

## Exploring The Impact of Machine Learning on Financial Decision-Making in The Nigerian Banking Sector

Anthony Adepetun<sup>1</sup>, Olayinka Odutola<sup>2</sup> & Elizabeth Modupe Dopemu<sup>3</sup>

Independent Researcher

DOI - <http://doi.org/10.37502/IJSMR.2022.51215>

### Abstract

This study examines the impact of machine learning on decision-making in Nigeria's banking sector, highlighting its potential to enhance credit risk evaluation, fraud detection, personalized banking, and predictive analytics. However, challenges like data quality, privacy, and regulatory compliance are significant barriers. The research applies the Technology Acceptance Model (TAM) and Diffusion of Innovation Theory (DOI) to understand adoption drivers, focusing on perceived usefulness and compatibility.

The findings suggest that Nigerian banks can improve decision-making and customer experiences by effectively adopting machine learning. However, they must address challenges like bias and operational inefficiencies. Strong data governance, transparent models, and ethical practices are essential for successful integration and sustained growth.

**Keywords:** Machine Learning, Financial Decision-Making, Banking, Technology Adoption, Data Quality, Risk Assessment, Customer Experience, Compliance, Ethics.

### 1. Introduction

Recent advancements in machine learning (ML) have transformed industries globally, including banking. ML algorithms excel in processing large datasets, uncovering patterns, and generating valuable insights (Han et al., 2022; Schoenherr et al., 2023). In financial institutions, ML has shown promise in improving decision-making, risk management, fraud detection, and customer service (Mohammad et al., 2023). The Nigerian banking sector, critical to the country's economy, faces challenges like financial risks, regulatory compliance, and customer satisfaction (Nigeria Deposit Insurance Corporation, 2021; Sadok et al., 2022).

This study examines the growing relevance of ML in Nigerian banking, where it could revolutionize financial decision-making, enhance customer experiences, and reduce operational costs (Adewale et al., 2020; Nigeria Economic Outlook, 2023). The research is grounded in the Technology Acceptance Model (TAM) and Innovation Diffusion Theory (IDT), exploring factors influencing ML adoption and its impact on financial decisions (Davis, 1989; Rogers, 1962). While ML offers significant benefits, challenges like data quality, regulatory constraints, and infrastructure limitations hinder its implementation (Adewale et al., 2020; Schoenherr et al., 2023).

This research aims to address gaps in the literature by assessing ML adoption, benefits, and challenges in Nigerian banking through a structured literature review. Insights from this study

will inform strategies for effective ML integration, enhancing competitiveness and resilience in the sector.

## **1.2 Research Aim**

To critically explore the impact of machine learning on financial decision-making in the Nigerian banking sector.

## **1.3 Research Objectives**

- i. Analyze existing literature on Machine Learning (ML).
- ii. Investigate ML's impact on financial decision-making in Nigerian banking, based on empirical studies.
- iii. Identify challenges associated with ML adoption in the Nigerian banking sector.
- iv. Provide recommendations to address these challenges.

## **2. Methodology**

This chapter outlines the methodology used to achieve the study's objectives, including research philosophy, approach, design, population, sampling technique, data analysis, and ethical considerations.

### **2.1 Research Philosophy**

The study adopts interpretivism, focusing on understanding the meanings and interpretations of machine learning's impact on financial decision-making in Nigerian banking (Babbie, 2016; Guba & Lincoln, 1994).

### **2.2 Research Approach**

An inductive approach was employed to derive insights from existing literature on ML's influence in the sector (Bryman, 2015; Neuman, 2014).

### **2.3 Research Design**

A qualitative research design was chosen to explore complex social phenomena through a literature review rather than primary data collection (Creswell & Plano, 2018; Bryman, 2015).

### **2.4 Population of the Study**

The population consists of 43 scholarly journal articles that discuss the impact of machine learning on financial decision-making in Nigerian banking.

### **2.5 Sample and Sampling Technique**

A convenience sampling strategy was used to select relevant and useful journal articles from various databases, ensuring they align with the study's objectives (Saunders et al., 2018; Neuman, 2014).

### **2.6 Method of Data Analysis**

Content analysis was utilized to systematically examine themes and patterns within the selected articles (Neuman, 2014; Bryman, 2015).

### **2.7 Ethics, Sustainability, and Responsibility (ESR)**

The study adheres to ethical principles by ensuring data privacy, addressing algorithmic bias, evaluating ML's sustainability, and promoting responsible ML applications in banking (Adeyemo et al., 2013; Bowen, 1953; Ehie & Hall, 2016). Ethical considerations include secure data handling, unbiased algorithms, transparency, and accountability in automated decision-making.

This methodology ensures a comprehensive and ethical examination of machine learning's role in enhancing financial decision-making within the Nigerian banking sector.

### 3. Structured Literature Review

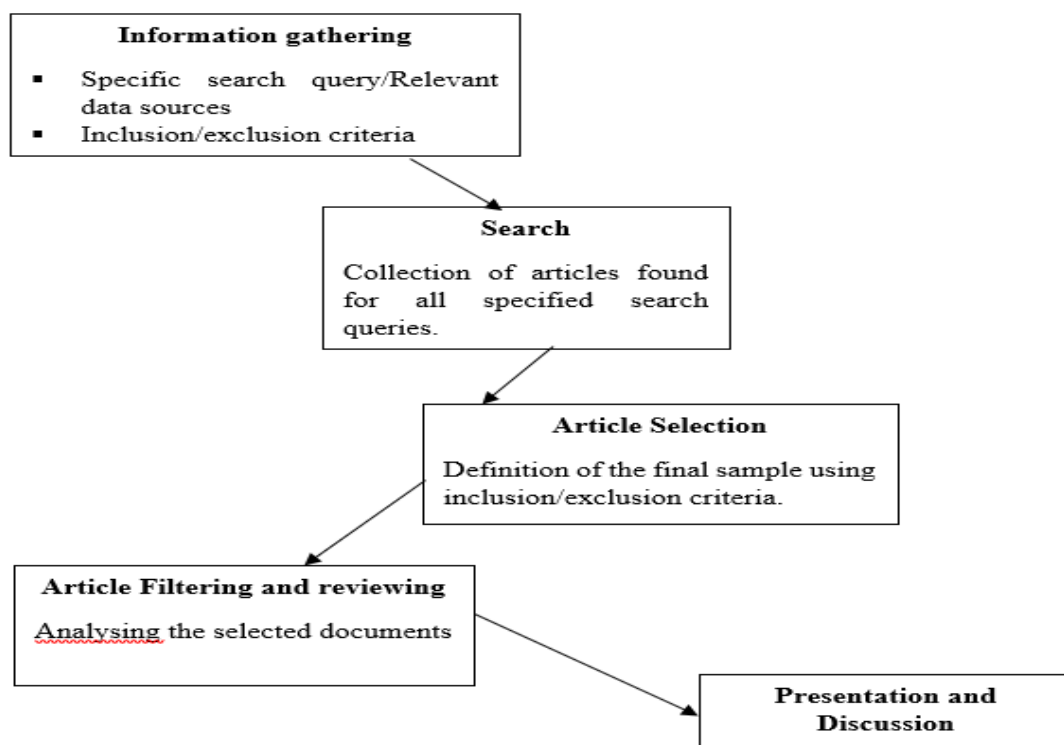
The purpose of this section is to present a structured literature review (SLR) of published academic papers on the impact of machine learning on financial decision making in the Nigerian banking sector. The search was queried using the following keywords and phrases: "MACHINE LEARNING," "FINANCIAL DECISION MAKING," "NIGERIAN BANKING INDUSTRY," "NIGERIAN BANKING SECTOR," "DATA MINING," and "LEARNING ANALYTICS."

During the search, the researcher encountered many difficulties in finding relevant papers. Initially, the researcher resolved to search for articles on the SCOPUS database. However, very few and unrelated articles were found on the database. The researcher, therefore, resorted to searching various sources for papers related to the subject matter. Still, only a few papers were found. The dearth of empirical studies indicates that Nigerian scholars have not largely investigated the subject matter.

The procedure of searching is depicted in the figure 1 below:

#### 3.1 Procedure of Searching Articles

**Fig. 1: Procedure of searching related articles**



### 3.2 Literature on Machine Learning

The literature was scanned to understand the perception and opinion of Nigerian authors on the concept of Machine Learning. A snapshot of selected studies is presented in table 1 below.

The details of studies presented in table 1 was used to arrive at the discussions provided in this study.

**Table 1: Papers on the Concept of Machine Learning by Nigerian Authors**

S/N	Authors	Title	Journal Name	Country	Perception
1.	Evwiekpaefe & Abdulkadir (2023)	A Predictive Model for Diabetes Mellitus Using Machine Learning Techniques (A Study in Nigeria)	The African Journal of Information Systems	Nigeria	Machine learning is a system for reading a wide range of dataset to make informed decisions.
2.	Ekubo & Esiefarienrhe (2022)	Using machine learning to predict low academic performance at a Nigerian university	The African Journal of Information and Communication	Nigeria	Machine learning aims to find meaningful patterns in massive amounts of data in order to predict future outcomes.
3.	Umar, Sani, Suleiman & Tijani (2022)	An Overview of Machine and Deep Learning Technologies Application in Agriculture: Opportunities and Challenges in Nigeria	Sule Lamido University Journal of Science and Technology	Nigeria	It comprises using systems that can learn from a dataset and make intelligent judgements on their own.
4.	Ofori, Maina & Gitonga (2020)	Using Machine Learning Algorithms to Predict Students' Performance and Improve Learning Outcome: A Literature Based Review	Journal of Information and Technology	Nigeria	Machine learning refers to an analytic method that is meant to find data patterns and correlations between data variables.

Machine learning, as discussed by Evwiekpaefe and Abdulkadir (2023), involves analyzing varied datasets to support informed decision-making, aligning with the Technology Acceptance Model (TAM) and Innovation Diffusion Theory (IDT). Similarly, Ekubo and Esiefarienrhe (2022) highlight machine learning's role in identifying patterns within large datasets for predicting outcomes, emphasizing its perceived usefulness and simplicity of use. Umar et al. (2022) describes machine learning as systems learning from data to make autonomous decisions, reinforcing its significance through TAM and IDT. Oyerinde and Chia (2017) focus on machine learning's predictive capabilities, and Oloruntoba and Akinode (2017) emphasize its role in extracting insights from academic information systems. Collectively, these views underscore machine learning's ability to automate decision-making and enhance adoption across various fields, particularly within financial decision-making in the Nigerian banking sector.

**Table 2: Papers on the impact of Machine Learning on Financial Decision Making in Nigerian Banking Sector.**

S/ N	Authors	Title	Journal Name	Country	Method & Type	Major Findings
1.	Achara et al. (2023)	Financial Institution Readiness and Adoption of Machine Learning Algorithm and Performance of Select Banks in Rivers State, Nigeria	Asian Journal of Economics, Finance and Management	Nigeria	Quantitative, Cross sectional and empirical	<ul style="list-style-type: none"> <li>The level of service delivery among banks would increase with the use of machine learning algorithms.</li> </ul>
2.	Odumu & Igbonoba (2023)	Big Data Mining Model to Predict Electronic Payment System Using Machine Learning	International Journal of Recent Engineering Science	Nigeria	Quantitative and Empirical	<ul style="list-style-type: none"> <li>Data mining through machine learning is a preemptive and predictive tool for Nigerian banks to better policy</li> </ul>

						formulation, financial advisory services, and performance measurement.
3.	Akinwunmi & Dare (2022)	Machine Learning Approach to Credit Scoring for Fintech Start-Ups Using Micro Finance Banks in Nigeria	International Journal of Innovative Research & Development	Nigeria	Quantitative & empirical	<ul style="list-style-type: none"> <li>ML help lending firms determine creditworthiness of an individual applying for a loan.</li> </ul>

The study by Achara et al. (2023) suggests that machine learning can significantly enhance service delivery in Nigerian banks, aligning with the Technology Acceptance Model (TAM) and Diffusion of Innovation Theory (DOI). The perceived utility of machine learning supports better service quality, making it likely to be adopted for personalizing customer interactions, streamlining processes, and improving decision-making. Similarly, studies by Odumu & Igbonoba (2023), Akinwunmi & Dare (2022), Ukpong (2022), Ashfaq et al. (2022), Asongo et al. (2021), and Ugwu (2020) highlight the benefits of machine learning in areas such as policy development, creditworthiness assessment, fraud detection, and credit risk management. These studies emphasize the potential for machine learning to improve operational efficiency, customer satisfaction, and overall financial stability in the Nigerian banking Sector

#### 4. Findings And Discussions

A thorough examination of the scholarly literature on the application of machine learning to the banking industry provides a wealth of information that, taken together, sheds light on the difficulties, advantages, and consequences of this technological advancement. The literature reveals a number of recurrent themes that illuminate the challenging environment for using machine learning in the banking sector.

##### 4.1 Benefit and Opportunities

The transformational potential of machine learning in the banking industry has been highlighted in numerous studies (Achara et al.,2023; Odumu & Igbonoba,2023; Akinwunmi & Dare,2022; Ukpong,2022; Ashfaq et al.,2022; Asongo,2021). It is obvious that machine learning has the ability to improve risk assessment, decision-making processes, and customer experiences. In particular, when it comes to credit risk assessment and fraud detection, banks can anticipate customer behaviour, spot trends, and reduce possible risks due to machine

learning's predictive capabilities. Additionally, common processes can be automated with the use of machine learning, improving resource allocation and operational efficiency.

#### **4.2 Challenges and Concern**

To fully realize the advantages of machine learning, however, a number of challenges and issues must be resolved. There are several problems with data, from unstructured text and picture data restrictions to problems with data quality (Bhatore et al.,2020). For producing useful insights and avoiding biases in decision-making, it is essential to guarantee clean, accurate, and relevant data (Ukpong,2022). Given the sensitivity of financial data, issues about data privacy and confidentiality are especially prevalent (Mndebele et al.,2023; Ukpong,2022). A further difficulty is assuring adherence to ethical standards and data localization requirements (Ukpong,2022), which are both part of regulatory framework compliance.

#### **4.3 Technological and Organizational Barriers**

System compatibility, processing speed, and the difficulty of describing and interpreting machine learning results are all examples of technological challenges (Achara et al.,2023). Gaining the trust of stakeholders requires integrating machine learning into current processes, assuring real-time processing, and offering clear explanations. Additionally, the research emphasises how external factors might influence results from machine learning because of changing economic and market conditions Mndebele & Mayayise (2023). A concentrated effort must be made to create sophisticated algorithms, improve algorithmic transparency, and improve system architectures in order to meet these problems.

#### **4.4 Human Factors and Skill Requirements**

For machine learning to be successfully integrated, human elements are essential (Achara et al.,2023). The body of literature emphasises the requirement for qualified professionals who can design, implement, and oversee machine learning systems Mndebele & Mayayise (2023). Given that the technology requires a thorough understanding of both financial operations and data science, the lack of skills and proper training is a difficulty. Employee adoption of new technology and its successful deployment are both influenced by employee attitudes (Achara et al.,2023), emphasising the significance of change management and employee training activities.

#### **4.5 Regulatory Landscape and Legislation**

Legislative issues stand out as a key driver of machine learning use in the banking industry (Mndebele & Mayayise,2023); Ukpong,2022; Bhatore et al.,2020). The regulatory environment is changing to handle the novel problems that cutting-edge technology has created. Deploying machine learning responsibly and ethically requires adherence to regulatory standards, data protection laws, and sector-specific rules.

### **5. Conclusion, Implications and Recommendations**

#### **5.1 Conclusion**

The research on the impact of machine learning on financial decisions in the Nigerian banking industry reveals a landscape of both opportunities and challenges. Machine learning shows potential in improving banking operations such as credit risk assessment, fraud detection,



personalized banking, and predictive analytics, ultimately enhancing customer engagement and decision-making.

However, the integration of machine learning presents difficulties, including data quality, privacy concerns, technical issues, and regulatory compliance. To overcome these, banks must invest in robust data management, transparent machine learning models, and employee training. Theories like the Diffusion of Innovation and the Technology Acceptance Model underscore the importance of aligning machine learning with existing practices and ensuring user acceptance.

In conclusion, while machine learning offers transformative potential, its successful adoption in Nigerian banks requires a comprehensive approach that addresses both technological and human factors. This strategic integration will enhance competitiveness, customer satisfaction, and long-term sustainability in the evolving financial landscape.

## 5.2 Recommendations

Nigerian banks can effectively implement machine learning by prioritizing data quality, ensuring robust governance structures, and developing transparent models that provide clear decision explanations to build stakeholder trust. Investing in staff training to bridge the data science skills gap is essential for successful system deployment, while ensuring compliance with ethical standards, data protection laws, and industry regulations helps mitigate legal risks. To overcome employee resistance, banks should involve staff in the adoption process through change management strategies and collaborate with technology providers and academic institutions to access cutting-edge resources. Continuous monitoring to mitigate biases and uphold ethical standards will ensure that machine learning is used responsibly, driving innovation, enhancing customer experiences, and securing long-term viability in the competitive banking sector.

## REFERENCES

- 1) Abubakar, A., Akintola, A., & Idris, I. K. (2019). Machine learning-based fraud detection: A survey. *International Journal of Computer Applications*, 179(21), 14-20.
- 2) Achara, M., Emeka, J.O., Nwulu, S.O. & Ufuoma, E.O. (2023). Financial institution readiness and adoption of machine learning algorithm and performance of select banks in Rivers State, Nigeria. *Asian Journal of Economics, Finance and Management*, 5(1), 180-192.
- 3) Adewale, A. P., Hammed, A. A., Adetunmbi, A. O., & Ayo, C. K. (2020). A review of machine learning algorithms for the banking sector. In A. G. Muthu (Ed.), *Emerging technologies and applications in data processing and management* (pp. 153-173). IGI Global.
- 4) Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4th ed.). Sage Publications.
- 5) Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and Conducting Mixed Methods Research* (3rd ed.). Sage Publications.
- 6) Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340.



- 7) Evwiekpaefe, A. E. & Abdulkadir, N. (2023). A predictive model for diabetes mellitus using machine learning techniques (a study in Nigeria). *The African Journal of Information Systems*, 15 (1), 1-21.
- 8) Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research, In N. K. Denzin and Y. S. Lincoln (Eds.), *Handbook of Qualitative Research* (pp. 105-117). Sage Publications.
- 9) Hamidu, A. A., Haron, H. M., & Amran, A. (2018). Critical factors towards philanthropic dimension of CSR in the Nigerian financial sector: The mediating effects of cultural influence. *International Journal of Business and Innovation*, 4(1), 27–48.
- 10) Han, J., Shao, L. & Sun, L. (2022) Study Film and Television Postproduction and Innovation Strategy Based on an Artificial Intelligence Algorithm. *Mobile Information Systems*, 1-11.
- 11) Mndebele, S. & Mayayise, T. (2023). The issues, challenges and impacts of implementing machine learning in the financial services sector. *Digital Skills 2023 EPiC Series in Education Science*, 5, 31–46.
- 12) Mohammad, H. S. I., Nizar, M. F., Sahawneh, M. Abu F, Maghaydah, S. & Itani, R. (2023). The role of artificial intelligence in mitigating cyber security issues and its impact on FinTech. *2023 International Conference on Business Analytics for Technology and Security (ICBATS)*, pages 1-5.
- 13) Neuman, W. L. (2014). *Social Research Methods: Qualitative and Quantitative Approaches* (7th ed.). Pearson.
- 14) Nigeria Deposit Insurance Corporation. (2021). Annual report and statement of accounts 2020. Retrieved from <https://ndic.gov.ng/wp-content/uploads/2021/07/Annual-Report-and-Accounts-2020.pdf>
- 15) Odutola, A. A. (2022). Advanced procurement analytics: Building a model for improved decision-making and cost efficiency within global supply chains. *International Journal of Scientific and Management Research*, 5(6), 273-286.
- 16) Oloruntoba, S. A. & Akinode, J. L. (2017). Student academic performance prediction using support vector machine. *International Journal of Engineering Sciences & Research Technology*, 6(12), 588-598.
- 17) Oyerinde O. D. & Chia P. A. (2017). Predicting students' academic performances – a learning analytics approach using multiple linear regression. *International Journal of Computer Applications*, 157 (4), 37-44.
- 18) Rogers, E. M. (1962). *Diffusion of innovations*. Free Press.
- 19) Sadok, H., Sakka, F. & Maknouzi, M. H. (2022) Artificial intelligence and bank credit analysis: A review. *Cogent Economics & Finance*, 10:1, DOI: 10.1080/23322039.2021.2023262.
- 20) Saunders, M. N. K., Lewis, P., & Thornhill, A. (2018). *Research Methods for Business Students* (8th ed.). Pearson.
- 21) Schoenherr, J. R., Abbas, R., Michael, K., Rivas, P. & Anderson, T. D. (2023). Designing AI Using a Human-Centered Approach: Explainability and accuracy toward trustworthiness. *IEEE Transactions on Technology and Society*, 4(1), 9-23.
- 22) Trochim, W. M. (2006). *Deduction and Induction*. Social Research Methods Knowledge Base. Retrieved from <https://socialresearchmethods.net/kb/dedind.php>
- 23) Trochim, W. M., and Donnelly, J. P. (2006). *The Research Methods Knowledge Base* (3rd ed.). Atomic Dog Publishing.

- 24) Umar, M. A., Sani, B. M., Suleiman, U. & Tijjani, M. L. (2022). An Overview of Machine and Deep Learning Technologies Application in Agriculture: Opportunities and Challenges in Nigeria. *Sule Lamido University Journal of Science & Technology*, 4 (1&2), 84-96.
- 25) United Nations. (2021). *World Population Prospects 2021*. Department of Economic and Social Affairs, Population Division.