements of the effects of artificial intelligence on employee performance is further illustrated in figure 3 and 4.

CONCLUSION AND POLICY IMPLICATIONS

The current study has provided evidence on the direct and indirect impact of artificial intelligence on the employee performance of the commercial banks in Benue state of Nigeria. This study is paramount since limited empirical evidence exists, particularly in the developing/underdeveloped countries around the world. The direct effect of artificial intelligence on employee performance is significantly positive. By implication, an increase in the adoption and implementation of “artificial intelligence” in the banking sector will increase employee performance, creating corporate value. The result also shows that human capital positively and significantly impacts the relationship between artificial intelligence and employee performance. Knowledge, expertise, training, skills among others are key in the use of technology. Therefore, this study recommends that banks should invest generously in the adoption of “artificial intelligence” in their business operations. Investment in capacity building and employee training should be embraced and incorporated as a business strategy to reap the full benefits that add value to the firm and give a competitive advantage.

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LIST OF TABLES & FIGURES

Table 1
Pros and Cons of AI

Pros of AI	Cons of AI
Helps in problem solving	It is expensive
Knowledge can be spread easily	Time consuming
Minimum error	Creativity depends upon the programmer
Tasks can be completed faster	Can lead to increase in unemployment
Multiple functions can be performed at the same time	AI in wrong hands can create a huge destruction
It can be programmed to work for a longer period	AI lacks in providing creative responses

Source: Neelam (2021)

Table 2
Gender statistics of the respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	199	63.8	63.8	63.8
Female	113	36.2	36.2	100.0
Total	312	100.0	100.0	

Table 3
Age statistics of the respondents

Years	Frequency	Percent	Valid Percent	Cumulative Percent
18 to 30	189	60.6	60.6	60.6
31 to 40	121	38.8	38.8	99.4
1 & above	2	.6	.6	100.0
Total	312	100.0	100.0	

Table 4
Experience statistics of the respondents

Years	Frequency	Percent	Valid Percent	Cumulative Percent
1 to 5	233	74.7	74.7	74.7
6 to 10	67	21.5	21.5	96.2
11 & above	12	3.8	3.8	100.0
Total	312	100.0	100.0	

Table 5
Reliability of Instrument

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Artificial Intelligence	0.714	0.727	0.839	0.636
Employee Performance	0.795	0.800	0.879	0.709
Human Capital	0.731	0.730	0.848	0.650

Table 6
Fornell-Larcker Criterion

	Artificial Intelligence	Employee Performance	Human Capital
Artificial Intelligence	0.798		
Employee Performance	0.759	0.842	
Human Capital	0.667	0.614	0.806

Table 7
path coefficient for direct effect

Hypotheses	Relationship	Original Sample (O)	Standard Deviation	T Statistics	P Values
H1	AI -> EP	0.630	0.058	10.938	0.000
H2	HC -> EP	0.194	0.063	3.064	0.002

Table 8
Effect Size and Predictive Relevance

Endogenous Construct	R Square	R Square Adjusted	Effect size
Employee Performance	0.597	0.595	Strong
Human capital	0.615	0.611	Strong

Table 9
path coefficient for indirect effect

Hypotheses	Relationship	Original Sample (O)	Standard Deviation	T Statistics	P Values
H3	AI_HC -> EP	-0.116	0.030	3.823	0.000

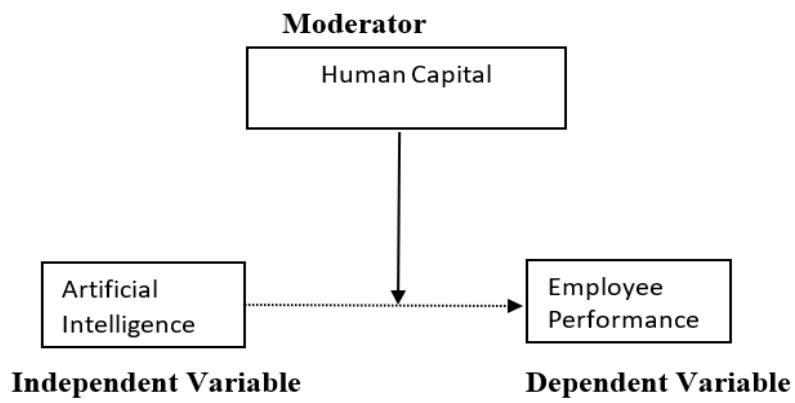


Figure 1
Conceptual Framework
 Source: Own composition (2022)

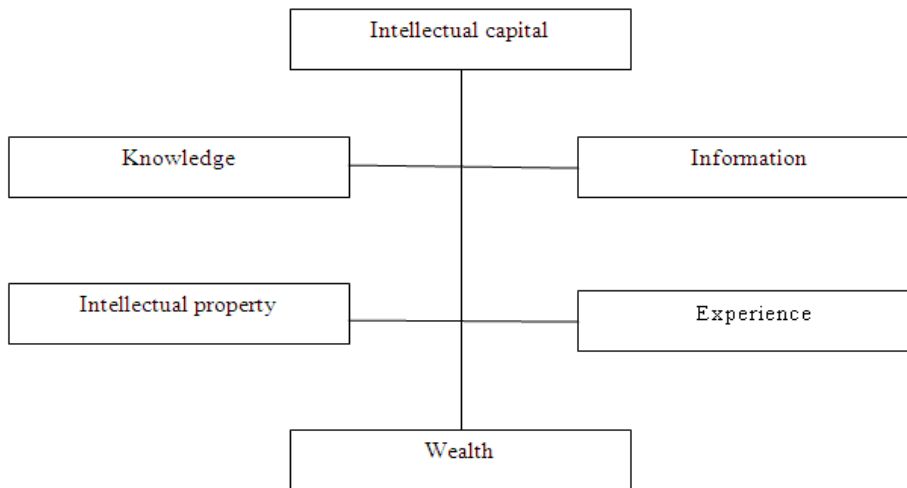


Figure 2
Stewart model of Intellectual capital
 Source: Stewart, 1997

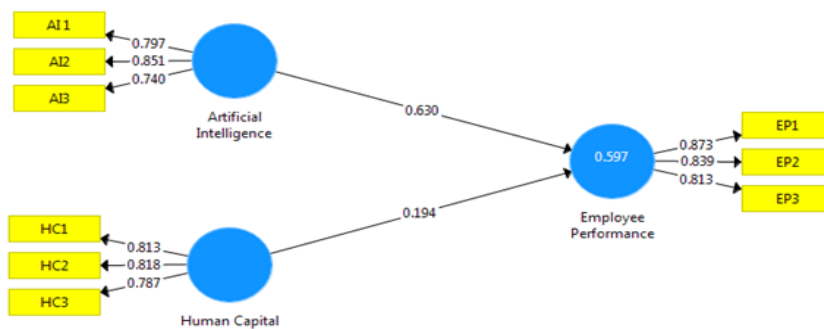


Figure 3
Structure model

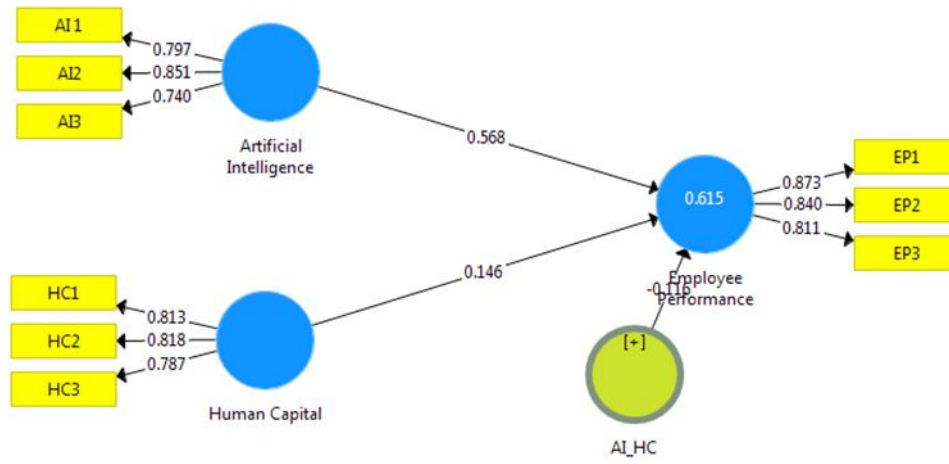


Figure 4
Structure model