THE IMPACT OF ARTIFICIAL INTELLIGENCE ON FINANCIAL PERFORMANCE IN SAUDI FINTECH FIRMS: THE MEDIATING ROLE OF ENTREPRENEURIAL ORIENTATION - A PATH ANALYSIS APPROACH

Abdalla Ahmed[1], Mohamad Saad[2], Ibrahim Omer Elfaki Elamin[3], Ahmed Faek Elgendy[4], Mahmoud Abdul Aleem Elkholy[5], Eman Ali Selem[6]

[1] Department of Mathematics and Statistics, Collage of Science, King Faisal University, Saudi Arabia, amohammedzain@kfu.edu.sa, https://orcid.org/0000-0003-1668-1616
[2]Accounting Department, College of Business Administration, King Faisal University, Al-Ahsa, Saudi Arabia, msoahmad@kfu.edu.sa, https://orcid.org/0000-0002-8635-0276
[3] Department of Finance, Applied College, King Faisal University, Al-Ahsa, ielamin@kfu.edu.sa , https://orcid.org/0000-0001-7579-9070
[4] Business Administration Department, Faculty of Commerce, Benha University, Benha, Egypt, https://orcid.org/0000-0002-5689-1485
[5] Accounting department, Faculty of Commerce, Benha University, Accounting department, Faculty of Business Administration, Taibah University, KSA mkhouly@taibahu.edu.sa , https://orcid.org/my-orcid?orcid=0009-0002-5145-3168,
[6] Accounting department, Faculty of Commerce, Suez Canal University, Accounting department, Faculty of Business Administration, Taibah University, KSA, esalem@taibahu.edu.sa, https://orcid.org/0009-0001-1480-5956

Abstract
This study aims to identify the impact of artificial intelligence (AI) on the financial performance of fintech firms in the Kingdom of Saudi Arabia (KSA) and to examine whether entrepreneurial orientation (OE) plays a mediating role in this relationship. A comprehensive survey method was adopted to collect data from all fintech firms licensed in the Kingdom of Saudi Arabia by the Saudi Arabian Monetary Authority (SAMA), with the study population consisting of 96 companies. A quantitative approach was applied in the data analysis, using path analysis to investigate both the direct and indirect relationships among the study variables. The findings indicate that AI does not have a direct impact on the financial performance of Saudi Fintech Firms. However, an indirect effect emerges when entrepreneurial orientation acts as a mediating variable. This suggests that AI influences financial performance through its effect on entrepreneurial orientation. This study provides scientific and quantitative insights for decision-makers in fintech firms in Saudi Arabia, helping them make sound strategic decisions that enhance overall performance. This understanding can help decision-makers in these firms break traditional stagnation, fostering innovation and growth that contribute to the advancement of the Saudi digital economy.

Keywords: Artificial Intelligence, Fintech firms, Financial Performance, Entrepreneurial orientation, Path analysis.

1. Introduction

The global financial landscape is undergoing a transformative shift, largely driven by advancements in (AI). Fintech firms are at the forefront of this transformation, utilizing AI to enhance service delivery, streamline internal operations, and strengthen risk management frameworks (Y. Guo et al., 2020; Xu, X., 2021). This integration of (AI) holds particular relevance for Saudi Arabia, a nation pursuing ambitious financial inclusion and technological innovation goals under the Vision 2030 framework (Alshuwaier, H., & Al-Somali, 2020)

Although recent studies have investigated the distinct impacts of AI on aspects such as operational efficiency (Y. Guo et al., 2020) and innovation potential (Lee, E., & Shin, 2023), a comprehensive understanding of how AI adoption influences the financial performance of fintech firms—especially in emerging markets like Saudi Arabia—remains underexplored. This study seeks to bridge this gap by examining the relationship between AI adoption and the financial performance of Saudi Arabian fintech firms. By integrating the mediating role of entrepreneurial orientation, the research provides deeper insights into the key determinants of fintech success in an increasingly digital financial ecosystem.

2. Literature Review

2.1 AI and Operational Efficiency as a dimension of entrepreneurial Orientation in financial institutions

An expanding body of literature has examined the individual effects of (AI) on financial institutions, particularly its influence on operational efficiency (Y. Guo et al., 2020) These studies underscore AI's capacity to automate routine tasks, enhance decision-making processes, and streamline institutional workflows. Such advancements facilitate greater operational efficiency, enabling financial institutions to manage higher transaction volumes with reduced resource input. The research identifies key AI

applications in domains such as loan processing, customer service, and fraud detection. The findings suggest that the adoption of AI technologies can lead to significant cost reductions and improvements in service delivery, thereby enhancing overall institutional performance.

2.2 AI and Innovation as a dimension of entrepreneurial orientation in financial institutions

(Lee, E., & Shin, 2023) explore the role of (AI) in enhancing innovation capabilities within financial institutions. Their study highlights AI's potential in the development of novel financial products and services, emphasizing its ability to process and analyze large volumes of customer data to uncover unmet needs and inform innovative solutions. Furthermore, AI facilitates the automation of routine tasks associated with product development, thereby enabling human capital to concentrate on higher-order creative functions. The research provides illustrative examples of AI-driven innovation, including personalized financial offerings, algorithmic trading platforms, and robo-advisory services. The findings indicate that AI adoption serves as a significant catalyst for innovation, offering financial institutions a strategic advantage in a competitive market.

2.3AI and Risk Management as a dimension of entrepreneurial orientation

The application of (AI) in risk management represents a critical focus within contemporary financial research. (Xu, X., 2021) conducted an extensive survey examining the use of machine learning techniques in financial risk management. Their findings underscore AI's efficacy in processing large-scale datasets to detect and mitigate financial risks. Specifically, machine-learning algorithms have demonstrated utility in identifying fraudulent transactions, evaluating creditworthiness, and forecasting potential financial losses. The study highlights the transformative role of AI in enhancing credit risk assessment, fraud detection, and portfolio optimization. These advancements collectively suggest that AI integration can substantially enhance the risk management capabilities of financial institutions.

Similarly, (Ashta & Herrmann, 2021) provide a broader perspective on the implementation of AI in the financial sector, recognizing both the opportunities and challenges it presents. Their study emphasizes the importance of human oversight in AI-driven decision-making processes and explores the implications for workforce dynamics. Key concerns addressed include data privacy, algorithmic bias, and the imperative for transparency and accountability in AI systems. The study further examines AI's potential to revolutionize financial markets through big data analytics, risk management innovations, and targeted customer engagement strategies. While acknowledging that AI may render certain job roles obsolete, the authors also highlight the emergence of new opportunities for skilled professionals. They advocate for the inclusion of diverse perspectives in AI development and stress the importance of ethical considerations, ongoing product evaluation, and societal impact assessments. Overall, the study calls for a balanced approach to AI adoption—one that maximizes its technological potential while responsibly managing its social, ethical, and economic consequences.

2.4 AI in Financial Services: current applications and future implications

(Y. Guo et al., 2020; Xu, X., 2021) investigate the expansive adoption of (AI) within the financial services sector, examining both its current applications and potential future implications. Their study underscores AI's transformative capacity across multiple functional areas, including customer service, fraud detection, and investment management. Notable applications highlighted include AI-driven chatbots that enhance customer interaction, machine learning algorithms designed to identify fraudulent behavior, and AI-based tools that generate personalized investment recommendations. Despite these advancements, the study also acknowledges significant challenges related to (AI) implementation, particularly concerning data privacy and the need for comprehensive regulatory frameworks. Overall, this research offers a thorough analysis of the evolving role of AI in financial services, providing critical insights into its present utility and future trajectory within the industry.

2.5AI in Banks: AI Disclosure on financial performance

(Alzoubi et al., 2024) examine the impact of (AI) disclosure on the financial performance of Jordanian banks. Employing content analysis, the study investigates the dissemination of AI-related information within the textual data of annual reports from 15 banks listed on the Amman Stock Exchange over the period 2014 to 2021. The findings indicate a notable increase in the frequency of AI-related keyword disclosures throughout the observed timeframe. Furthermore, the study reveals that the extent of AI-related disclosures is positively associated with key financial performance indicators, namely Return on Assets (ROA) and Return on Equity (ROE), while exhibiting a negative correlation with total expenses. These results support the assertion that AI disclosure contributes to enhanced revenue generation and cost efficiency. The authors emphasize the importance of transparent and ethically grounded communication regarding AI initiatives, suggesting that such disclosures can strengthen a firm's reputation as a responsible and innovative entity within the financial sector.

2.6AI and financial performance

(Finkenwirth, 2021) investigates the impact of (AI) on the financial performance of firms within the German financial services industry. The study utilizes content analysis to examine the presence of AI-related terminology in the annual reports of 84 publicly listed companies over the period from 2016 to 2019. By focusing on financial performance indicators such as Return on Assets (ROA), Return on Equity (ROE), and

the Price-to-Earnings (P/E) ratio, the study aims to elucidate the relationship between AI adoption and financial outcomes. The findings suggest a positive association between the frequency of AI-related disclosures and improved accounting performance. Furthermore, the research underscores the importance of recognizing the stage of AI adoption as a moderating factor in its impact on financial performance. Ultimately, the study provides a comprehensive analysis of AI's influence on financial performance in the German context, while emphasizing the need for further empirical exploration into the dynamics of AI implementation and its broader implications.

3. Data Science and AI in Fintech

(Y. Guo et al., 2020) examine the critical role of data science and (AI) in advancing the Financial Technology (FinTech) sector. The study highlights a variety of techniques and methodologies employed in the conceptualization and design of complex economic-financial (Ecofin) systems, quantification of FinTech business models, facilitation of intelligent human-machine interactions, and the analysis and optimization of smart FinTech services. The authors emphasize the application of data science and AI across several key domains, including financial modeling, behavioral and event-driven analysis, causality inference, and multivariate time series transformation.

In addition to these technical applications, the study explores the inherent complexities and challenges facing the financial sector—such as data quality limitations, ethical considerations, fairness in algorithmic decision-making, and broader organizational, human, and environmental factors. The paper also identifies significant opportunities for the Data Science and Analytics for Intelligence (DSAI) community, particularly in enabling intelligent financial planning, developing algorithmic trading strategies, and detecting non-compliant or illicit activities.

Overall, the study underscores the growing importance of data science and AI in enhancing financial intelligence and supporting the evolution of the FinTech ecosystem. It highlights the transformative potential of DSAI in fostering innovation while simultaneously addressing emerging regulatory and ethical challenges in the financial sector.

4. Banking and IT through AI

(Jakšič & Marinč, 2019) explore the transformative effects of information technology (IT) on the banking sector, with a particular focus on relationship banking and AI-supported lending. The study highlights the growing financial demands of the population, the diminishing relevance of physical proximity in banking interactions, and the evolving role of human bankers amid increasing AI integration. It addresses the ethical challenges associated with AI-driven lending systems, as well as the broader societal implications of technological advancements, including their impact on financial stability.

The research examines the dynamic landscape of modern banking, shaped by rapid IT developments and the integration of AI technologies. It identifies both the opportunities and obstacles posed by these innovations—particularly in the context of maintaining ethical standards and ensuring meaningful human involvement in decision-making processes. Moreover, the study underscores the continued importance of relationship banking and calls for financial institutions to adapt to shifting consumer expectations and behaviors in the digital era. In doing so, it emphasizes the necessity for banks to balance technological efficiency with personalized service delivery.

4.1 AI and Fintech through robot-advisor

(Daniel Belanche, 2019) investigates the role of robo-advisors within the financial technology (FinTech) industry, focusing on the factors that influence customer adoption of these AI-driven services. The study underscores the necessity of thoroughly understanding customer needs and preferences to ensure the successful implementation of robo-advisory systems. It suggests that robo-advisors can be marketed effectively across demographic segments, regardless of age or gender; however, the strength of adoption determinants varies across national and cultural contexts.

The research identifies key factors shaping users' intention to adopt robo-advisors, emphasizing both utilitarian motivations—such as efficiency and convenience—and social influences. In addition to these determinants, the study discusses the broader challenges and opportunities associated with deploying (AI) in frontline financial services. These include concerns about trust, personalization, and the balance between automation and human interaction.

In conclusion, the study offers valuable insights into the adoption patterns of robo-advisors, highlighting the critical role of motivational and contextual factors in shaping customer behavior. It reinforces the importance of aligning technological innovation with user expectations to ensure effective integration of AI solutions in the financial services landscape.

4.2 Summary and Research Gap

The reviewed literature collectively underscores the substantial impact of (AI) on various dimensions of financial institutions.(Lee, E., & Shin, 2023; Verganti et al., 2020) provide empirical evidence of AI's positive effects on operational efficiency and innovation, respectively. Similarly,(Demir, E., Manganelli, F., & Mascia, 2023; Xu, X., 2021) examine AI's applications in risk management and its broader integration into financial

services. Despite these contributions, a critical gap remains in understanding the overall impact of AI adoption on the financial performance of fintech firms—particularly within emerging markets such as Saudi Arabia.

While existing studies tend to focus on isolated dimensions, such as operational efficiency or innovation (Lee, E., & Shin, 2023; Verganti et al., 2020), or explore AI applications within the context of general financial institutions (Xu et al., 2021; Demir et al., 2023), few have offered a holistic analysis of how AI adoption influences the comprehensive financial health of fintech firms operating in specific regulatory and economic environments. This study seeks to address that gap by investigating the impact of AI adoption on the financial performance of Saudi Arabian fintech firms, with particular attention to the mediating role of entrepreneurial orientation. By exploring this dynamic relationship, the research aims to provide deeper insights into the key success factors influencing fintech performance in a rapidly evolving technological landscape.

5. Methodology

A quantitative methodology is adopted, employing a structured survey instrument to gather data from FinTech firms licensed by the Saudi Arabian Monetary Authority (SAMA), which actively implementing AI applications such as (data Science, and robot-advisor) and comprising 96 companies. The deliberate selection of SAMA-authorized firms ensures the robustness of the findings, as these firms operate within a well-defined regulatory framework and demonstrate a credible level of technological and financial maturity. This ensures the credibility of the data collected on both financial performance and AI implementation. SAMA's oversight fosters adherence to financial regulations, enhancing the quality and reliability of financial data obtained from participating Fintech firms.

Questionnaire Design: A structured questionnaire was developed to collect data on the following aspects.

Independent Variable: Artificial intelligence (AI): This variable include questions to assess the type and extent of AI applications used by the Fintech firms (e.g., machine learning algorithms for fraud detection, natural language processing for customer chatbots).

Mediating Variable: Entrepreneurial orientation: is divided into three dimensions: The responses related to the three dimensions of entrepreneurial orientation, operational efficiency, innovation, and risk management were aggregated into a single composite quantitative variable, to enable the application of the path analysis test. Operational Efficiency: Questions measure the impact of AI on operational efficiency, such as processing speed, resource allocation, and cost reduction. Innovation: The questionnaire will evaluate the extent to which Artificial Intelligence (AI) facilitates innovation in product development, service delivery, and business model transformation. Risk Management: Questions will explore how AI applications contribute to risk management practices, including fraud detection, cybersecurity, and regulatory compliance.

Dependent Variable: Financial Performance of fintech firms: contain data on key financial indicators pertinent to FinTech firms. These metrics encompass profitability indicators, including Return on Equity (ROE) and Return on Assets (ROA), in addition to revenue growth and customer acquisition cost. These variables serve as critical benchmarks for evaluating the financial performance and market competitiveness of the surveyed firms.

Data Collection Procedure:

The finalized questionnaire was distributed electronically to the selected Fintech firms. Follow-up emails and reminders sent to maximize response rates. The data collection phase began in august 2025 and extended over a two-month period.

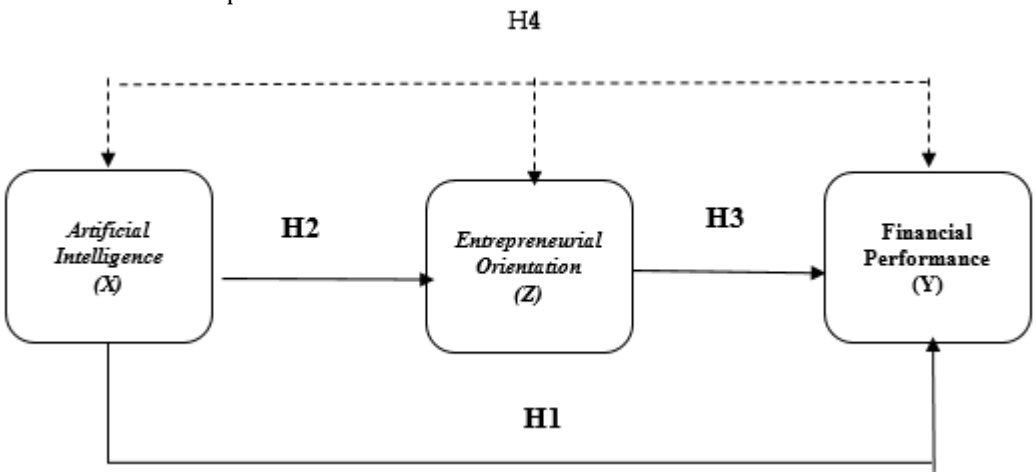


Figure 1: Conceptual Framework

Source: Developed by researchers based on study hypotheses

Research Hypotheses

H1: There is a significant effect of AI on the financial performance of Saudi Fintech Firms.
H2: There is a significant effect of AI on the OE in Saudi Fintech Firms.
H3: There is a significant effect of OE on the financial performance of Saudi Fintech Firms.
H4: There is a significant mediating effect of EO on the relationship between AI and financial performance in Saudi Fintech firms.

6. Data Analysis:

The objective of this study is to evaluate the impact of Artificial Intelligence (AI) and entrepreneurial orientation on the financial performance of FinTech firms, with a specific focus on the mediating role of entrepreneurship. Path analysis is utilized as the principal analytical method to investigate both the direct and indirect relationships among the variables, thereby uncovering the underlying mechanisms through which AI affects financial outcomes.

Path analysis model:

This study used the general model of variables in path analysis, which contains independent variables, dependent variables, and mediating variables.

Mediation analysis is employed to investigate causal relationships between an independent variable (X) and a dependent variable (Y), aiming to elucidate the underlying mechanism through which X exerts its influence on Y. Specifically, mediation is said to occur when the effect of X on Y is transmitted indirectly through an intervening or mediator variable (Z), which, in turn, influences Y. This relationship can be represented as X → Z → Y. An independent variable can impact the dependent variable in three ways: directly (X → Y), indirectly through a mediator (X → Z → Y), or through a combination of both direct and indirect effects

Mediation Regression Equations

Statistical mediation analysis is typically conducted using three primary approaches:

- Causal steps approach – the initial method for assessing mediation.
- Difference in coefficients approach – the second method, which evaluates changes in effect sizes.
- Product of coefficients approach – the third method, focusing on the multiplication of path coefficients to determine indirect effects.

Each of these methods relies on data derived from the following three regression equations:

$$Y = \propto_1 + \beta_1 X + e_1 \quad (1)$$

$$Z = \propto_2 + \beta_2 X + e_2 \quad (2)$$

$$Y = \propto_3 + \beta_3 Z + e_3 \quad (3)$$

In the equations above:

- **Y** is the dependent variable.
- **Z** represents the mediator.
- **X** is the independent variable.
- $\boldsymbol{\alpha_1}$**,** $\boldsymbol{\alpha_2}$**, and** $\boldsymbol{\alpha_3}$ are the intercepts.
- $\boldsymbol{\beta_1}$ is the coefficient representing the relationship between the independent and dependent variables.
- $\boldsymbol{\beta_2}$ denotes the coefficient that connects the independent variable to the dependent variable while adjusting for the mediator.
- $\boldsymbol{\beta_m}$ represents the coefficient linking the mediator to the dependent variable while controlling for the independent variable.
- $\boldsymbol{\beta_3}$ indicates the coefficient connecting the independent variable to the mediator.
- $\boldsymbol{e_1}$**,** $\boldsymbol{e_2}$**, and** $\boldsymbol{e_3}$ represent the residual terms.

It is important to note that mediation models can be adapted to accommodate both linear and nonlinear effects, as well as interactions between **Z** and **X** in the equations, (Jenatabadi, 2015).

Study model:

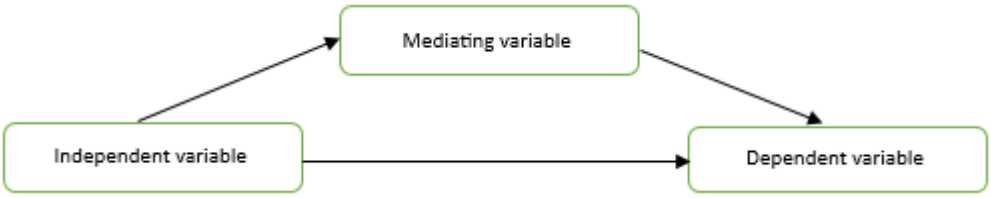


Figure 2: : Path analysis model.

Source: Developed by researchers

This model explains the variables in the study model:

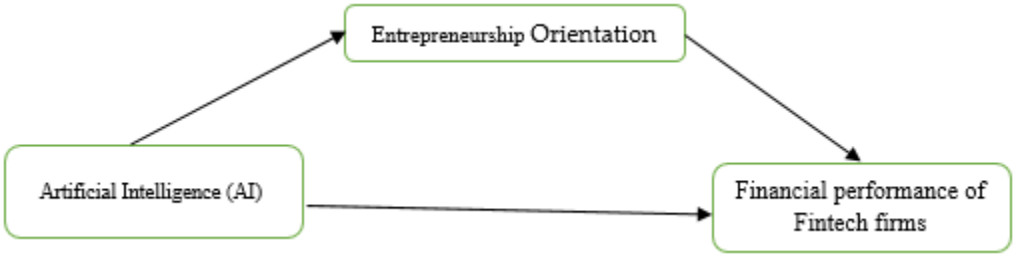
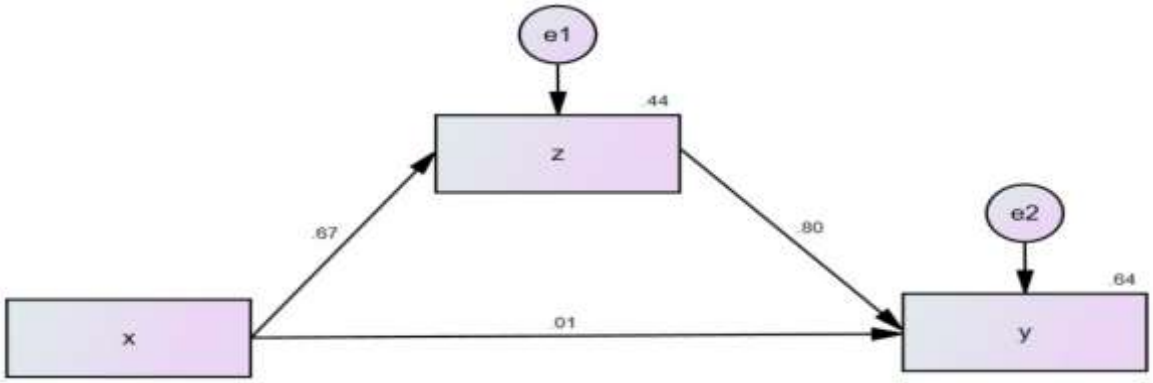


Figure 3: Study model.
Source: Developed by researchers
As indicated in the figure above where:
Independent variable (x) is artificial intelligence.
The dependent variable (y) is the financial performance of fintech firms.
The mediating variable (z) is entrepreneurship orientation.



Chi-square = 0.000 , df =0
Figure 4: estimates default model

Source: Developed by researchers
From the chart above, it explains:
The side effect from Artificial Intelligence (x) on the financial performance of fintech firms (y) is equal to 0.01 and is called the direct effect, the size effect from Artificial Intelligence (x) on Entrepreneurship (z) is equal to 0.67, and size effect from Entrepreneurship (z) on the financial performance of fintech firms (y) is equal 0.80

- Direct effect equals 0.01
- Indirect effect equal 0.67*0.80 = 0.536

The indirect (mediated) effect of x on y is 0.536. That is, due to the indirect (mediated) effect of x on y, when x goes up by 1, y goes up by 0.536. This is in addition to any direct (unmediated) effect that x may have on y.

- Total effect: to calculate the total effect, use the following equation:

$$c = ć + ab$$

Where:
C: total effect
ć: direct effect
a: effect between x on z
b: effect between z on y

$$c = 0.01 + (0.67 * 0.80) = 0.546$$

Then, the total effect is equal to 0.546

- Chi-square value =0.000 is less than 2 with a degree of freedom equal to 0, this explains that the model fits the data and that there is no difference between the default model and the estimated model.
- It is estimated that the predictors of x_3 explain (e_2) 64% of its variance, and it is estimated that the predictors of x_2 explain (e_1) 44% of its variance.

Like that, generated the following equations of regression:

- The effect of the independent variable (x) on the dependent variable (y), is called total effect.

$$Y = \propto_1 + \beta_1 X$$

- Effect of the independent variable (x) on the mediating variable (z)

$$Z = \propto_2 + \beta_2 X$$

- Effect of the mediating variable (z) on the dependent variable (y) in the presence of the independent variable (x) as a control variable.

$$Y = \propto_3 + \beta_3 Z$$

Table (1) Regression weights: (group number 1 - default model)

			Estimate	S.E.	C.R.	P
z	<---	x	1.230	.141	8.695	***
y	<---	z	.351	.036	9.664	***
y	<---	x	.006	.067	.083	.934

The results indicate a highly significant effect ($p < 0.001$) based on the P-value column. Specifically, there is a significant effect of variable X on variable Z, as well as of variable Z on variable Y. However, the effect of X on Y is insignificant, as the P-value is 0.934 greater than the 0.05 threshold. Consequently, the regression of X on Y is ruled out.

In the Estimate column:

The first value, 1.230, indicates that when X increases by 1 unit, Z increases by 1.230 units.

The second value, 0.351, indicates that when Z increases by 1 unit, Y increases by 0.351 units.

Additionally, the Critical Ratio (CR) value for the regressions of X on Z and Z on Y is greater than 1.964, suggesting that the model demonstrates a good fit.

Table (2) Model fit summary

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	6	.000	0		
Saturated model	6	.000	0		
Independence model	3	152.957	3	.000	50.986

The **CMIN** value in the table is **0**, indicating a perfect model fit. This suggests that the model aligns well with the observed data, with no discrepancies between the expected and actual values.

Table (3) RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.000	1.000		
Saturated model	.000	1.000		
Independence model	8.396	.522	.044	.261

The table above shows that the **Goodness-of-Fit Index (GFI)** value is **1,** which exceeds the recommended threshold of **0.90**. This indicates a strong model fit, providing evidence that the model accurately represents the data.

Table (4) Baseline Comparisons

Model	NFI Delta1	CFI
Default model	1.000	1.000
Saturated model	1.000	1.000
Independence model	.000	.000

The table indicates that the Comparative Fit Index (CFI) is nearly 1, further confirming the model's strong fit. In addition, the Normed Fit Index (NFI) is equal to 1, providing additional evidence that the model closely corresponds with the observed data.

Table (5) RMSEA

Model	RMSEA	LO 90	HI 90	CLOSE
Independence model	.725	.630	.826	.000

The Root Mean Square Error of Approximation (RMSEA) evaluates model fit, with lower values indicating a better fit. The P-CLOSE statistic tests the hypothesis of a close fit, and a value of 0, being less than the 0.05 threshold, provides strong evidence that the model fits the data well.

7. Discussion and Conclusions

Hypothesis 1: There is a significant effect of AI on the financial performance of Saudi Fintech Firms, which is rejected this finding diverges from the conclusions of some previous studies and also Specifically, the deployment of AI solutions like robo-advisors and chatbots contributes to reducing transaction costs and enhancing operational efficiency(Finkenwirth, 2021; C. Guo et al., 2025; Malik, 2025) Furthermore, AI's analytical capabilities, such as predictive modeling and big data analysis, improve financial reporting quality and risk mitigation, directly translating into better financial performance through increased profitability or substantial cost savings (Alhazmi et al., 2025; Bahari & Napitupulu, 2025; Shiyyab et al., 2023)

Hypothesis 2: There is a significant effect of AI on the OE in Saudi Fintech Firms is accepted and also This hypothesis is strongly supported by contemporary research the literature confirms a strong positive link between AI adoption and various facets of organizational effectiveness. Evidence and Literature Alignment: Academic work focusing on the Kingdom of Saudi Arabia (KSA) demonstrates that Artificial Intelligence (AI)

and Machine Learning (ML) capabilities positively affect Business Performance. This positive effect stems from AI's ability to optimize internal processes, automate tasks, and integrate critical components with efficient algorithms. The resulting ability to offer faster, more cost-effective, and customized services constitutes a core improvement in a firm's overall organizational effectiveness and agility (Atienza-Barba et al., 2024; C. Guo et al., 2025; Raza et al., 2025; Verganti et al., 2020)
Hypothesis 3: There is a significant effect of OE on the financial performance of Saudi Fintech Firms. Is accepted and also This hypothesis is strongly supported by contemporary research Evidence and Literature Alignment: Numerous studies within Saudi Arabia and the broader entrepreneurship field confirm the positive impact of EO (operation efficiency, risk-taking, and innovativeness) on firm performance (FP) The relationship is often indirect, where EO is translated into FP through intermediate factors like Innovation Capability (IC). Firms with high EO are more likely to develop competencies that lead to financial success, and this entrepreneurial orientation is a key ingredient for organizational success and higher financial performance in Saudi SMEs(Atienza-Barba et al., 2024; Lee, E., & Shin, 2023; Seraj et al., 2025; Xu, X., 2021)
Hypothesis 4: There is a significant mediating effect of EO on the relationship between AI and financial performance in Saudi Fintech firms. Is accepted, The confirmation of this hypothesis establishes a significant contribution to the existing body of knowledge, given the dearth of empirical studies that have investigated the direct relationship between Artificial Intelligence (AI) adoption and its impact on the financial performance of Saudi Fintech firms, mediated by the strategic variable of Entrepreneurial Orientation (EO), The Theoretical Flow (AI EO FP): A strong theoretical argument can be built: AI Adoption (providing powerful tools and data) facilitates/strengthens EO (by enabling bolder risk-taking, more informed proactiveness, and faster innovation cycles). This strengthened EO is then the direct driver of Superior Financial Performance. The confirmed mediation of related concepts (like innovation and agility) strongly supports this theoretical model.

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