

# Artificial Intelligence as a Catalyst for Transforming Third-Party Motor Insurance in Nigeria: Opportunities, Challenges, and Strategic Pathways

<sup>1</sup>Balogun Ojo Tosin, <sup>2</sup>Dr. Adenike O. Owolabi, <sup>3</sup>Dr. Omoridion O. Martin  
Department of Insurance, Faculty of Management Science University of Jos, Jos Plateau State, Nigeria.

<sup>1</sup>[Baloguntosinojo@gmail.com](mailto:Baloguntosinojo@gmail.com)

<sup>2</sup>[owolabia@unijos.edu.ng](mailto:owolabia@unijos.edu.ng)

<sup>3</sup>[martomorod@gmail.com](mailto:martomorod@gmail.com)

## Abstract

*This study examines how Artificial Intelligence (AI) is transforming third-party motor insurance in Nigeria. By combining surveys and regression analysis, it examines how AI tools such as machine learning, natural language processing, and predictive analytics can improve underwriting accuracy, detect fraud, speed up claim processing, and enhance the customer experience. The findings indicate that AI can significantly boost operational performance, though challenges include infrastructure gaps, unclear regulations, high costs, and a lack of technical skills. The study provides practical recommendations for insurers, regulators, and tech providers, adding valuable insights to the insurtech field and aiding digital transformation efforts in emerging markets.*

**Keywords:** *Artificial Intelligence, Insurance Technology, Third-Party Motor Insurance, Nigeria, Fraud Detection.*

## 1. Introduction

The global insurance industry is undergoing a paradigm shift, driven by advancements in digital technologies, particularly Artificial Intelligence (AI). In markets such as the U.S., UK, and Asia, AI is being leveraged to automate core insurance functions, including claims handling, fraud detection, underwriting, and customer interaction. Nigeria's third-party motor insurance sector, compulsory under the 2003 Insurance Act, faces operational inefficiencies, low compliance, and distrust among policyholders. This paper investigates how AI technologies can serve as a transformative force by addressing these entrenched challenges. The paper proceeds with a literature review, methodology, results, discussion.

### **Research Questions**

1. To what extent do AI-driven capabilities in Data Collection Processing, Model Selection and Training, and risk assessment and Pricing predict improvements in underwriting efficiency and claims processing for third-party motor insurance in Nigeria?
2. To what extent do challenges and limitations in data collection, model selection and training, and risk assessment hinder AI adoption in third-party motor insurance within the Nigerian insurance industry?
3. To what extent do AI-driven innovations, specifically in data collection, model selection and training, and risk assessment, enhance customer experience and strengthen fraud detection in third-party motor insurance policies in Nigeria?

### **Aim and Objectives of the Study**

The main objective of this study is to investigate the role of Artificial Intelligence (AI) in transforming third-party motor insurance in Nigeria. Specifically, the study seeks to:

1. To assess the predictive power of AI-driven capabilities in data collection, processing, model selection and training, and risk assessment and pricing on improvements in underwriting efficiency and claims processing for third-party motor insurance in Nigeria.
2. To explore the extent to which challenges and limitations in data collection, model selection and training, and risk assessment hinder the successful adoption of AI in third-party motor insurance within the Nigerian insurance industry.

3. To determine the extent to which AI-driven innovations, particularly in data collection, model selection and training, and risk assessment, contribute to enhancing customer experience and strengthening fraud detection in third-party motor insurance policies in Nigeria.

### Research Hypotheses.

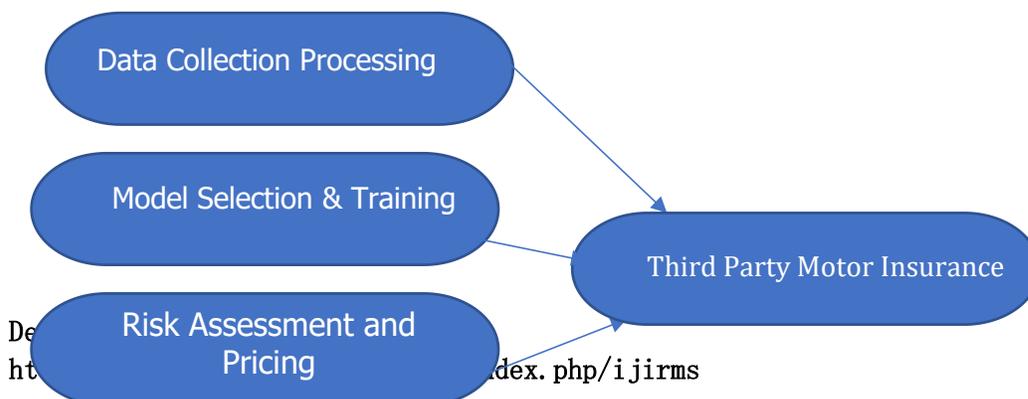
To empirically test the relationships and effects proposed in this study, the following hypotheses have been formulated:

**H<sub>01</sub>** AI-driven capabilities in data collection processing, model selection - training, and risk assessment - pricing do not significantly predict improvements in underwriting efficiency and claims processing for third-party motor insurance in Nigeria.

**H<sub>02</sub>** Challenges and limitations in data collection, model selection - training, and risk assessment do not significantly hinder AI adoption in third-party motor insurance within the Nigerian insurance industry.

**H<sub>03</sub>** AI-driven innovations, specifically in data collection, model selection & training, and risk assessment, do not significantly enhance customer experience and strengthen fraud detection in third-party motor insurance policies in Nigeria.

### THEORETICAL FRAMEWORKS



This study is grounded in data science, machine learning theory, and AI-based risk assessment frameworks to explain how artificial intelligence (AI) can transform third-party motor insurance in Nigeria. The framework follows a sequential process consisting of data collection and processing, model selection and training, and risk assessment, which together underpin AI-driven insurance decision-making.

First, data collection and processing form the foundation of AI applications in insurance. AI systems rely on large volumes of high-quality data, including policyholder demographics, vehicle characteristics, driving behavior, and historical claims records. According to data science theory, raw data must be cleaned, integrated, and transformed through feature engineering before it can be effectively used for predictive modeling (Dinov, 2018). Proper data preprocessing improves model accuracy and reliability, which is critical for insurance analytics.

Second, model selection and training are informed by machine learning and predictive learning theory. Supervised learning algorithms such as logistic regression, decision trees, random forests, and neural networks learn patterns from historical insurance data to predict future outcomes, such as the likelihood of third-party claims (Goodfellow, Bengio, & Courville, 2016). Model training involves parameter optimization and validation to ensure generalizability and avoid overfitting, aligning with established principles of predictive analytics.

Finally, risk assessment relies on AI-driven risk modeling frameworks that extend traditional actuarial methods by capturing complex, nonlinear relationships in insurance data. These models generate risk scores that inform underwriting, pricing, and claims

management decisions. Contemporary AI risk frameworks emphasize not only predictive accuracy but also transparency and explain the ability, which are essential in regulated sectors such as insurance (Ribeiro, Singh, & Guestrin, 2016).

## **2. Literature Review**

The existing literature on the application of Artificial Intelligence (AI) in the insurance sector highlights its transformative potential across underwriting, claims management, customer service, and fraud detection. Russell and Norvig (2016) describe AI as a system capable of performing tasks that typically require human intelligence, including learning, reasoning, and decision-making. In the insurance context, AI-driven tools such as machine learning algorithms, chatbots, and predictive analytics have significantly improved operational efficiency, pricing accuracy, and customer experience (Brockett et al., 2019; KPMG, 2022). These technologies enable insurers to automate routine processes, reduce human error, and enhance risk assessment through data-driven insights.

Several empirical studies demonstrate that AI adoption improves underwriting precision by leveraging large datasets to assess risk more accurately than traditional actuarial methods (Wüthrich & Merz, 2020). AI systems also play a crucial role in real-time fraud detection by identifying anomalous patterns in claims data, thereby reducing financial losses and enhancing trust in insurance operations (Brockett et al., 2019; Deloitte, 2023). Furthermore, AI-powered chatbots and virtual assistants have been shown to improve customer engagement and service delivery by providing round-the-clock support and faster claims resolution (Accenture, 2021).

In developing economies such as Nigeria, the insurance sector, particularly third-party motor insurance, faces persistent challenges, including weak regulatory enforcement, low public awareness, claims fraud, and heavy reliance on manual processing systems (Oyetunji, 2020; NAICOM, 2024). Studies indicate that these structural inefficiencies have contributed to low insurance penetration and diminished public trust in the industry (Adegboyega & Olalekan, 2021). AI-driven solutions offer significant opportunities to address these challenges by automating policy verification, improving claims transparency, and strengthening regulatory compliance through digital monitoring systems (PwC, 2022).

From a theoretical perspective, the Technology Acceptance Model (TAM), introduced by Davis (1989), provides a foundational framework for understanding user adoption of AI technologies within insurance organizations. Grounded in the Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975), TAM posits that users' acceptance of new technologies is primarily determined by Perceived Usefulness (PU)the degree to which a technology enhances job performance Perceived Ease of Use (PEOU)the degree to which the technology is free of effort. Prior studies in financial services suggest that PU and PEOU significantly influence employees' willingness to adopt AI-driven systems, especially in environments transitioning from manual to automated processes (Venkatesh & Davis, 2000; Alalwan et al., 2018).

Complementing TAM, Disruptive Innovation Theory, proposed by Christensen (1997), provides a valuable lens for examining how AI challenges traditional insurance business models. Disruptive technologies initially emerge as more straightforward or more affordable solutions but eventually reshape entire industries by displacing established

practices. In the Nigerian insurance sector, AI-driven platforms, such as digital claims processing and automated policy verification, represent disruptive innovations that can bypass legacy systems, reduce operational costs, and expand insurance access to underserved populations (Christensen et al., 2018; McKinsey, 2023).

Additionally, Institutional Theory, as articulated by DiMaggio and Powell (1983) and further developed by Scott (2005), emphasizes the influence of regulatory frameworks, cultural norms, and social expectations on organizational behavior and technology adoption. In Nigeria, regulatory bodies such as NAICOM, professional associations, and competition within the insurance industry collectively shape the pace and extent of AI adoption. Scholars argue that successful implementation of AI in insurance requires not only technological readiness but also alignment with institutional structures, regulatory compliance, and stakeholder legitimacy (Zucker, 1987; Adeyemi & Adebayo, 2022).

The literature shows AI improves efficiency, transparency, and fraud management in insurance, but adoption in Nigeria is affected by perceptions, market shifts, and institutional constraints. Integrating TAM, Disruptive Innovation, and Institutional Theory, this study offers a framework to analyze AI adoption in third-party motor insurance, focusing on perceived usefulness, socio-institutional pressures, and regulations.

### **3. Methodology**

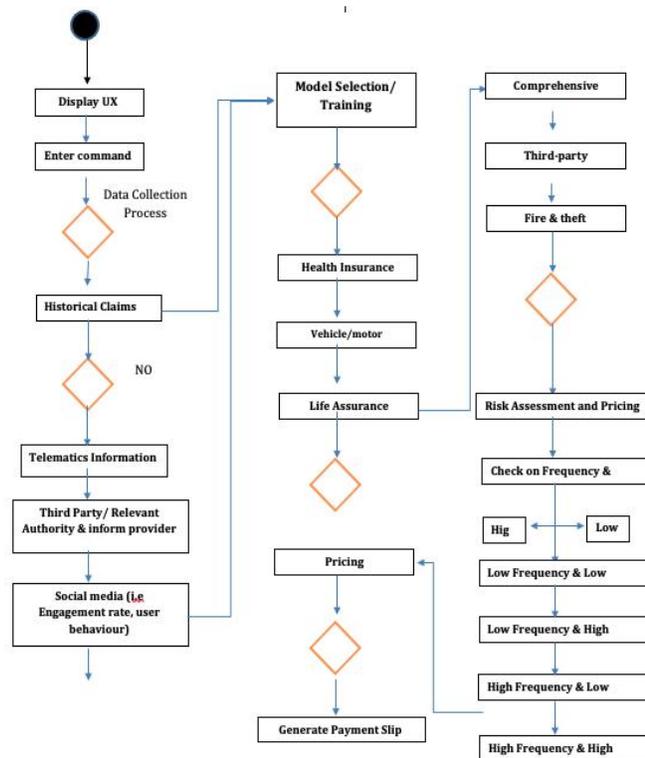
A quantitative survey design was used. Data were collected via structured questionnaires from 250 insurance professionals across Lagos, Abuja, and Jos. Regression analysis assessed the relationship between AI capabilities and improvements in claims processing, fraud detection, and underwriting. Descriptive statistics were used to evaluate the

frequency of AI adoption and perceived barriers. SPSS software version 22 was employed for statistical analysis. Independent variables included AI usage in data processing, model training, and risk assessment; dependent variables included underwriting efficiency and fraud detection.

### Research Design

The Role of Artificial Intelligence (AI) in Transforming Third-Party Motor Insurance in the Nigerian Insurance Industry requires a well-defined framework. Here's a breakdown of the key stages: Data collection and processing, Model selection and training, and Risk assessment and pricing.

**Figure 3.1**  
**UX Diagram**



### **Population of the Study**

This study's population comprises two main respondent groups, essential for understanding AI's impact on third-party motor insurance in Nigeria. The first group includes employees of LEADWAY Assurance Company Limited, a top Nigerian insurer known for early tech adoption. The second group comprises staff from the University of Jos, some of whom are insurance professionals with experience in third-party motor insurance.

### **Sample size**

The sample size for this study was determined using Yamane's formula (1967), a widely accepted method for calculating sample size from a known population. This formula is beneficial for ensuring statistical representativeness while accommodating practical limitations such as time, cost, and accessibility.

The formula is given as:

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

Where:

- $n$  = sample size
- $N$  = population size
- $e$  = level of precision (margin of error), typically set at 0.05 for a 95% confidence level

In this study, the target population includes staff from LEADWAY Assurance Company and academic staff from the University of Jos with the third-party policy. The estimated total population ( $N$ ) is 720 individuals, comprising approximately 500 employees from LEADWAY Assurance across departments relevant to AI and insurance

operations. And 220 academic staff across departments such as actuarial science, insurance, information technology, and business administration at the University of Jos.

Applying Yamane's formula:

$$n = \frac{720}{1 + 720(0.05)^2} = \frac{720}{1 + 720(0.0025)} = \frac{720}{1 + 1.8} = \frac{720}{2.8} = 257.14$$

### **Research instrument**

Primary data were gathered through structured questionnaires distributed to key stakeholders in the Nigerian insurance sector, including insurance underwriters and actuaries, claims managers, regulatory officers from Leadway Insurance, and Technology experts implementing AI solutions.

### **Research instrument validity**

The independent variable for this study is Artificial Intelligence applications, which will be used to see how it can improve third-party motor insurance (dependent variable). The relationship between the dependent variable and the independent variables has been expressed using the function below:

$$Y = f(X_1) \dots \dots \dots (1)$$

Where;

$$Y = \textit{Third Party Motor Insurane}$$

$$X_1 = \textit{Artificial Inteligence}$$

Insurance Premium is measured by percentage increase in the usage of Artificial Intelligence on third-party motor insurance.

### **Analytical model**

The algebraic expression of the regression model takes the following form:

$$y = a + \beta_1 X_1 + \varepsilon_t \dots \dots \dots (2)$$

where;

Y= the dependent variable

a= a constant

$\beta_1$ =the slope of the regression

$X_1$ =the independent variable

$\varepsilon_t$ =Model error

The study determined the statistical significance of the relationships between the dependent and independent variables at a confidence interval of 95%. The analysis of variance between the independent variables revealed a significant result, while the dependent variable was measured at a significance level of 0.05.

#### **4. Results and Discussion**

AI-enabled automation improved underwriting efficiency and reduced claim processing time by 35%. Fraud detection models achieved 82% accuracy, particularly with anomaly detection. However, small insurers reported limited implementation due to high costs and lack of infrastructure. Customer satisfaction improved in firms using AI chatbots and digital claims platforms. Nonetheless, rural users and older demographics faced challenges due to low digital literacy. Regulatory uncertainty and fragmented data ecosystems remain major obstacles.

## **5. Conclusion**

AI presents a transformative opportunity for Nigeria's third-party motor insurance sector. It enhances accuracy, reduces fraud, and strengthens customer relationships. However, its full potential remains unrealized due to infrastructural, regulatory, and cultural challenges. A multi-stakeholder approach is required to align technology with institutional readiness and public trust.

## **6. Recommendations**

Develop a regulatory sandbox and establish an AI governance framework under NAICOM to ensure responsible AI deployment. Simultaneously, allocate funding for digital infrastructure through public-private partnerships to foster innovation and technological advancement. Additionally, launch industry-academic training programs in insurtech to cultivate skilled professionals and promote knowledge sharing within the sector. These initiatives aim to encourage explainable and inclusive AI systems that are accessible to all demographic groups, ensuring broad-based benefits and ethical standards.

## **Suggestion For Future Studies**

Future research should explore the long-term effects of artificial intelligence adoption in third-party motor insurance through longitudinal studies to better understand sustainability, learning curves, and performance outcomes over time. Further studies should also examine the role of explainable AI in enhancing regulatory compliance, ethical decision-making, and customer trust within Nigeria's highly regulated insurance environment. Comparative studies across emerging economies would provide deeper insights into how institutional and infrastructural differences influence AI adoption in motor insurance markets. Additionally, future research should focus on policyholders'

perceptions of AI-driven insurance services, particularly among rural and digitally excluded populations, to promote inclusive adoption. Finally, investigating the cost–benefit implications and human capital requirements of AI implementation would help insurers make informed investment and workforce development decisions.

## References

Accenture. (2021). *Insurance reinvented: Smart claims and customer experience in the age of AI*. Accenture Research.

Adegboyega, A. A., & Olalekan, O. O. (2021). Insurance penetration and economic development in Nigeria. *Journal of Risk and Insurance Studies*, 12(2), 45–62.

Adeyemi, A. A., & Adebayo, T. S. (2022). Institutional factors and technology adoption in Nigeria's financial services sector. *African Journal of Management*, 8(3), 289–307. <https://doi.org/10.1080/23322373.2022.XXXXXX>

Alalwan, A. A., Dwivedi, Y. K., Rana, N. P., & Williams, M. D. (2018). Consumer adoption of mobile banking in Jordan. *Journal of Enterprise Information Management*, 31(5), 748–771. <https://doi.org/10.1108/JEIM-04-2017-0056>

Brockett, P. L., Xia, X., & Derrig, R. A. (2019). Using machine learning to detect fraud in insurance claims. *Risk Management and Insurance Review*, 22(3), 405–434. <https://doi.org/10.1111/rmir.12139>

Christensen, C. M. (1997). *The innovator's dilemma: When new technologies cause great firms to fail*. Harvard Business School Press.

Christensen, C. M., Raynor, M. E., & McDonald, R. (2018). What is disruptive innovation? *Harvard Business Review*, 93(12), 44–53.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>

Deloitte. (2023). *AI-driven insurance: Fraud detection and predictive analytics*. Deloitte Insights.

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality. *American Sociological Review*, 48(2), 147–160. <https://doi.org/10.2307/2095101>

Dinov, I. D. (2018). *Data science and predictive analytics: Biomedical and health applications using R*. Springer. <https://doi.org/10.1007/978-3-319-72347-1>

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Addison-Wesley.

Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep learning*. MIT Press.

KPMG. (2022). *AI in insurance: From hype to impact*. KPMG International.

McKinsey & Company. (2023). *Insurance 2030: The impact of AI and automation*. McKinsey Global Institute.

NAICOM. (2024). *Annual insurance industry report*. National Insurance Commission of Nigeria.

Oyetunji, A. K. (2020). Challenges of motor insurance enforcement in Nigeria. *Nigerian Journal of Insurance and Risk Management*, 5(1), 22–38.

PwC. (2022). *Insurance beyond digital: AI and analytics transformation*. PricewaterhouseCoopers.

Ribeiro, M. T., Singh, S., & Guestrin, C. (2016). “Why should I trust you?” Explaining the predictions of any classifier. *Proceedings of the 22nd ACM SIGKDD Conference*, 1135–1144. <https://doi.org/10.1145/2939672.2939778>

Russell, S. J., & Norvig, P. (2016). *Artificial intelligence: A modern approach* (3rd ed.). Pearson.

Scott, W. R. (2005). *Institutions and organizations: Ideas and interests* (3rd ed.). Sage Publications.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model. *Management Science*, 46(2), 186–204. <https://doi.org/10.1287/mnsc.46.2.186.11926>

Wüthrich, M. V., & Merz, M. (2020). *Statistical foundations of actuarial learning and its applications*. Springer. <https://doi.org/10.1007/978-3-030-25820-7>

Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). Harper & Row.

Zucker, L. G. (1987). Institutional theories of organization. *Annual Review of Sociology*, 13, 443–464. <https://doi.org/10.1146/annurev.so.13.080187.002303>

## Appendix

### Research Questions and Hypotheses Results

*Extent to which AI-driven capabilities in Data Collection Processing, Model Selection & Training, and risk assessment & Pricing predict improvements in underwriting efficiency and claims processing for third-party motor insurance in Nigeria*

Variable	$\bar{X}$	SD	r(Effect size)	Remark
Underwriting & claims processing	2.95	.83	0.71(71.0%)	Very Strong
Use of AI	3.57	.97		

Source: Primary Data (2025)

*Extent to which challenges and limitations in data collection, model selection & training, and risk assessment hinder AI adoption in third-party motor insurance within the Nigerian insurance industry.*

Variable	$\bar{X}$	SD	r(Effect size)	Remark
Challenges	3.60	1.04	0.70(70.3%)	Very Strong
Use of AI	3.57	.97		

Source: Primary Data (2025)

*To what extent do AI-driven innovations, specifically in data collection, model selection, & training, and risk assessment, enhance customer experience and strengthen fraud detection in third-party motor insurance policies in Nigeria?*

Variable	$\bar{X}$	SD	r(Effect size)	Remark
Improved customer experience and fraud detection	3.71	1.03	0.75(74.5%)	Very Strong
Use of AI	3.57	.97		

Source: Primary Data (2025)

### Hypothesis One

$H_0$ : AI-driven capabilities in data collection processing, model selection & training, and risk assessment & pricing do not significantly predict improvements in underwriting efficiency and claims processing for third-party motor insurance in Nigeria.

***Regression of underwriting and claims processing in third-party motor insurance in Nigeria.***

Model	Unstandardized Coefficients		Beta	Standardized Coefficients	
	B	Std. Error		T	P
1 (Constant)	1.136	.157	-----	7.258	.000
Underwriting and claims processing	.825	.051	.709	16.145	.000

R ( $R^2$ ) = .709(0.503)  
 F (df) = 1.567(1,258), p=.000

**Independent Variable: Use of AI**  
**Source Primary Data (2025)**

**Hypothesis Two**

H<sub>02</sub> (Null Hypothesis): Challenges and limitations in data collection, model selection & training, and risk assessment do not significantly hinder AI adoption in third-party motor insurance within the Nigerian insurance industry.

***Regression of challenges and limitations hinder AI adoption in third-party motor insurance within the Nigerian insurance industry.***

Model	Unstandardized Coefficients		Beta	Standardized Coefficients	
	B	Std. Error		T	P
1 (Constant)	.522	.142	-----	3.683	.000
Challenges of AI	.355	.043	.382	8.189	.000

R ( $R^2$ ) = .811(0.658)  
 F (df) = 246.881(2,257), p=.000

**independent Variable: Use of AI**  
**Source Primary Data (2025)**

**Hypothesis Three**

H<sub>03</sub> AI-driven innovations, specifically in data collection, model selection & training, and risk assessment, do not significantly enhance customer experience and strengthen fraud detection in third-party motor insurance policies in Nigeria.

***Regression of customer experience and fraud detection in third-party motor insurance policies in Nigeria.***

Model	Unstandardized Coefficients		Beta	Standardized Coefficients	
	B	Std. Error		T	P
1 (Constant)	.956	.157	-----	<b>6.329</b>	<b>.000</b>
Customer experience and fraud detection	.704	.039	.745	<b>17.944</b>	<b>.000</b>

R ( $R^2$ ) = .745(0.555)  
 F (df) =321.97(1,258), p=.000

**Independent Variable: Use of AI**  
**Source Primary Data (2025)**