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Artificial Intelligence and Operational Efficiency of Deposit Money Banks in Lagos State, Nigeria

Felicia S. Adeyemo[1*] and Grace Okoronkwo[2]
[1]Department of Business Administration, Caleb University, Imota, Lagos State, Nigeria
[2]Federal Institute of Industrial Research, Oshodi, Lagos State, Nigeria

*Corresponding author
Email: feliciaadeyemo@yahoo.com

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Abstract

This chapter examines the effect of Artificial Intelligence (AI) on the operational efficiency of deposit money banks in Lagos State, Nigeria. The study identified the types of AI technologies that are used by banks and examined the impact of the different types of technologies on the operational efficiency of five deposit money banks, namely: First Bank of Nigeria, United Bank of Africa, Guaranty Trust Bank, Access Bank, and Zenith Bank, all public liability companies with headquarters located in the Lagos metropolis. The study adopted a survey research design. Copies of the questionnaire were administered to 450 regular employees selected randomly from the five banks. The study revealed that deep learning ($\beta = 0.400$, $t = 5.445$, $p<0.05$); Automation ($\beta = 0.202$, $t = 2.143$, $p<0.05$) and fraud detection ($\beta = 0.460$, $t = 7.095$, $p<0.05$) had positive and significant effects on the operational efficiency of the selected deposit money banks, while chatbots had a positive but insignificant effect. The study concluded that artificial intelligence significantly contributed to the operational efficiency of the selected deposit money banks in Nigeria. The authors recommend that deposit money banks should effectively make use of artificial intelligence, especially deep learning, automation, and fraud detection, to improve organizational efficiency.

Keywords: *Artificial intelligence; Automation; Deep learning; Operational efficiency*

1.0. Introduction

Artificial intelligence (AI) is an intelligence feature that presents a more efficient capability in information processing. It is an extremely useful tool for identifying and solving abstract and complex problems (Reim, Aström, & Eriksson, 2020). Artificial intelligence is playing a role in every sector, making the world smarter and more innovative in terms of providing solutions to various problems in many industrial and service sectors. Sensors, cameras, and cyber security in the security sector; robots doing office work, self-driving cars, mapping out routes as well as traffic detection using Google Map, global positioning system (GPS) units, price estimation in hail rides like Uber and Bolt in the transportation sector; and the detection of cancer and other ailments in the health sector among others. These machines have been programmed to perform tasks that could previously only be performed by humans equipped with specialized knowledge and possessing special abilities acquired through extensive special training. This has ushered in an era of rapidly spreading artificial intelligence technologies with a rapidly increasing impact on business strategies and business value creation (Elegunde & Shotunde, 2020; Soni, Sharma, Singh & Kapoor, 2019; Wisskirchen, Biacabe, Bormann, Muntz, Niehaus, Soler & Brauchitsch, 2017).

Currently across the globe, business operations as well as their management have found their day-to-day operations being shaped by the era of Big Data. Artificial intelligence works to leverage the use of large data sets to promote business intelligence and decision making in specific areas of business processes, market trends, and consumer behaviour in order to promote informed decision making and ultimately give a competitive edge. Literature is scarce on the effects of artificial intelligence on business processes in many sectors in developing countries. The Nigerian banking sector is one of the largest service sectors in the country and probably the most influential in terms of potential to contribute to economic development. This study intends to contribute to the literature by examining the impact of artificial intelligence on the operational efficiency of deposit money banks in Lagos State. This is with a view to informing management practice and public policy strategies in the Nigerian banking sector.

2.0. Literature Review

Artificial intelligence (AI) has been described as an intelligent system that is created to use data analysis, and observations to perform tasks without needing to be programmed to do so (Antonescu, 2018). It is also defined as the intelligence that is exhibited by an artificial entity in order to solve complex problems, and such a system is generally assumed to be a computer or machine (Borana, 2016). On their own part, Plastino & Purdy (2018) describe artificial intelligence as a category of technology which involves a capital–labour hybrid with the ability to self-learn, continuously improve, and be rapidly scaled-up.

One of the advantages of artificial intelligence is that its decisions are based on facts and not on emotions. This comes as an advantage given that even with the utmost efforts, human decisions can be negatively affected by emotions. In addition, unlike humans, machines do not need any sleep and, as such, overcome the inherent disadvantage that comes with fatigue in human beings. As such, it enables the easier spread of knowledge given that once an artificial mind gets trained for a specific thing, it can be easily copied to others, thereby reducing the time that would have been wasted in the passing on of knowledge to other humans through training.

As a disadvantage, artificial intelligence is not able to creatively respond to prompts. Also, they are unable to explain the reason behind any decision or action. Presently, artificial intelligence cannot on its own, provide a solution to a particular problem. Further to this, should there be any form of malfunctioning, artificial intelligence may produce wrong solutions. Due to the fact that AI cannot explain the reason for any decision, blind reliance on AI may result in problems. Another challenge resulting from the emergence of artificial intelligence is that, in the wrong hands, AI can be used to

cause mass-scale destruction. A major problem is that with the development of AI comes the possibility that it would substitute humans in every field, thus leading to a high rate of unemployment, thereby causing depression, increased crime rate, and poverty. It is also of major concern that in fields like medicine, where the human touch is considered indispensable, machines may possibly never be able to replace humans.

2.1. Types of Artificial Intelligence

a) Deep learning (DL): is an advanced type of machine learning that consists of multiple artificial neural network layers, providing high-level abstracts for data modelling (Le Cun, Bengio & Hinton, 2015).With the introduction and popularity of Financial Technologies (FinTech) in recent years, the prevalence of the use of deep learning in finance and banking services is being embraced (Huang, Cha & Cho, 2020).
b) Chatbots: The emergence of chatbots has led to a change in the bank-customer interface and communication. Chatbots use artificial intelligence tools for processing natural language, which are configured to read, process, and analyse large amounts of information (Suhel, Shukla, Vyes & Mishra, 2020). With the aid of these artificial chatbots, people's interactions, including past conversations, are used to improve and expand databases. These chatbots work to answer unclear or ambiguous questions and can also generate responses on their own with the aid of processing technology. Chatbots' functions include retrieving knowledge to assist in providing customers with required information, especially as it regards the provision of specific products or services (Joshi, 2018).
c) Automation: in banking refers to the adoption of artificial intelligence in banking activities or business processes in order to increase efficiency in operations while maintaining competitiveness. Automation can be described as that arrangement whereby machines are allowed to carry out business operations and, in this case, banking functions without the interference of humans. This is accomplished by utilizing machines rather than humans in banking processes. Automation allows banks to enter and also grow in new markets.
d) Fraud Prevention: With the introduction of credit cards, mobile banking, and online payments in banking services, scammers have devised various means of exploiting people by stealing their information in order to use them to make unauthorized purchases and/or movements of large amounts of money. The various activities of banks and other e-commerce websites to try to identify and stop the reoccurrence of these fraudulent transactions are described as "fraud detection" (Pradheephan & El Gayar, 2019). The damage caused by fraud cannot be overemphasized. Credit card fraud, a form of fraud involving the use of fake or stolen credit card information to cause financial harm to original account holders or sellers, has increased drastically in recent times. The Nilson report (2016) states that the total loss accruing from credit card fraud in the world as at 2015 was $21.84 billion, with a projected rise to $32 billion in 2020 (Nilson Report, 2016).

2.2. Types of Operational Efficiency

Operational efficiency is described as the effective deployment of resources so as to produce an organization’s required results and also meet operational goals on schedule (Malderna & Kreling, 2017). Kigundu (2015) refers to operational efficiency as the capability of an organisation to deliver high quality products and services in the most cost-effective manner. The operational efficiency concept describes the results in improving operating cash flows, increasing the organization’s total asset turnover, and effective reductions in the operating risk of the organization (Akyer, 2012). Operational efficiency refers to identifying wasteful processes and resources that deplete organizational profits and ensuring that they are optimized (Gill, Singh, Mathur & Mand, 2014). It means implementing a system that is appropriate and cost-effective. Operational efficiency is an important component that critically drives superiority in business results. Therefore, in this study, operational efficiency is defined as the ratio between the input (artificial intelligence) to run a business operation and the output (money, revenue, and margins) gained from the business. The input applied by a firm is the utilisation of intelligent systems to work. Output results are production, service,

and quality. The maximum output expected from the applied input is the operating potency of such a business organization. Operational efficiency is achieved by the re-organisation of the core processes of any organisation so as to effectively and efficiently provide the needed response to dynamic market forces in a lucrative manner (Sankowska, 2016). In an attempt to attain operational efficiency, some organizations strive to minimize redundancy and waste through the best utilisation of their workforce, technology, and business processes in order to attain success. Operational efficiency ensures that businesses deliver quality products and services to their customers in a way that reflects the most cost-effective possible process (Kariuki & Omar, 2018). Generally, it can be surmised that operational efficiency means the minimization of loss and the maximization of the capability of resources so as to ensure that quality products and services are available to customers. For an organisation to remain competitive, it should, of necessity, boost operational efficiency wherever possible. As a disadvantage however, operational efficiency may lead to reduced operational flexibility in firms. Generally, achieving efficiency in any organisation's operation will most often run divergently with flexibility, given that efficiency portrays a routinisation of processes (Kartic & Agarwal, 2018). Some of the outcomes of operational efficiency are:

a) Service Innovation: Durst, Mention, and Poutanen (2015) define service innovation as the innovation carried out in diverse areas of the service sector that involves developing entirely new services and improving existing ones. Service innovation refers to an organization's elevated service offering that is made up of new service delivery; a new organisational architecture or marketing proposition; a new client interface or customer encounter; and a new system of service delivery. It can also refer to the improvements in performance and productivity through human resource management (Randhawa & Scerri, 2015). Nees, Ludo, Rommert, and Jan (2010) views service innovation as a new service or the renewal of an existing service that is put into practice in order to provide benefit to the organization that developed it. This is usually derived from the added value that the renewal provides to customers. Service innovation, according to Kjos (2013) can also be viewed as a multi-stage process that allows organisations to transform ideas into new or even improved services for competition, advancement, and successful differentiation in the market place (Kjos, 2013). By way of advantage, service innovation enables the creation and provision of sustained competitive advantage for an organization, helping it to overcome the challenge of maintaining growth in saturated markets and also enabling firms to excel in their service offerings, improve cost structure, enhance delivery systems, and also utilize technology growth.
b) Cost reduction may be defined as an attempt to bring the cost down without affecting the product or service's suitability for its intended use and purpose (Sharma, 2017). The term also denotes real or genuine savings in production, administration, selling, and distribution costs. These savings are brought about by eliminating non-essential or wasteful elements from the design of a product and from the processes, techniques, and practices involved in service provision (Zhiran, Xu, & Mengxiao, 2012). Cost reduction is to be understood as the achievement of a real and permanent reduction in the unit cost of goods manufactured or services rendered without impairing their suitability for the use intended or a diminution in the quality of the product (CIMA, nd). The advantages of cost reduction include an increase in profit, the provision of more money to improve workers' and management relationships, the availability of goods and services to users at cheaper rates, effective competition, and an increase in total exports. Cost reduction increases productivity as it helps to make the best use of resources while ensuring continuous improvement. There are, however, some downsides to cost reduction, such as quality reduction, which might take time to become noticeable and may cause the business to lose to competitors. Cost reduction may lead to apathy on the part of employees, which may eventually lead to the failure of the aim of cost reduction.
c) Service quality is the extent to which the service offered exceeds the customer's earlier expectations (Neupane & Devkota, 2017). It is that difference that exists between the perceived service received and the actual expectations of a customer for the service encountered that makes perception and expectation the central elements of service quality (Mosahab, Mahamad &

Ramayah, 2010). Koranne and Borgave (2016) opined that service quality is defined as a comparison of customer expectations with service performance. Improved service quality can lead to the retention of a higher percentage of existing customers. High quality service can aid the attraction of more customers through positive referrals. The usage or adoption rate of the services among existing customers may also increase given improved service quality. One of the challenges of service quality is its inseparability between production and consumption. For instance, due to intense involvement of humans, a slight flaw in presentation may pose a challenge to quality. Customization of services may appear insensitive to the specific needs of some service users. In the long run, obsession with growth in productivity and target increases often turns out to be detrimental to service quality.

d) Customer satisfaction: According to Aftab, Sarwar, Sultan, and Qadeer (2016), customer satisfaction can be seen as that feeling that an individual experiences when a service offered meets their expectations. Kotler, Armstrong, Saunders, and Wong (2000), for their part, explained that customer satisfaction relies on the extent to which products and services meet or surpass client expectations. It is a service provider's ability to create a high level of satisfaction for its product differentiation that leads to the establishment of strong customer relationships (Deng, Lu, Wei, & Zhang, 2010). It is that vital positioning of a firm's performance; an assessment that an experience was as good as it was perceived to be (Aftab *et al*., citing Hunt, 1977). Customer satisfaction is actually very vital for developing the desires of customers for future purchases (Mittal and Kamakura, 2001). Figure 1 shows the perceived relationships among the variables considered.

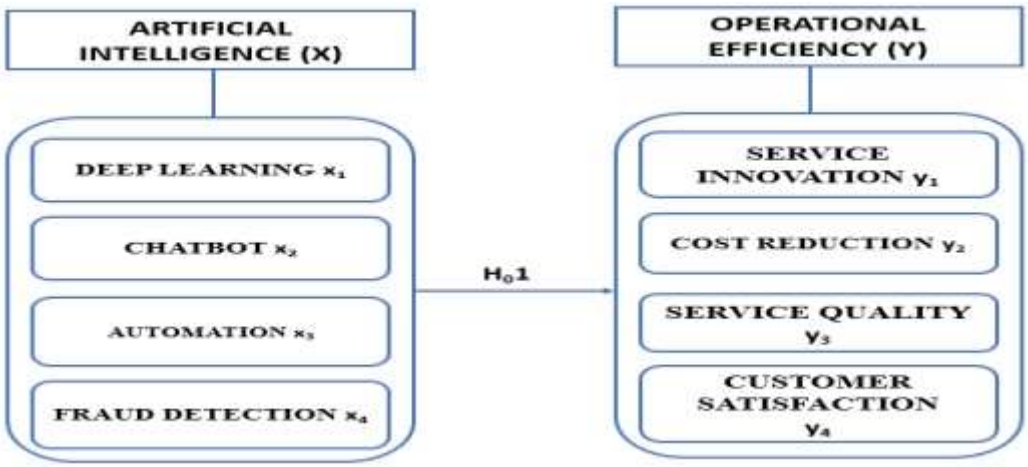

Figure-1. *Conceptual Model for artificial intelligence and operational efficiency*

3.0. Theoretical Framework

This study is anchored on the Technology Acceptance Model (TAM). The model was developed by Davis (1985) to address the issue of adoption of innovations. The features and capabilities having been identified; the model culminates in the actual use of the new technology. The process of adoption of innovation begins with identifying the system features and capabilities and the motivations required to use the innovations, which are variables to measure their use and then actual usage (Ahmad, Bhatti, & Hwang, 2020). This applies to the adoption of innovation in an organization as perceived usefulness in the context of the potential adopters and the perception that the innovation adopted is easy to use and finds applicability within the organization, thereby encouraging its adoption (Adnyasuari & Darma, 2017).

The Technology Acceptance Model (TAM) is a theory in information systems. The major importance of TAM is to analyse the internal beliefs of the individual in the process of adopting new technology (Marakarkandy, Yajnik, & Dasgupta, 2017). The Technology Acceptance Model postulates that the

use of an information system is determined by behavioural intention, and this intention is determined by the person's attitude towards the use of the system and also by his perception of its utility. It indicates that there are only two components that determine users' acceptance of an innovation. These are the perceived usefulness and the perceived ease of use of the system (Abd Ghani, Rahi, Yasin, & Alnaser, 2017). Perceived usefulness is the degree to which a potential user of an innovation believes that using a particular innovation will enhance his or her performance (Vukovi, Pivac, & Kundid, 2019), referring to consumers' perceptions based on the outcome of their experience. The existence of perceived usefulness has been significantly recognized in many businesses, primarily in the banking sector. In other occurrences, it is regarded as a determinant of actual behaviour whereby a user is encouraged to use an innovative and user-friendly self-service technology to improve and establish greater autonomy in performing some banking activities (Al-Shbiel & Ahmad, 2016).

Consequently, the perceived ease of use of the system is how a user accepts and agrees that using an existing model is not costly. In this model, consumers perceive a new service better than its substitutes (Mutahar, Daud, Ramayah, Isaac, & Aldholay, 2018). This is because users can easily experiment with the latest innovations and evaluate their benefits. Perceived ease of use is widespread in the banking and e-commerce industries. Many consumers may feel a sense of satisfaction after the use of an online service innovation. Therefore, perceived ease of use is a practical aspect that has an impact on a consumer's experience in the use of technological service innovation (Abd Ghani, Rahi, Yasin, & Alnaser, 2017; Ahmad, 2018).

3.1. Methodology

This section discusses the methods and techniques that were adopted in this work, which include the research design, population, sample size, sampling technique, method of data collection, and validity and reliability of survey instrument.

This study adopted the survey research design. The population of the study comprised regular employees of five selected deposit money banks in Lagos State, Nigeria (First Bank of Nigeria Plc, United Bank of Africa, Guaranty Trust Bank, Access Bank, and Zenith Bank Plc). According to the Nigerian Banker (2020), these deposit money banks are referred to as FUGAZ deposit money banks, and they also represent the Tier 1 deposit money banks that have been considered too big to fail. The population figure is given as 3,098 employees of the selected deposit money banks. To determine the sample size for the study, The Research Advisors sampling table was used (see Appendix I). Using a confidence level of 95% and a 5% margin of error, the sample size is given as 346. A 30% provision was made in the sample to make up for errors in filling, non-response rates, and discrepancies that may come up as a result of questionnaire administration and retrieval. Therefore, the final sample is 450, that is, 346 + 104. This sample is distributed across the deposit money banks by proportional probability as shown in Table 1 based on the following estimation:

$$\frac{\text{No of staff per bank}}{\text{Total No. of Staff}} \times 450$$

Table 1: Proportionate Sample Size

Companies	No of Employees	Proportionate Sample Size
First Bank Plc	756	110
United Bank for Africa Plc	726	105
Guaranty Trust Bank Plc	587	85
Access Bank Plc	326	47

Zenith Bank Plc	703	103
Total	**3,098**	**450**

The stratified random sampling technique was used to select respondents from the different management levels of the selected deposit money banks. This gave every member of the strata in the target population an equal chance of being selected for the study. A stratified sampling technique was used to group the respondents according to location. This grouping includes Badagry, Epe, Ikeja, Ikorodu, and Lagos Island. This grouping has been proven to be the main financial hubs in Lagos State and has been used by other researchers (Oteri & Ayeni, 2016). After the stratification, the next step was the use of a simple random sampling method to pick the sample or respondents from each of these divisions. This was done after a proportionate allocation of samples had been done for each bank. One of the major strengths of this technique is that it provides greater precision as it allows for greater accuracy. Besides, a stratified sample often requires smaller samples from each strata bank. This helps to guard against the bias of unrepresentativeness that is common with other sampling techniques.

The method used for data collection is the primary method, with the use of an adapted questionnaire administered to the respondents. The use of a questionnaire aided in the gathering of information from a large number of respondents. It ensures anonymity for the respondents and gives them a chance to express their opinions. The data was gathered with the help of research assistants who have been trained in accordance with the study's aims and objectives.

The pilot study consisted of ten per cent (10%) of the sample size of the main study, which is 45 copies. These copies of the questionnaire were administered to employees of Wema Bank Plc. Wema bank was selected because it is not part of the original banks selected for the study and also ranks well in the Nigerian banking sector.

The validity of the constructs was ascertained using content and construct validity. The principal component factor analysis was used, and the factor loadings of these items were used to establish the average variance extracted (AVE). For each of the variables, the average variance extracted was computed. The Kaiser-Meyer-Olkin (KMO) and Bartlett values were also computed, and Table 2 below shows the results.

From the results, the Kaiser-Meyer-Olkin (KMO) shows values higher than 0.5 which is evidence that the sample for the study is adequate. The Bartlett's test results in all the variables indicated 0.000 corroborated the KMO. Hence, it is established that the research instrument is valid. The average variance extracted (AVE) is greater than 0.5, indicating that the measurement questions can better reflect the characteristics of each research variable in the model. Reliability analysis was carried out to determine the reliability level of the variables of the study and the results shown in Table 3.

The result also revealed that the Cronbach's Alpha coefficient for all the study variables is above 0.70, which suggests that the instrument used for evaluation was highly reliable.

Table 2: Validity of the Results

S/N	Variables	Number of items	KMO	Bartlett Test	Sig	AVE
1.	Deep Learning	4	0.534	171.681	0.000	0.58
2.	Chatbot	4	0.674	154.812	0.000	0.67
3.	Automation	4	0.643	134.719	0.000	0.65
4.	Fraud Detection	4	0.585	151.651	0.000	0.76
1.	Service Innovation	4	0.841	779.426	0.000	0.813

2.	Cost Reduction	4	0.771	602.615	0.000	0.715
3.	Service Quality	4	0.804	804.231	0.000	0.762
4.	Customer Satisfaction	4	0.848	333.100	0.000	0.848

Table 3: Reliability of the Results

S/N	Variables	Number of items	Composite Reliability	Cronbach Alpha Coefficients
1.	Deep Learning	4	0.782	0.720
2.	Chatbot	4	0.773	0.833
3.	Automation	4	0.775	0.861
4.	Fraud Detection	4	0.883	0.745
1.	Service Innovation	4	0.741	0.725
2.	Cost Reduction	4	0.760	0.833
3.	Service Quality	4	0.851	0.829
4.	Customer Satisfaction	4	0.715	0.827

4.0. Results

A total of four hundred and fifty (450) copies of the questionnaire were administered, and four hundred and twenty-six (426) were filled, returned and considered usable. This represents a 95% response rate. Regression analysis was used to express the relationship between the two variables, and estimated the value of the dependent variable (Y) based on a selected value of the independent variable (X). For the purpose of this paper, it was used to determine the relationship between the independent variable - artificial intelligence and the dependent variable – operational efficiency.

H_0: Artificial intelligence has no significant effect on operational efficiency in deposit money banks in Lagos State, Nigeria.

Table 4: Effect of Artificial Intelligence on Operational Efficiency of Deposit Money Banks in Lagos State, Nigeria

Variables	*B*	*T*	*Sig*	*R*	R^2	$AdjR^2$	Std. Error of the Estimate
Constant	58.725	21.884	.000	.448[a]	.201	.193	2.75714
Deep Learning	.400	5.445	.000				
Chatbot	.059	.966	.335				
Automation	.202	2.143	.033				
Fraud Detection	.460	7.095	.000				
a. Dependent Variable: Operational Efficiency			F (425,4) = 26.464				

4.1. Interpretation

Table 4 reveals the result of the multiple regression analysis which examined the effect of artificial intelligence on the operational efficiency of the selected deposit money banks in Lagos. The results showed that deep learning (β = 0.400, t = 5.445, $p<0.05$); Automation (β = 0.202, t = 2.143, $p<0.05$) and fraud detection (β = 0.460, t = 7.095, $p<0.05$) had positive and significant effects on operational efficiency of the selected deposit money banks in Lagos State, Nigeria, while chatbot (β = 0.059, t = 0.966, $p>0.05$) had a positive but insignificant effect. The results of the analysis revealed that three of

the dimensions of artificial intelligence (deep learning, automation and fraud detection) had significant effect on operational efficiency of selected deposit money banks. This implies that, deep learning, automation and fraud detection are pivotal in improving operational efficiency of selected deposit money banks in Lagos State, Nigeria.

The calculated correlation coefficient of R = 0.448 showed that a moderately strong positive relationship exists between the sub-variables of artificial intelligence and operational efficiency of selected banks. The coefficient of multiple determination, Adjusted R^2 *was* 0.201 indicating that artificial intelligence explained about 20.1% of the changes in operational efficiency of the banks studied, while the remaining 79.9% could be attributed to other factors not included in this model. The multiple regression model is expressed as thus:

$$OE = 58.725 + 0.400DL + 0.202Au + 0.460FD \ldots\ldots\ldots i$$

Where:

OE = Operational Efficiency
DL = Deep Learning
Au = Automation
FD = Fraud Detection

The regression model shows that holding artificial intelligence sub-variables to a constant zero, operational efficiency would be 58.725. The results of the multiple regression analysis indicates that when deep learning, automation and fraud detection were improved by one unit, operational efficiency would positively increase by 0.400, 0.202 and 0.460 respectively. This implies that an increase in deep learning, automation and fraud detection would lead to an increase in the operational efficiency of the selected deposit money banks. Also, F statistics (F (425.4) = 26.464 at p = 0.000 ($p<0.05$) showed that the overall model was significant in predicting the effect of artificial intelligence on operational efficiency of the selected deposit money banks. The result shows an overall statistical significance with $p<0.05$ which implies that artificial intelligence sub-variables with particular emphasis on deep learning, automation and fraud detection were major predictors and determinants of operational efficiency of the selected deposit money banks studied. Therefore, the null hypothesis (H_0) which states that artificial intelligence had no significant effect on operational efficiency of selected banks was rejected.

4.2. Discussion of Findings

The test of the hypothesis revealed that artificial intelligence has a significant effect on the operational efficiency of selected deposit money banks examined with respect to deep learning, automation, and fraud detection. This finding has implications conceptually, empirically, and theoretically. From a conceptual angle, the findings supported definitions and clarifications of the concepts of the study by Antonescu (2018). That is, AI is an intelligent system that can accomplish tasks without the need for programming by using data, analysis, and observation and that it is also the intelligence displayed by an artificial entity in order to solve complicated issues through a computer machine (Borana, 2016). Plastino & Purdy (2018) define AI as a capital–labour hybrid with the ability to self-learn, continually improve, and scale-up swiftly.

Empirically, the findings from this study were in agreement with Königstorfer and Thalmann (2020), who reported that introducing AI in commercial banking could change business processes and interactions with customers, which could create research opportunities for behavioural finance. The study further suggested that by using AI, commercial banks can reduce losses in lending, increase security in processing payments, automate compliance-related work, and improve customer targeting. The findings also corroborate Mor and Gupta (2021), who observed that the influence of artificial intelligence (AI) on the technical efficiency of 47 commercial banks in India reduced technical inefficiency by 11%. This was mostly attributed to internal variables or decision making. The decision

supports the acceleration of AI deployment as well as increasing asset levels and lowering non-performing assets, particularly for public-sector banks. Similarly, the results are in line with the findings of Alzaidi (2018) that artificial intelligence is now used in detecting mismatches in transactions and giving personalized customer recommendations, which supports findings that artificial intelligence can also be used in the banking sector to eliminate manual tasks and reduce the requirements for back-office operations. Although artificial intelligence deployment in the banking sector is still in its early stages, the application of sophisticated artificial intelligence algorithms can enable effective risk and asset management in the banking industry, which can help to further optimize financial policies. Also, in the study of Prentice, Dominique Lopes, and Wang (2020), the results showed that both AI and employee service quality explain significant variances in overall service quality assessment as well as customer satisfaction and loyalty.

5.0. Conclusion and Recommendations

This study explored the effect of artificial intelligence on the operational efficiency of selected deposit money banks in Lagos State, Nigeria and concluded that artificial intelligence had a significant and positive effect on the banks' operational efficiency in Nigeria. The study recommended that deposit money banks should effectively make use of artificial intelligence such as deep learning, automation, and fraud detection to continuously improve organizational efficiency.

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Appendix I

Sample Size Table*

From The Research Advisors

Required Sample Size†

Population Size	Confidence = 95% Margin of Error 5.0%	3.5%	2.5%	1.0%	Confidence = 99% Margin of Error 5.0%	3.5%	2.5%	1.0%
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	126	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1,000	278	440	606	906	399	575	727	943
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376
2,000	322	563	869	1655	498	808	1141	1785
2,500	333	587	952	1984	524	879	1288	2173
3,500	346	641	1068	2565	558	977	1510	2890
5,000	357	678	1170	3268	586	1066	1734	3842
7,500	365	710	1275	4211	610	1147	1960	5165
10,000	370	727	1332	4899	622	1193	2098	6239
25,000	378	760	1448	6939	646	1285	2399	9972
50,000	381	772	1491	8056	655	1318	2520	12455
75,000	382	776	1506	8514	658	1330	2563	13583
100,000	383	778	1513	8762	659	1336	2585	14227
250,000	384	782	1527	9248	662	1347	2626	15555
500,000	384	783	1532	9423	663	1350	2640	16055
1,000,000	384	783	1534	9512	663	1352	2647	16317
2,500,000	384	784	1536	9567	663	1353	2651	16478
10,000,000	384	784	1536	9594	663	1354	2653	16560
100,000,000	384	784	1537	9603	663	1354	2654	16584
300,000,000	384	784	1537	9603	663	1354	2654	16586

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