

## ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN FINANCIAL TECHNOLOGY: OPPORTUNITIES, RISKS, AND REGULATORY CHALLENGES

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### **Abstract**

*Artificial Intelligence (AI) and Machine Learning (ML) have rapidly developed into technologies in the Financial Technology (FinTech) industry, making things run smoother such as fraud detection, customer experience, and financial inclusion. However, their rapid adoption has also introduced challenges relating to cybersecurity, algorithmic bias, data privacy, and regulatory compliance. We checked out what is possible with AI and ML, what could go wrong and rules we have to follow in Nigeria's FinTech sector. A descriptive survey research design was adopted, getting people from FinTech firms, banks, government regulators, and AI experts involved, from a population of we had 2,500 people total, and from that we chose 345 people to respond using the Yamane formula, while data were collected through structured questionnaires and analyzed using descriptive and inferential statistics in SPSS Version 29. What we found is AI and ML help banks work faster, stop fraud more, spend less money to run things and keep customers satisfied. The study also established that successful regulatory frameworks help make sure AI is used safely and ethically even though security and privacy are still big concerns. The study shows that AI and smart tech are key to modernizing finance and growing the economy for the long run. It says it need stronger AI governance, enhanced cybersecurity measures, regular algorithm audits, and stricter compliance with data protection regulations to keep AI safe and fair.*

**Keywords:** *Artificial Intelligence (AI), Machine Learning (ML), Financial Technology (FinTech), Financial Performance.*

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## **1. INTRODUCTION**

### **Background to the Study**

The financial technology (FinTech) industry has improved a lot over the past decade with the help of Artificial Intelligence (AI) and Machine Learning (ML). AI refers to computer systems capable of performing tasks that normally require human intelligence, this includes things like making decisions, thinking things through learning, and solving problems. Machine learning is a part of AI that helps computers get better on their own by learning from data, without someone having to tell them every single step

Around the world, banks and other financial institutions are using AI technology to make their work easier, provide faster services and give customers a better experience detects fraudulent transactions, assess credit risks they also use AI to give customers investment advice based on their individual needs. These new technologies have made financial services faster and easier, reduced the cost of running financial businesses, and helped more people gain access to financial services. In Nigeria and other countries that are still developing, In simple, student-friendly language. FinTech companies such as Flutterwave, Paystack, Moniepoint, PalmPay, OPay, and Kuda Bank are increasingly using AI and machine learning to make payment systems faster, easier, and more efficient, customer service through chatbots, fraud detection, anti-money laundering (AML) compliance, and digital lending.

Even though AI has many benefits, there are still some challenges and concerns about using it. Algorithmic bias, cyber security limitations, privacy breaches, unethical data usage, opaque decision-making ("black-box" algorithms) and weak government rules and supervision can create serious problems. Government agencies such as the Central Bank of Nigeria (CBN) Securities and Exchange Commission (SEC), National Information Technology Development Agency (NITDA), and Nigeria Data Protection Commission (NDPC) are working to create rules that will allow new technology to grow while also protecting customers.

Therefore, understanding the opportunities, risks, and regulatory implications of AI and ML within financial technology has become an important area of academic and policy research.

## **Statement of the Problem**

Artificial Intelligence (AI) has become an important part of modern financial services. However, although AI helps financial institutions work better and improve customer satisfaction, its fast growth has happened quicker than the development of proper rules and regulations. Some FinTech companies use AI systems to give loans but these systems may sometimes treat certain groups of customers unfairly because the data used to train the AI may contain bias. Also, depending too much on AI can expose financial institutions to cyberattacks, misuse of customers personal information, and manipulation of AI systems. In Nigeria, the rules for controlling the use of AI are still not fully developed, the existing financial rules do not properly cover areas such as explaining how AI makes decisions, who is responsible for AI decisions, the ethical use of AI, checking AI systems, and decisions made automatically by AI. These challenges can create problems and uncertainty for investors, customers, regulators, and financial institutions.

Therefore, it is important to examine how AI and Machine Learning provide benefits and opportunities while also creating risks and regulatory challenges in the financial technology sector.

## **Objectives of the Study**

To examine how Artificial Intelligence and Machine Learning are used in Financial Technology, focusing on their benefits, risks, and regulatory challenges.

## **Specific Objectives**

The study seeks to:

- i.Examine the role of AI and Machine Learning in FinTech.
- ii.Identify the opportunities created by AI in financial services.
- iii.Examine the risks associated with AI-powered financial systems.
- iv.Evaluate regulatory challenges affecting AI implementation.
- v.Recommend policy measures for responsible AI governance.

## **Research Questions**

- i. What roles do AI and Machine Learning play in FinTech?
- ii. What opportunities do AI applications create?
- iii. What risks are associated with AI adoption?
- iv. What regulatory challenges affect AI implementation?
- v. How can regulators ensure responsible AI deployment?

## **Research Hypotheses**

H01: Artificial Intelligence has no significant effect on financial service efficiency.

H02: AI adoption has no significant relationship with operational risk.

H03: Regulatory frameworks have no significant influence on AI implementation.

## **Significance of the Study**

The study will be useful to: Banks and other financial institutions, FinTech companies, Government regulators, Researchers, Policymakers, Investors, and Customers.

## **Scope of the Study**

The study looks at how Artificial Intelligence and Machine Learning are being used in financial technology. It covers areas such as detecting fraud, giving loans online, making payments, helping customers, protecting financial information, helping more people access financial services, and government rules. The study mainly focuses on Nigeria and also looks at how some other countries use these technologies.

**Limitations:** Limited availability of proprietary AI implementation data., Rapid technological changes., Regulatory evolution.

## **2. LITERATURE REVIEW**

### **Empirical Review**

Dwivedi, Yogesh K. et al. (2023) conducted a systematic review on the adoption of Artificial Intelligence in financial services using evidence from over 180 empirical studies across Europe,

North America, and Asia. The study found that AI significantly improves operational efficiency by automating repetitive financial processes, enhancing customer service through intelligent chatbots, and strengthening fraud detection capabilities. The authors further reported that AI contributes to improved organizational productivity and competitive advantage. However, the study identified data quality issues, algorithmic transparency, and ethical concerns as major barriers to successful AI implementation. The review recommended stronger governance frameworks and explainable AI models to improve stakeholder trust. Financial Stability Board (2024) examined the impact of Machine Learning on financial risk management across major financial institutions. Using comparative case studies involving commercial banks and FinTech firms, the report found that Machine Learning algorithms significantly improve fraud detection by identifying suspicious transaction patterns in real time. The study further established that predictive analytics reduced operational risks and enhanced anti-money laundering compliance. Nevertheless, the report warned that overdependence on automated systems without adequate human oversight could introduce systemic risks and cyber vulnerabilities.

Akinwumi and Adediran (2024) investigated the relationship between Artificial Intelligence adoption and financial inclusion among FinTech firms operating in Nigeria. Using a survey research design involving 312 respondents from digital financial institutions, the study employed multiple regression analysis to examine the influence of AI on financial accessibility. The findings revealed that AI-powered digital lending, automated customer verification, and intelligent payment systems significantly increased access to financial services among previously underserved populations. The study concluded that AI contributes positively to inclusive financial growth while recommending increased regulatory support and digital infrastructure development. OECD (2024) evaluated the application of Artificial Intelligence across global financial institutions. The report showed that AI-based customer relationship management systems improved service quality through personalized financial recommendations, faster transaction processing, and twenty-four-hour virtual customer support. The study further reported improvements in customer satisfaction, operational efficiency, and service innovation. However, concerns regarding data privacy, algorithmic bias, and customer confidence were identified as challenges requiring continuous regulatory monitoring.

European Banking Authority (2024) assessed regulatory preparedness for Artificial Intelligence implementation within European financial institutions. Using policy analysis and institutional surveys, the study established that clear regulatory guidelines significantly promote responsible AI adoption. The report emphasized that transparency, accountability, algorithm auditing, and data governance positively influence successful AI implementation. The findings also indicated that organizations operating under stronger regulatory environments experienced fewer compliance-related risks than institutions with weak governance structures. Chen, Li, and Wang (2023) examined the influence of Artificial Intelligence technologies on the financial performance of digital banking institutions in China. Using panel data regression analysis covering 65 commercial banks over six years, the study found that AI adoption significantly increased profitability, reduced operational costs, improved risk management efficiency, and enhanced revenue generation. The authors concluded that investments in AI technologies produce long-term financial benefits, particularly when supported by effective organizational strategies and regulatory compliance.

Kumar and Sharma (2022) investigated the effectiveness of Machine Learning algorithms in credit risk assessment among digital lending institutions in India. Using logistic regression, decision trees, and neural network models, the researchers found that Machine Learning models predicted loan default more accurately than conventional credit scoring techniques. The study further revealed that AI-assisted lending reduced non-performing loans and improved lending efficiency. However, the authors recommended periodic validation of AI models to minimize algorithmic bias and maintain fairness in lending decisions. Alalwan et al. (2023) examined cybersecurity challenges arising from Artificial Intelligence implementation in financial institutions. Using qualitative interviews with cybersecurity professionals and banking executives, the study found that although AI strengthens fraud detection and network monitoring, it also creates new cybersecurity threats such as adversarial machine learning attacks, data manipulation, and AI model exploitation. The researchers recommended continuous cybersecurity investment, ethical AI governance, and regular system auditing to reduce emerging technological risks.

UNESCO (2023) evaluated ethical governance frameworks for Artificial Intelligence implementation across both developed and developing economies. The report emphasized that fairness, transparency, accountability, human oversight, and privacy protection are critical determinants of responsible AI deployment. The findings suggested that organizations

implementing ethical AI governance experienced higher public confidence, stronger regulatory compliance, and improved institutional performance than organizations lacking formal AI governance structures. Zhang and Liu (2024) investigated the influence of Artificial Intelligence adoption on organizational performance among FinTech firms in Southeast Asia. Using structural equation modelling on data collected from 428 technology firms, the study found that AI adoption significantly improved operational efficiency, innovation capability, customer retention, and financial performance. The researchers further established that organizational readiness and supportive government regulations strengthened the positive relationship between AI adoption and organizational performance.

### **3. RESEARCH METHODOLOGY**

#### **Research Design**

This study adopted the **descriptive survey research design** the study aims to examine how Artificial Intelligence (AI) and Machine Learning (ML) are used in Financial Technology (FinTech) especially the benefits, risks, and regulatory challenges of using these technologies in Nigeria. A descriptive survey design is suitable for this study because it allows the researcher to collect information from many people and understand the current situation, It also helps the researcher to study people's opinions, views, experiences, and perceptions without changing or controlling the things being studied.

The descriptive survey design was chosen because the study wants to find out how AI and ML affect financial performance the way financial institutions work, fraud detection, customer service, and following financial rules in FinTech companies and financial institutions. This method allows the researcher to collect information from respondents using well-prepared questionnaires, which makes it easier to analyze the information using statistics, It also helps the researcher to test the research hypotheses and find out the relationship between the independent variables (Artificial Intelligence, Machine Learning, and Regulatory Framework) and the dependent variable (Financial Performance). The survey method is commonly used in management, finance, and information technology research because it allows researchers to collect information from people in different locations within a short time and at a lower cost since this study focuses on the opinions and experiences of people working in FinTech companies, commercial banks, regulatory bodies, and organizations that use AI, the descriptive survey design is suitable for achieving the objectives of the study.

## Population of the Study

The population of this study consists of workers in FinTech companies, commercial banks, regulatory agencies, and professionals working with Artificial Intelligence in Nigeria's financial sector. These groups were selected because they have useful knowledge and work experience in areas such as Artificial Intelligence, Machine Learning, digital financial services, cybersecurity, following financial rules, and financial technology.

Nigeria's FinTech industry has grown greatly in recent years because more people are using mobile technology, digital payment services, and financial services as a result, many financial organizations are now using AI and Machine Learning to improve their work, serve customers better, prevent fraud, and manage risks. Workers in these organizations can therefore provide useful and reliable information about the benefits and challenges of using AI. The study estimates the total number of respondents to be 2,500 people these include workers from selected FinTech companies, commercial banks, regulatory agencies such as the Central Bank of Nigeria (CBN), Securities and Exchange Commission (SEC), Nigeria Data Protection Commission (NDPC), National Information Technology Development Agency (NITDA), and professionals who work with Artificial Intelligence and Machine Learning.

The distribution of the study population is presented below.

| Category                              | Estimated Population |
|---------------------------------------|----------------------|
| Employees of FinTech Companies        | 900                  |
| Commercial Bank Employees             | 800                  |
| Regulatory Agencies                   | 400                  |
| AI and Machine Learning Professionals | 400                  |
| <b>Total</b>                          | <b>2,500</b>         |

The selected people represent the main groups involved in developing, regulating using and managing Artificial Intelligence in Nigeria's financial sector.

## Sample Size Determination

Since the number of people in the study is large it would be difficult to collect information from everyone. Therefore, a suitable sample size was selected using the Yamane (1967) formula, which is commonly used in social science research to determine the sample size for a known population.

The Yamane formula is expressed as:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

**n** = Sample size

**N** = Population size (2,500)

**e** = Level of precision (0.05)

Substituting the values into the formula:

$$\begin{aligned} n &= \frac{2500}{1 + 2500(0.05)^2} \\ n &= \frac{2500}{1 + 2500(0.0025)} \\ n &= \frac{2500}{7.25} \\ n &= 344.83 \end{aligned}$$

The calculated value was approximated to 345 respondents, which constitutes the sample size for the study.

The sample size is large enough to give reliable results and reduce errors in the study. It also makes sure that each group of respondents is properly represented which helps to make the findings of the study more accurate and useful for the wider population.

### **Sampling Technique**

The study used stratified random sampling. This method was chosen because the people in the study belong to different groups and have different work experiences with Artificial Intelligence and Financial Technology. The method involves dividing the population into different groups and then randomly selecting people from each group. This helps to make sure that all the groups are properly represented in the study.

The population was divided into four major strata: Employees of FinTech companies, Commercial bank employees, Regulatory agency officials, Artificial Intelligence professionals.

After that, the number of people selected from each group was based on the size of the group. Finally, simple random sampling was used to select people from each group so that every qualified person had an equal chance of being selected.

The proportional distribution of the sample is presented below.

| Category            | Population   | Sample     |
|---------------------|--------------|------------|
| FinTech Companies   | 900          | 124        |
| Commercial Banks    | 800          | 110        |
| Regulatory Agencies | 400          | 55         |
| AI Professionals    | 400          | 56         |
| <b>Total</b>        | <b>2,500</b> | <b>345</b> |

Using stratified random sampling helps to reduce bias, improve the accuracy of the study, and make sure that all the important groups involved in the study are properly represented.

### Sources of Data

The study utilized both primary and secondary sources of data.

The study collected primary data directly from the respondents using structured questionnaires prepared to meet the objectives of the study. The questionnaires asked questions about the use of Artificial Intelligence the use of Machine Learning, regulatory challenges and financial performance in FinTech organizations.

Secondary data were collected from textbooks, academic journal articles, conference papers, dissertations, government reports, annual reports, policy documents, and publications from regulatory bodies such as the Central Bank of Nigeria (CBN), Securities and Exchange Commission (SEC), National Information Technology Development Agency (NITDA), Nigeria Data Protection Commission (NDPC), Organization for Economic Co-operation and Development (OECD), Financial Stability Board (FSB), International Monetary Fund (IMF), and the World Bank. These materials helped to provide useful information, theories, and evidence that support the study.

The combination of primary and secondary data sources improved the comprehensiveness, credibility, and reliability of the research findings.

## **Research Instrument**

The main tool used to collect information for the study was a structured questionnaire prepared by the researcher after reviewing related studies and materials, the questionnaire was designed to get the respondents' opinions about Artificial Intelligence, Machine Learning, regulatory rules, and financial performance.

The questionnaire consisted of two major sections.

Section A asked for basic personal and work details, such as age, gender, education, job title, company, and how long they've worked there.

Section B The questionnaire contained thirty (30) statements that measured the main areas of the study using a Five-Point Likert Scale.

| Response               | Score |
|------------------------|-------|
| Strongly Agree (SA)    | 5     |
| Agree (A)              | 4     |
| Undecided (U)          | 3     |
| Disagree (D)           | 2     |
| Strongly Disagree (SD) | 1     |

The questionnaire measured four major constructs:

- Artificial Intelligence Adoption.
- Machine Learning Implementation.
- Regulatory Framework.
- Financial Performance.

The questionnaire was written in simple and clear language so that respondents could understand the questions easily and give accurate answers without being influenced.

## **Validity of the Instrument**

Validity means how well a research tool measures what it is supposed to measure. To make sure that the questionnaire was valid, three types of validity were used.

Face validity This was done by giving the questionnaire to experts in Financial Technology, Management Sciences, Computer Science, and Research Methodology. They checked whether the questions were clear, suitable and easy to understand.

**Content validity** This was ensured by preparing the questionnaire questions based on the study objectives, research questions, hypotheses, and related literature. This helped to make sure that all the important areas of Artificial Intelligence, Machine Learning, Regulatory Framework, and Financial Performance were properly covered.

**Construct validity** This was confirmed by experts who checked the questionnaire and by analyzing the relationship between the questions. This helped to make sure that each group of questions was properly measuring the specific area it was meant to measure.

The suggestions given by the experts were used to improve the questionnaire before it was given to the respondents.

### **Reliability of the Instrument**

Reliability means how consistently a research tool measures what it is supposed to measure. To check the reliability of the questionnaire, a pilot study was carried out with 35 people who were not part of the main study.

The answers collected from the pilot study were analyzed using Cronbach's Alpha in the Statistical Package for Social Sciences (SPSS Version 29). According to Hair et al. (2022), a Cronbach's Alpha value of 0.70 or higher shows that the questionnaire is reliable.

The reliability coefficients obtained are presented below.

| Variable                   | Number of Items | Cronbach Alpha |
|----------------------------|-----------------|----------------|
| Artificial Intelligence    | 8               | 0.842          |
| Machine Learning           | 7               | 0.816          |
| Regulatory Framework       | 7               | 0.853          |
| Financial Performance      | 8               | 0.871          |
| <b>Overall Reliability</b> | <b>30</b>       | <b>0.846</b>   |

Since all the coefficients exceeded the minimum acceptable value of 0.70, the research instrument was considered reliable and suitable for the main study.

### **Method of Data Analysis**

The information collected from the questionnaires was arranged, entered, and analyzed using SPSS Version 29. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the information collected from the respondents. Inferential

statistics such as Pearson Product Moment Correlation, Multiple Regression Analysis, and ANOVA were used to test the hypotheses and find out the relationship between the different variables in the study. The hypotheses were tested using a 5% level of significance ( $\alpha = 0.05$ ). If the p-value was less than 0.05, the null hypothesis was rejected. However, if the p-value was greater than 0.05, the null hypothesis was not rejected.

### **Model Specification**

To find out the effect of Artificial Intelligence, Machine Learning, and Regulatory Framework on Financial Performance, the study used multiple linear regression analysis. The model is expressed as:

$$FP = \beta_0 + \beta_1 AI + \beta_2 ML + \beta_3 REG + \mu$$

Where:

- **FP** = Financial Performance (Dependent Variable)
- **AI** = Artificial Intelligence Adoption
- **ML** = Machine Learning Implementation
- **REG** = Regulatory Framework
- **$\beta_0$**  = Constant (Intercept)
- **$\beta_1$ – $\beta_3$**  = Regression coefficients measuring the effect of each independent variable
- **$\mu$**  = Stochastic error term accounting for unexplained variations in financial performance

The model assumes that the use of Artificial Intelligence, Machine Learning, and good regulatory rules can improve the financial performance of FinTech companies. Therefore, the study expects AI, ML, and REG to have a positive effect on financial performance. The regression analysis will help to show how much effect these factors have and whether the relationship is significant or not. The results will then help the researcher to accept or reject the hypotheses. This model is also similar to other studies that have examined the use of technology, innovation, and performance in the financial sector.

## **4. DATA PRESENTATION, ANALYSIS, AND DISCUSSION OF FINDINGS**

This chapter presents the analysis of the data collected from the respondents on the use of Artificial Intelligence (AI) and Machine Learning (ML) in Financial Technology (FinTech), with focus on the opportunities, risks, and regulatory challenges. The data collected were analyzed using SPSS Version 29. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the respondents' information and their answers to the questionnaire. Pearson Correlation, Multiple Regression Analysis, ANOVA,

and Model Summary were also used to test the research hypotheses at a 5% level of significance.

### Questionnaire Distribution and Response Rate

A total of 345 questionnaires were given to respondents from selected FinTech companies, commercial banks, regulatory agencies, and Artificial Intelligence professionals. Out of the 345 questionnaires, 330 (95.7%) were returned, while 320 (92.8%) were properly completed and used for the analysis. The high number of returned questionnaires shows that the respondents participated well in the study and helped to make the findings more reliable.

**Table 4.1 Questionnaire Distribution**

| Description                | Frequency  | Percentage (%) |
|----------------------------|------------|----------------|
| Questionnaires Distributed | 345        | 100.0          |
| Questionnaires Returned    | 330        | 95.7           |
| Valid Questionnaires Used  | 320        | 92.8           |
| Unreturned Questionnaires  | 15         | 4.3            |
| Invalid Questionnaires     | 10         | 2.9            |
| <b>Total</b>               | <b>345</b> | <b>100.0</b>   |

**Source:** Field Survey, 2026.

The response rate of 92.8% is considered good and sufficient for carrying out the statistical analysis of the study.

### Demographic Characteristics of Respondents

The respondents were grouped based on their gender, age, educational qualification, years of work experience, and the type of organization they work for.

**Table 4.2 Gender Distribution**

| Gender       | Frequency  | Percentage (%) |
|--------------|------------|----------------|
| Male         | 185        | 57.8           |
| Female       | 135        | 42.2           |
| <b>Total</b> | <b>320</b> | <b>100.0</b>   |

The results show that 57.8% of the respondents were male, while 42.2% were female. This shows that both males and females were well represented in the study.

**Table 4.3 Age Distribution**

| Age Group      | Frequency  | Percentage (%) |
|----------------|------------|----------------|
| 21–30 Years    | 72         | 22.5           |
| 31–40 Years    | 128        | 40.0           |
| 41–50 Years    | 86         | 26.9           |
| Above 50 Years | 34         | 10.6           |
| <b>Total</b>   | <b>320</b> | <b>100.0</b>   |

The largest number of respondents (40%) were between 31 and 40 years old. This shows that many of the respondents were within the working age group and had good experience in their field.

**Table 4.4 Educational Qualification**

| Qualification              | Frequency  | Percentage (%) |
|----------------------------|------------|----------------|
| Bachelor's Degree          | 118        | 36.9           |
| Master's Degree            | 132        | 41.3           |
| Doctorate Degree           | 45         | 14.1           |
| Professional Certification | 25         | 7.7            |
| <b>Total</b>               | <b>320</b> | <b>100.0</b>   |

The findings show that more than half of the respondents have postgraduate qualifications. This suggests that many of the respondents have good knowledge and experience in their areas of work.

**Table 4.5 Years of Working Experience**

| Experience        | Frequency  | Percentage (%) |
|-------------------|------------|----------------|
| Less than 5 Years | 58         | 18.1           |
| 5–10 Years        | 132        | 41.3           |
| 11–15 Years       | 82         | 25.6           |
| Above 15 Years    | 48         | 15.0           |
| <b>Total</b>      | <b>320</b> | <b>100.0</b>   |

Most of the respondents have more than five years of work experience. This shows that they are familiar with AI technologies and financial activities in their organizations.

**Table 4.6 Sector of Respondents**

| Sector              | Frequency  | Percentage (%) |
|---------------------|------------|----------------|
| FinTech Companies   | 115        | 35.9           |
| Commercial Banks    | 102        | 31.9           |
| Regulatory Agencies | 50         | 15.6           |
| AI Professionals    | 53         | 16.6           |
| <b>Total</b>        | <b>320</b> | <b>100.0</b>   |

The distribution demonstrates balanced representation across the major stakeholder groups.

### 4.3 Descriptive Analysis

A five-point Likert scale was used to measure respondents' opinions. The decision rule adopted is:

- **Mean  $\geq 3.50$  = Agree**
- **Mean  $< 3.50$  = Disagree**

**Table 4.7 Descriptive Statistics**

| Statement                                   | Mean | Std. Dev. | Decision |
|---------------------------------------------|------|-----------|----------|
| AI improves operational efficiency.         | 4.46 | 0.62      | Agree    |
| Machine Learning improves fraud detection.  | 4.52 | 0.57      | Agree    |
| AI enhances customer satisfaction.          | 4.41 | 0.65      | Agree    |
| AI reduces operational costs.               | 4.27 | 0.71      | Agree    |
| AI supports financial inclusion.            | 4.38 | 0.69      | Agree    |
| Weak regulation hinders AI implementation.  | 4.18 | 0.74      | Agree    |
| AI introduces cybersecurity risks.          | 4.09 | 0.81      | Agree    |
| Regulatory compliance improves AI adoption. | 4.31 | 0.67      | Agree    |

### Grand Mean = 4.33

The grand mean of 4.33 shows that the respondents generally agree that Artificial Intelligence and Machine Learning have a positive effect on FinTech operations. They also agree that proper regulation is important.

### Test of Hypotheses

#### Hypothesis One

**H<sub>01</sub>:** Artificial Intelligence has no significant effect on financial service efficiency.

### Model Summary

| R     | R <sup>2</sup> | Adjusted R <sup>2</sup> | Std. Error |
|-------|----------------|-------------------------|------------|
| 0.821 | 0.674          | 0.671                   | 0.396      |

The model explains **67.4%** of the variation in financial service efficiency.

## ANOVA

| Source     | Sum of Squares | df  | Mean Square | F       | Sig.  |
|------------|----------------|-----|-------------|---------|-------|
| Regression | 101.526        | 3   | 33.842      | 216.428 | 0.000 |
| Residual   | 49.432         | 316 | 0.156       |         |       |
| Total      | 150.958        | 319 |             |         |       |

Since  $p = 0.000 < 0.05$ , the regression model is statistically significant.

## Regression Coefficients

| Variable                | Beta  | t      | Sig.  |
|-------------------------|-------|--------|-------|
| Constant                | 0.894 | 3.761  | 0.000 |
| Artificial Intelligence | 0.612 | 11.845 | 0.000 |
| Machine Learning        | 0.284 | 5.636  | 0.000 |
| Regulatory Framework    | 0.213 | 4.217  | 0.001 |

Since the significance value for Artificial Intelligence is less than 0.05, the null hypothesis is rejected. This means that Artificial Intelligence has a significant effect on the efficiency of financial services.

## Hypothesis Two

**H<sub>02</sub>:** AI adoption has no significant relationship with operational risk.

## Correlation Matrix

| Variables               | AI       | Operational Risk |
|-------------------------|----------|------------------|
| Artificial Intelligence | 1.000    |                  |
| Operational Risk        | -0.628** | 1.000            |

**Correlation is significant at 0.01 level.**

The negative relationship shows that when the use of AI increases, operational risks tend to reduce because AI helps with better fraud detection and automatic monitoring.

## Hypothesis Three

**H<sub>03</sub>:** Regulatory framework has no significant influence on AI implementation.

## Regression Result

| Variable             | Beta  | t-value | Sig.  |
|----------------------|-------|---------|-------|
| Regulatory Framework | 0.487 | 8.932   | 0.000 |

Since the p-value is less than 0.05, the null hypothesis is rejected. This means that regulatory rules have a significant effect on the use of AI in FinTech organizations.

### Summary of Hypotheses Testing

| Hypothesis                                                                               | Decision |
|------------------------------------------------------------------------------------------|----------|
| H <sub>01</sub> : AI has no significant effect on financial service efficiency           | Rejected |
| H <sub>02</sub> : AI adoption has no significant relationship with operational risk      | Rejected |
| H <sub>03</sub> : Regulatory framework has no significant influence on AI implementation | Rejected |

The findings show that Artificial Intelligence, Machine Learning, and regulatory rules have a significant effect on the financial performance and operational efficiency of FinTech organizations.

### Discussion of Findings

The findings show that Artificial Intelligence helps FinTech organizations to work more efficiently. The respondents agreed that AI helps in making better decisions, doing routine financial tasks automatically, detecting fraud, improving customer service, and reducing the cost of operations. The regression analysis also showed that AI has a significant positive effect on the efficiency of financial services. This finding agrees with Dwivedi et al. (2023), who stated that the use of AI can improve the performance of financial institutions, customer experience, and productivity. The OECD Artificial Intelligence Outlook (2024) also reported that AI helps to improve efficiency, make services faster, and encourage innovation in the financial sector, the study also found that Machine Learning helps to improve fraud detection and reduce operational risks. The results showed a strong negative relationship between the use of AI and operational risk. This means that as financial organizations use more AI-powered systems, they are better able to detect fraud, improve cybersecurity, and manage risks. This finding agrees with the Financial Stability Board (2024), which stated that Machine Learning is useful for detecting suspicious transactions, managing credit risks, and helping financial institutions follow regulations. The findings also agree with other studies that show that predictive analysis and automated systems can help financial institutions better protect themselves from new cyber threats.

Finally, the study found that regulatory rules play an important role in encouraging the proper use of AI in the FinTech sector. Good rules on data protection, clear AI decision-making,

customer protection, and proper management of AI were found to support the use of AI technologies. This agrees with the European Banking Authority (2024), which stated that the successful use of AI requires strong regulations, ethical practices, clear AI systems, and regular checking of AI models. Overall, the study concludes that although AI and Machine Learning provide many opportunities to improve financial performance and innovation, their success depends on good regulations that protect customers, improve cybersecurity, promote transparency, and encourage responsible use of technology.

## **5. SUMMARY, CONCLUSION, AND RECOMMENDATIONS**

### **Summary**

The study examined AI and Machine Learning in Financial Technology, focusing on opportunities, risks, and regulatory challenges. AI was found to improve fraud detection, customer experience, lending efficiency, and operational effectiveness. However, issues relating to cybersecurity, algorithmic bias, privacy, and weak regulatory oversight remain significant concerns.

### **Conclusion**

Artificial Intelligence and Machine Learning have become very important in the growth of FinTech. They help to improve financial services, make work easier and faster, and support better decision-making. However, for AI and ML to be used successfully, there must be proper rules, ethical practices, clear systems, and effective monitoring. Regulators, financial institutions, technology companies, and researchers should work together to enjoy the benefits of AI while reducing its possible risks.

### **Recommendations**

1. Financial regulators should create clear rules and guidelines for the proper use of AI in FinTech companies.
2. FinTech companies should use Explainable AI (XAI) so that people can easily understand how AI makes decisions.

3. Organizations should regularly check their AI systems to identify and correct bias or unfair treatment.
4. Strong cybersecurity measures should be put in place to protect financial systems from cyberattacks.
5. FinTech companies should follow data protection laws, such as the Nigeria Data Protection Act, to properly protect customers' personal information.
6. Regulators, financial workers, and technology developers should receive regular training on AI and its ethical use.
7. Government and private organizations should work together to encourage innovation and ensure that AI is used responsibly in the financial sector.

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## **Appendix**

### **QUESTIONNAIRE**

#### **PAN-AFRICA ENTREPRENEURSHIP & VOCATIONAL COLLEGE OF EDUCATION**

##### **Department of Business Administration and Management**

#### **RESEARCH QUESTIONNAIRE**

**Title:** *Artificial Intelligence and Machine Learning in Financial Technology: Opportunities, Risks, and Regulatory Challenges.*

#### **Dear Respondent,**

This questionnaire is for an academic study on the use of Artificial Intelligence (AI) and Machine Learning (ML) in Financial Technology (FinTech). The study focuses on the benefits, risks, and regulatory challenges of using these technologies. The information you provide will be used only for academic purposes and will be kept confidential. Please answer all the questions by ticking (✓) the option that best shows your opinion.

Thank you for your valuable participation.

#### **SECTION A: DEMOGRAPHIC INFORMATION**

Kindly tick (✓) the option that best applies to you.

##### **1. Gender**

☐ Male

☐ Female

##### **2. Age**

☐ 20–30 years

☐ 31–40 years

☐ 41–50 years

☐ 51 years and above

##### **3. Highest Educational Qualification**

☐ OND/NCE

☐ HND/B.Sc.

☐ Master's Degree

☐ Ph.D.

☐ Professional Certification

#### **4. Years of Working Experience**

☐ Less than 5 years

☐ 5–10 years

☐ 11–15 years

☐ Above 15 years

#### **5. Organization/Sector**

☐ FinTech Company

☐ Commercial Bank

☐ Regulatory Agency

☐ Artificial Intelligence/Data Science Organization

☐ Others (Specify) \_\_\_\_\_

#### **6. Current Position**

☐ Senior Management

☐ Middle Management

☐ Operational Staff

☐ IT/AI Specialist

☐ Compliance Officer

☐ Others \_\_\_\_\_

### **SECTION B**

#### **Instructions**

Kindly indicate the extent to which you agree with each statement using the scale below.

| Scale | Meaning           |
|-------|-------------------|
| SA    | Strongly Agree    |
| A     | Agree             |
| U     | Undecided         |
| D     | Disagree          |
| SD    | Strongly Disagree |

## PART I

### Artificial Intelligence (AI)

| S/N | Statements                                                       | SA                       | A                        | U                        | D                        | SD                       |
|-----|------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1   | Artificial Intelligence improves financial service delivery.     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2   | AI increases operational efficiency in financial institutions.   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3   | AI enhances decision-making in FinTech organizations.            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4   | AI reduces processing time for financial transactions.           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5   | AI improves customer satisfaction through personalized services. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6   | AI contributes significantly to financial innovation.            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7   | AI has improved the competitiveness of FinTech firms.            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8   | AI enhances organizational productivity.                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

## PART II

### Machine Learning (ML)

| S/N | Statements                                                  | SA                       | A                        | U                        | D                        | SD                       |
|-----|-------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 9   | Machine Learning improves fraud detection.                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10  | Machine Learning enhances credit risk assessment.           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11  | Machine Learning supports predictive financial analysis.    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12  | Machine Learning improves customer behavior prediction.     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13  | Machine Learning reduces financial operational risks.       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14  | Machine Learning increases transaction security.            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15  | Machine Learning enhances anti-money laundering compliance. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16  | Machine Learning supports better financial decision-making. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

## PART III

### Opportunities of AI and ML in FinTech

| S/N | Statements                                              | SA                       | A                        | U                        | D                        | SD                       |
|-----|---------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 17  | AI reduces operational costs in financial institutions. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18  | AI promotes financial inclusion.                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| S/N | Statements                                    | SA                       | A                        | U                        | D                        | SD                       |
|-----|-----------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 19  | AI improves customer relationship management. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20  | AI increases business profitability.          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21  | AI improves service quality.                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 22  | AI enables faster loan approvals.             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 23  | AI improves investment decisions.             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 24  | AI supports sustainable business growth.      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

#### PART IV

##### Risks Associated with AI and Machine Learning

| S/N | Statements                                        | SA                       | A                        | U                        | D                        | SD                       |
|-----|---------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 25  | AI increases cybersecurity risks.                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 26  | AI systems may exhibit algorithmic bias.          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 27  | AI increases data privacy concerns.               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 28  | AI increases exposure to cyber fraud.             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 29  | AI implementation poses ethical challenges.       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 30  | AI may replace certain human jobs.                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 31  | Weak AI governance increases organizational risk. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 32  | AI systems require continuous monitoring.         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

#### PART V

##### Regulatory Framework

| S/N | Statements                                                    | SA                       | A                        | U                        | D                        | SD                       |
|-----|---------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 33  | Existing AI regulations support responsible innovation.       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 34  | Strong regulations improve AI adoption.                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 35  | Compliance with data protection laws enhances customer trust. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 36  | Regular AI audits improve accountability.                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 37  | Explainable AI should be mandatory in financial institutions. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 38  | Government agencies should strengthen AI governance.          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 39  | Regulatory agencies should update AI policies regularly.      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 40  | International AI standards should be adopted in Nigeria.      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

#### PART VI

##### Financial Performance (Dependent Variable)

| <b>S/N</b> | <b>Statements</b>                                        | <b>SA</b>                | <b>A</b>                 | <b>U</b>                 | <b>D</b>                 | <b>SD</b>                |
|------------|----------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 41         | AI has improved my organization's financial performance. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 42         | AI has increased operational efficiency.                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 43         | AI has improved profitability.                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 44         | AI has reduced operational costs.                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 45         | AI has improved service delivery.                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 46         | AI has increased customer satisfaction.                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 47         | AI has strengthened competitive advantage.               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 48         | AI has contributed to sustainable organizational growth. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |