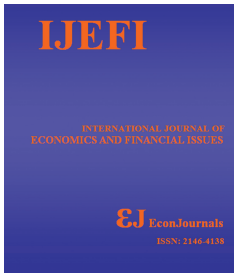

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Sustainable Financial Performance in the Age of AI: Opportunities and Challenges

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ABSTRACT

This study investigates the role of artificial intelligence (AI) in shaping sustainable financial performance by exploring both the opportunities and challenges of AI adoption in the financial sector. It highlights AI's potential to enhance fraud detection, financial reporting, accessibility of financial services, and investor trust while also addressing concerns around ethics, regulatory gaps, algorithmic bias, and data privacy. A quantitative research design was adopted using survey data collected from 200 finance professionals across auditing, financial services, education, banking, investment, and energy sectors. The study applied descriptive statistics, exploratory factor analysis (EFA) to examine the impact of AI opportunities and challenges on sustainable financial performance and reliability tests using Cronbach's alpha to ensure internal consistency of the scales. The results demonstrate that AI integration significantly strengthens fraud detection, improves financial reporting transparency, and enhances investor confidence through proactive disclosures. These findings validate the signaling effect of AI-related transparency on firm performance. However, empirical evidence also confirms that ethical dilemmas, regulatory fragmentation, data privacy risks, and algorithmic bias remain critical barriers to sustainable AI adoption. While opportunities strongly align with improved financial performance, challenges undermine stakeholder trust and limit equitable integration. The study is limited to survey responses from finance professionals in selected industries, which may restrict generalizability across global contexts. Additionally, the cross-sectional design prevents assessment of long-term causal effects. This research contributes by bridging the gap between AI innovation and sustainable finance literature. It extends signaling, stakeholder, and technology acceptance theories, showing how AI disclosures act as strategic signals of credibility and long-term value creation.

Keywords: Artificial Intelligence, Financial Sustainability, Opportunities and Threats of AI
JEL Classifications: G30, G32, Q01, C55, O33

1. INTRODUCTION

Artificial intelligence (AI) is rapidly transforming the global business landscape, offering unprecedented opportunities for enhanced efficiency, real-time decision-making, and process automation across multiple sectors (Mulyana et al., 2025). Among its most disruptive advancements is generative AI, which is reshaping industries by streamlining complex operations and significantly boosting productivity. In the financial sector, AI adoption has expanded rapidly, powering functions such as customer service through intelligent chatbots, automating credit analysis, and strengthening fraud detection mechanisms using machine learning algorithms (Omoge et al., 2022; Sheth et al., 2022).

These innovations have not only enhanced operational performance but have also contributed to financial accessibility and broader economic activity (Ozili, 2021; Agidi, 2019). AI capacity to process vast datasets enables financial institutions to make more strategic and informed decisions, particularly in identifying investment opportunities that align with Environmental, Social, and Governance (ESG) criteria. Additionally, AI enhances market transparency by detecting greenwashing and ensuring that sustainability claims are verifiable and credible (Amundi Research Center, 2024). These

capabilities position AI as a powerful catalyst for promoting financial sustainability and long-term value creation (Els, 2025).

However, the rapid integration of AI into highly regulated environments like finance also raises a host of ethical, regulatory, and governance concerns. Issues such as algorithmic bias, data privacy breaches, and the displacement of human labor continue to spark critical debates around the responsible use of AI technologies (Mogaji, 2020; Behl et al., 2023). Furthermore, questions persist regarding the transparency of AI systems and how organizations can ensure that these technologies align with stakeholder expectations and regulatory frameworks (Moharrak and Emmanuel, 2025; Ooi, 2023). Despite the growing interest in AI-driven financial innovation, existing research has yet to fully explore the complex ethical and regulatory dimensions associated with its adoption in sustainable finance. There remains a pressing need to address how AI can be implemented responsibly, ensuring that technological progress does not compromise ethical standards or societal trust.

This study aims to fill this gap by examining the emerging challenges and opportunities linked to AI integration in sustainable financial practices. It will explore how financial institutions can adopt AI in ways that are both innovative and ethically sound, offering strategic recommendations for responsible implementation. By doing so, the research seeks to bridge the divide between technological advancement and the critical imperatives of ethical governance, regulatory compliance, and sustainability key pillars for long-term business resilience and financial sector integrity.

The remainder of this paper is structured as follows. The literature review outlines the intersection of artificial intelligence and sustainable finance, highlighting both emerging opportunities and pressing challenges. The methodology section then explains the research design, variables, data collection, and analytical techniques employed. This is followed by the presentation and analysis of results, which draw on responses from finance professionals across industries. Finally, the paper concludes with a discussion of key findings, theoretical and practical implications, and directions for future research.

2. LITERATURE REVIEW

The intersection of artificial intelligence (AI) and sustainable finance has gained increasing attention in recent years. Sustainable finance, once primarily focused on excluding harmful or unethical investments, has evolved into a broader approach that integrates environmental, social, and governance (ESG) considerations into financial decision-making (Dimmelmeier, 2021). At the same time, AI has begun to reshape the financial sector by enhancing operational efficiency, improving risk management, detecting fraud, and personalizing customer experiences (Bagó, 2023; Cao et al., 2021).

Despite these advancements, the integration of AI into sustainable finance presents several challenges. Ethical concerns such as algorithmic bias and data privacy remain significant obstacles (Weber et al., 2024). Moreover, while AI shows promise in areas like customer service, personalized financial advice, and advanced risk analysis, its application in promoting financial sustainability is still in the early stages of development and remains underexplored (Moharrak and Emmanuel, 2025). This literature review aims to examine the current landscape of AI in sustainable finance, highlighting emerging opportunities and future trends. It also critically explores the barriers to effective adoption, including technological limitations, regulatory uncertainties, and ethical implications, to provide a comprehensive understanding of this evolving field.

2.1. Opportunities and Trends of AI and Financial Sustainability

2.1.1. Fraud detection and improved financial reporting

Artificial intelligence (AI) has become a critical enabler in addressing longstanding challenges in the financial sector, particularly in enhancing the accuracy and transparency of financial reporting and strengthening fraud detection mechanisms. According to Aldemir and Uysal (2025), AI plays a vital role in modernizing financial processes, not only by detecting irregularities but also by improving overall citizen engagement with financial systems. The technological evolution within banking provides a clear backdrop for this transformation. It began with the introduction of automated teller machines (ATMs) (Rugimbana, 2010), progressed through the emergence of online and mobile banking (Park and Yoon, 2024), and has significantly contributed to broader financial inclusion.

Today, more advanced AI applications particularly machine learning are revolutionizing the financial landscape. These systems enable automated credit scoring, real-time fraud detection, and responsive customer service. Such innovations do more than streamline operations; they contribute to the development of more sustainable and inclusive financial practices. By increasing the reliability and accessibility of financial reporting, AI helps build trust and ensures greater transparency, both of which are essential for a resilient and equitable financial system (Kshetri, 2021; Ahmad et al., 2024). Building on these advancements, it becomes imperative to empirically examine whether these AI-driven innovations genuinely translate into measurable improvements in fraud detection and the accuracy and transparency of financial reporting forming the basis for the following hypothesis:

H_1: The integration of artificial intelligence substantially strengthens fraud detection capabilities thereby supporting the financial sustainability of organizations.

2.1.2. Affordable and efficient financial services

Artificial intelligence (AI) is playing a transformative role in advancing financial inclusion and promoting sustainable financial practices. These practices are particularly impactful for the poor, underbanked communities, and women groups often excluded from traditional banking systems (Khan, 2025). Through AI-driven automation, users can open accounts within minutes and receive credit approvals within hours, significantly reducing barriers to entry in the financial ecosystem. In doing so, these tools not only expand access but also promote financial literacy and contribute to poverty reduction by enabling more informed

and timely financial decisions. Beyond inclusion, AI is also reshaping the way financial decisions are made, particularly in the context of sustainable investing. By analysing vast and complex datasets, AI systems can identify patterns and trends that point to high-potential, sustainability aligned investments (Giesecke and Heidorn, 2022).

These capabilities support investors and institutions in aligning portfolios with environmental, social, and governance (ESG) goals more effectively and efficiently (Khan and Khan, 2024). Moreover, AI contributes to greater transparency in financial markets by identifying deceptive practices such as greenwashing where companies exaggerate their sustainability credentials. Through advanced algorithms and real-time data analysis, AI can assess the credibility of sustainability claims, thereby enhancing accountability and trust in ESG reporting (Amundi Research Center, 2024). Collectively, these applications demonstrate how AI can drive more inclusive, transparent, and sustainable financial systems. The discussion will lead to investigation, whether the integration of AI genuinely facilitates more inclusive, transparent, and sustainable financial systems forming the foundation for the following hypothesis.

H_2: The integration of artificial intelligence significantly enhances the affordability, speed, and accessibility of financial services, thereby promoting financial sustainability

2.1.3. AI disclosure in annual reports and impact on financial performance

Recent research has increasingly focused on the link between artificial intelligence (AI) practices particularly transparency and disclosure and firm performance. Elnokoudy (2025) explored the impact of voluntary AI related disclosures in annual reports and found a positive association between the extent of disclosure and financial performance. The study suggests that firms which openly communicate their AI initiatives tend to perform better financially, highlighting the growing importance of AI transparency, especially in emerging markets where investor confidence and technological adoption are still developing.

Similarly, Mulyana et al. (2025) examined the broader effects of AI adoption on organizational outcomes. Their findings confirm that implementing AI technologies leads to significant improvements in firm performance, which subsequently enhances overall firm value. This reinforces the view that AI is not merely a tool for operational efficiency but a strategic asset that can influence long-term business growth. In line with these findings, Saleem (2025) argued that higher levels of AI related disclosure are correlated with improved financial outcomes. Their research supports the hypothesis that transparency in AI strategies not only boosts profitability but also strengthens stakeholder trust. Together, these studies emphasize the dual role of AI adoption and disclosure in shaping firm performance, offering compelling evidence for the strategic integration of AI into corporate reporting and governance practices.

In light of this growing body of evidence, it becomes crucial to empirically test whether AI-related disclosures in annual reports have a measurable impact on financial performance leading to the formulation of the following hypothesis.

H_3: Voluntary disclosure of AI-related initiatives in annual reports has a positive impact on a firm's financial sustainability.

2.1.4. AI as transformative force in global business

Artificial Intelligence (AI) is increasingly recognized as a transformative force reshaping global business operations, decision-making, and strategic direction. Its adoption across industries is enabling companies to innovate faster, enhance efficiency, and gain a competitive edge in rapidly evolving markets. Beyond operational benefits, a growing body of research highlights the strategic importance of AI-related disclosures in shaping investor perceptions and financial outcomes.

Proactive disclosure of AI initiatives such as in annual reports or sustainability statements can significantly improve investor trust and positively influence firm performance. These disclosures provide stakeholders with insight into a company's technological capabilities and long-term vision. According to Tekin and Polat (2020), this effect is well explained through signaling theory, which posits that transparent communication serves as a signal of quality, reducing information asymmetry between firms and investors. When organizations openly share their AI strategies and implementations, they demonstrate strategic foresight and commitment to innovation, which can attract investors and enhance corporate reputation.

Furthermore, such transparency can serve as a differentiator in competitive markets, particularly as stakeholders increasingly demand accountability and ethical use of emerging technologies. In this context, AI disclosure is not merely a regulatory or branding effort—it is a strategic tool that can influence market valuation, boost investor confidence, and contribute to sustainable business growth (Tekin and Polat, 2020). Building on this perspective, the following hypothesis seeks to empirically assess whether transparent disclosure of AI initiatives meaningfully impacts investor confidence and contributes to improved financial performance.

H_4: Proactive disclosure of AI initiatives positively influences firm financial sustainability by enhancing investor trust and reducing information asymmetry.

2.2. Challenges of AI and Financial Sustainability

Despite the growing global adoption of artificial intelligence (AI) in the financial sector, significant challenges remain particularly regarding the transparency and consistency of AI related disclosures. In many cases, organizations choose to report their AI initiatives on a voluntary basis, resulting in a lack of standardized frameworks for disclosure. This issue is especially pronounced in emerging economies, where regulatory guidelines around AI usage are still evolving and institutional capacity to enforce disclosure standards may be limited (Abdelraouf et al., 2025).

2.2.1. Speculation and lack of real world evidence

Although the potential of AI to generate new content is being explored in areas such as personalized financial reporting, product

development, and scenario simulation (Graham, 2025), much of the current research remains largely theoretical or speculative. There is a noticeable gap in real-world applications and empirical evidence to support these innovations at scale. This limits our understanding of how effectively such AI tools perform in practical financial settings. Furthermore, the heavy reliance of AI systems on large datasets introduces additional concerns related to data privacy and algorithmic bias. These issues can result in unintended discriminatory outcomes, particularly in sensitive financial services like lending or insurance, where fairness and transparency are critical (Desiraju and Khan, 2023). In light of these challenges and the current lack of empirical validation, the practical impact of AI-driven innovations on financial performance and fairness are tested in following hypothesis.

H_1: The speculative nature and lack of real-world evidence regarding AI applications limit their perceived effectiveness in enhancing financial sustainability.

2.2.2. Ethical concerns and regulatory challenges

Effective integration of AI in financial sustainability demands strong collaboration among various stakeholders, along with robust governance frameworks to ensure the proper management of sustainability data and adherence to ethical standards (Chausson et al., 2024). While AI has significantly transformed banking operations by improving efficiency and service delivery, it also introduces risks such as high implementation costs, ethical dilemmas, and complex regulatory challenges. Additionally, many firms remain hesitant to provide detailed disclosures about their AI practices, often due to fears of revealing trade secrets or attracting regulatory scrutiny (Korteling et al., 2021).This lack of transparency can impede accountability and slow the progress toward more sustainable AI adoption. Understanding the balance between leveraging AI's benefits and managing its inherent risks can provide valuable insights into the conditions necessary for sustainable AI adoption in the financial sector. This sets the stage for the following hypothesis.

H_2: Ethical concerns and regulatory challenges negatively influence the transparency and sustainable adoption of AI in the financial sector.

2.2.3. Bias and data privacy

AI is increasingly influencing accounting by enhancing decision-making (Omoteso, 2012). However, these innovations raise issues about transparency, bias, and data privacy, especially in sustainable Finance, which demands credible, transparent, and socially responsible information. Concerns are growing around issues like algorithmic bias, where AI systems unintentionally absorb and reproduce the biases present in the data they are trained on (Sutton et al., 2016). This can lead to unfair or discriminatory outcomes. Additionally, the "black box" effect where the inner workings of AI models are so complex that it's unclear how decisions are made raises serious questions about transparency and accountability (Schweitzer, 2024). Given these concerns, it is important to investigate how AI's transparency, bias, and data privacy issues, forming the basis for the following hypothesis.

H_3: The presence of algorithmic bias and lack of transparency in AI systems negatively impact trust, fairness, and data privacy in sustainable finance and accounting practices.

2.3. Theoretical Framework

This study draws upon three core theories to explain the dynamics between artificial intelligence (AI) integration and sustainable financial performance: Signaling Theory, Stakeholder Theory, and Technology Acceptance Model (TAM). Signaling theory posits that organizations convey credible information to reduce information asymmetry between themselves and stakeholders (Digdowiseiso et al, 2024). In the context of AI, firms that proactively disclose their AI initiatives signal strategic foresight and technological competence, thereby enhancing investor trust and potentially boosting financial performance (Tekin and Polat, 2020) supporting H_3 and H_4.

Stakeholder theory emphasizes the importance of addressing the interests of all stakeholders investors, employees, regulators, and society rather than focusing solely on shareholders (Freeman, 1984). So, this theory reinforces H_2 and H_3. (TAM) developed by Davis (1989), posits that the perceived usefulness and ease of use of a technology influence its adoption. In finance, AI is adopted based on its perceived ability to improve operational efficiency, fraud detection, and financial inclusion so justifies hypotheses H_1 and H_2.

3. METHODOLOGY

3.1. Research Design

This study adopts a quantitative research approach to examine the relationship between artificial intelligence (AI) and sustainable financial performance, with a specific focus on both opportunities and challenges posed by AI in the financial sector. The research design is descriptive and explanatory, aiming to not only describe current trends and practices but also explain the extent to which AI influences sustainable financial outcomes.

3.2. Research Variables

Sustainable financial performance is conceptualized as the organization's ability to achieve long-term financial stability and serving as dependent variable. Two independent variables are examined in relation to this: opportunities and challenges associated with AI. The first independent variable, Opportunities and Trends of AI and Financial Sustainability, is assessed through four key dimensions. These include the role of AI in enhancing fraud detection and improving financial reporting, which helps firms maintain integrity and reliability in disclosures. Secondly, AI's contribution to providing affordable and efficient financial services is considered, highlighting its ability to reduce operational costs and improve access. Thirdly, the presence and quality of AI related disclosures in annual reports are evaluated to understand how transparency around AI practices influences financial outcomes.

Finally, AI is examined as a transformative force in the global business environment, reflecting its broader strategic impact on competitiveness and value creation. The second independent

variable, Challenges of AI and Financial Sustainability, summarizes the potential drawbacks and risks that accompany AI adoption. One major challenge is the speculative nature of AI implementation, where enthusiasm often outpaces real-world evidence of effectiveness. Ethical concerns and regulatory uncertainties form another critical dimension, especially as governments and institutions struggle to keep pace with rapid technological changes. Additionally, issues related to algorithmic bias and data privacy raise significant concerns about fairness, accountability, and compliance in financial decision-making processes.

3.3. Population Sampling and Data Collection

The target population for this research comprises professionals working in finance departments across various organizations. A random sampling strategy was employed to ensure the generalizability of the findings and minimize selection bias. The sample includes finance officials from diverse sectors to capture a broad understanding of AI integration in financial operations. Data were collected using a structured questionnaire, developed based on a thorough review of relevant literature and best practices in survey design. The questionnaire consisted of questions aligned with the research variables and was divided into three sections: demographic information, opportunities and trends related to AI, and challenges of AI in relation to sustainable financial performance. The questionnaires were distributed electronically to the selected sample. Respondents were informed about the purpose of the study and assured of the confidentiality and anonymity of their responses. Adequate time was given for completion, and reminders were sent to enhance response rates.

Table 1: Gender, industry designation and industry distribution

Particulars	Frequency	Percentage
Gender		
Female	83	41.50
Male	117	58.50
Designation	-	-
Accountant	6	3
Assistant Professor	6	3
Assistant Manager Finance	12	6
CFO	11	5.50
Charted Accountant	9	4.50
Director Finance	18	9
Manager Finance	28	14
Junior Accountant	6	3
Junior Auditor	19	9.50
Lecturer	4	2
Program Director	1	0.50
Senior Accountant	30	15
Senior Auditor	22	11
Treasurer	28	14
Industry	-	-
Auditing Firm	55	27.50
Banking	10	5.00
Education	36	18
Financial Services	60	30
Investment Company	21	10.50
Oil and Energy	18	9
Total	200	100

4. DATA ANALYSIS

Upon collection, the data were analysed involving three key statistical techniques. Descriptive statistics were used to summarize the demographic characteristics of respondents and examine the central tendencies and variability of each variable. Correlation analysis was conducted to explore the strength and direction of the relationships between sustainable financial performance and the AI-related variables. Finally, multiple regression analysis was applied to assess the impact of AI opportunities and challenges on sustainable financial performance and to identify which dimensions serve as significant predictors. All ethical standards for academic research were strictly followed. Participation was voluntary, and informed consent was obtained from all respondents. The collected data were used solely for research purposes and stored securely to maintain confidentiality.

4.1. Gender, Industry Designation and Industry Distribution

This frequency Table 1 shows the gender distribution of respondents in your dataset (N = 200). Out of the total, 117 participants (58.5%) are male while 83 participants (41.5%) are female. The designation-wise distribution of respondents reveals a balanced yet concentrated representation across accounting and finance-related roles. The largest category is *Senior Accountant* (15%), followed by *Finance Manager* (14%) and *Treasurer* (14%), highlighting that mid- to senior-level finance professionals dominate the sample. Similarly, significant proportions are observed for *Senior Auditor* (11%) and *Junior Auditor* (9.5%), which together indicate a strong representation of audit professionals across hierarchical levels.

The industry distribution demonstrates that respondents are primarily concentrated in finance-related sectors. *Financial Services* (30%) and *Auditing Firms* (27.5%) collectively account for more than half the sample, suggesting that the study predominantly reflects the professional realities of individuals working in financial oversight and service-providing institutions. The presence of *Education* (18%) indicates a noteworthy academic and training contribution to the sample, while *Banking* (5%) and *Investment Companies* (10.5%) add further diversity. A smaller yet significant segment (9%) represents the *Oil and Energy Sector*, highlighting inclusion from a capital-intensive industry.

4.2. Inter-item Covariance and Cronbach's Alpha

The internal consistency of the scales was assessed using inter-item covariance and Cronbach's alpha. For Scale 01, the average inter-item covariance was 0.507 and the reliability coefficient was 0.819, indicating strong internal consistency (Table 2). These

Table 2. Inter-item covariance and Cronbach's alpha

Scale	Scale 01	Scale 02	Scale 03	Scale 04	Scale 05	Scale 06	Scale 07
Covariance	0.50745	0.35162	0.51708	0.34219	0.52006	0.27073	0.33199
Items	4	4	4	4	4	4	4
Coefficient	0.8187	0.7053	0.8041	0.7105	0.7626	0.7537	0.7741

results align with recent studies emphasizing the robustness of AI-driven applications in enhancing financial processes such as fraud detection and reporting accuracy (Aldemir and Uysal, 2025; Kshetri, 2021). The strong reliability suggests that the items effectively capture perceptions of AI's role in strengthening transparency and operational trust within financial systems.

For Scale 02, the average inter-item covariance is 0.352 and Cronbach's alpha is 0.705, surpassing the minimum acceptable threshold. This indicates an adequate level of reliability and suggests that the items moderately converge to measure the construct. The finding resonates with the growing body of research on AI's contribution to affordable and efficient financial services, particularly in promoting inclusion among underserved groups. Such outcomes underscore AI's potential to reduce systemic barriers, though they also point to the need for continuous refinement of tools to ensure equitable access (Giesecke and Heidorn, 2022). In Scale 03, the average inter-item covariance is 0.517 and Cronbach's alpha is 0.804, demonstrating good reliability. This supports evidence that AI-related transparency, especially through voluntary disclosures, is positively linked to improved firm performance and financial outcomes (Elnokoudy, 2025; Saleem, 2025). The strong internal consistency indicates that respondents perceive disclosure practices as coherent and strategically relevant to sustainable finance.

Scale 04 having the average inter-item covariance of 0.342, with a reliability coefficient of 0.711. Although just above the acceptable threshold, these results suggest the scale adequately captures the intended construct. This is consistent with emerging literature showing that while AI disclosures and transparency efforts are increasing, they remain fragmented and often voluntary, particularly in emerging markets (Abdelraouf et al., 2025). Thus, the moderate strength reflects both the opportunities and ongoing limitations of AI-related reporting frameworks. In case of Scale 05, the average inter-item covariance is 0.520 and Cronbach's alpha was 0.763, both of which point to good reliability. These results echo arguments that proactive disclosure of AI initiatives can enhance investor trust and market confidence (Tekin and Polat, 2020). Respondents appear to view AI as strategically significant, supporting literature that positions AI not only as a tool for efficiency but also as a differentiator in corporate reputation and sustainability practices. The average inter-item covariance for Scale 06 is 0.271, yet Cronbach's alpha was 0.754, showing satisfactory internal consistency despite relatively lower inter-item correlations.

This reflects ongoing debates around the ethical and regulatory challenges of AI adoption (Chausson et al., 2024; Korteling et al., 2021). While respondents recognize the reliability of items capturing these issues, the moderate correlations suggest diverse perspectives on AI's risks, such as high implementation costs, governance dilemmas, and lack of standardized disclosure. Finally, Scale 07 yielded an average inter-item covariance of 0.332 and a Cronbach's alpha of 0.774, indicating good reliability. This finding is supported by literature highlighting algorithmic bias, data privacy, and the "black box" problem as critical barriers to sustainable AI adoption (Sutton et al., 2016; Schweitzer, 2024). The results suggest that respondents consistently perceive these concerns as significant challenges to trust, fairness, and transparency in sustainable finance. Overall, the analysis confirms that all seven scales demonstrate acceptable to good internal consistency.

4.3. Factor Analysis/Correlation (Principal Component Method)

The results of the exploratory factor analysis (EFA) provide strong support for the theoretical foundations outlined in the literature review. Fraud detection (FD1–FD4) exhibited high factor loadings (0.758–0.846) and explained 64.9% of the variance, confirming unidimensionality and internal consistency (Table 3).

This finding aligns with prior studies (Aldemir and Uysal, 2025; Kshetri, 2021) which emphasized the effectiveness of AI in enhancing fraud detection and ensuring transparency in financial reporting, supporting H_1. The results of the exploratory factor analysis (EFA) provide strong support for the theoretical

Table 3: Factor analysis/correlation

Factors	Egen value	Difference	Proportion	Cumulative
Scale 1				
Factor 1	2.59680	2.03434	0.6492	0.6492
Factor 2	0.56246	0.10511	0.1406	0.7898
Factor 3	0.45735	0.07396	0.1143	0.9042
Factor 4	0.38339		0.0958	1.0000
	Chi^2=269.48		Prob Chi^2=0.00	
Scale 2				
Factor 1	1.42114	1.41858	1.3246	1.3246
Factor 2	0.00257	0.14717	0.0024	1.3270
Factor 3	−0.14461	0.06158	−0.1348	1.1922
Factor 4	−0.20618		−0.1922	1.0000
	Chi^2=145.56		Prob Chi^2=0.00	
Scale 3				
Factor 1	1.93637	1.95739	1.2080	1.2080
Factor 2	−0.02102	0.12134	−0.0131	1.1949
Factor 3	−0.14236	0.02763	−0.0888	1.1060
Factor 4	−0.16999		−0.1060	1.0000
	Chi^2=249.84		Prob Chi^2=0.00	
Scale 4				
Factor 1	1.43447	1.32001	1.2535	1.2535
Factor 2	0.11446	0.29017	0.1000	1.3535
Factor 3	−0.17571	0.5312	−0.1535	1.2000
Factor 4	−0.22883		−0.2000	1.0000
	Chi^2=152.72		Prob Chi^2=0.00	
Scale 5				
Factor 1	2.23370	0.87342	0.6420	0.6420
Factor 2	1.36029	1.37820	0.3909	1.0329
Factor 3	−0.01791	0.07863	−0.0051	1.0277
Factor 4	−0.09654		−0.0277	1.0000
	Chi^2=921.59		Prob Chi^2=0.00	
Scale 6				
Factor 1	1.77597	1.33673	0.9766	0.9766
Factor 2	0.43924	0.60555	0.2415	1.2182
Factor 3	−0.16632	0.06409	−0.0915	1.1267
Factor 4	−0.23041		−0.1267	1.0000
	Chi^2=263.78		Prob Chi^2=0.00	
Scale 7				
Factor 1	1.83832	1.72470	1.1503	1.1503
Factor 2	0.11362	0.27732	0.0711	1.2214
Factor 3	−0.16369	0.02645	−0.1024	1.1190
Factor 4	−0.19014		−0.1190	1.0000
	Chi^2=245.04		Prob Chi^2=0.00	

foundations outlined in the literature review. Fraud detection and Improved Financial Reporting with the use of AI (FD1–FD4) exhibited high factor loadings (0.758–0.846) and explained 64.9% of the variance, confirming unidimensionality and internal consistency (Table 4). This finding aligns with prior studies (Aldemir and Uysal, 2025; Kshetri, 2021) which emphasized the effectiveness of AI in enhancing fraud detection and ensuring transparency in financial reporting, supporting H_1. Similarly, the dimension of Affordable and Fast Financial Services with the use of AI (AFS1–AFS4) showed moderate loadings (0.511–0.692) despite relatively high uniqueness values, indicating a substantial yet somewhat varied contribution of each item. This partially reflects the literature (Giesecke and Heidorn, 2022) where AI applications improve accessibility and affordability but still face practical limitations, particularly in inclusivity and data reliability. These results provide partial empirical support for H_2.

AI Disclosure and Financial Performance (AID1–AID4) demonstrated moderate-to-high factor loadings (0.621–0.752) with strong unidimensionality, reinforcing earlier findings by Elnokoudy (2025) and Saleem (2025) that voluntary AI disclosures in annual reports enhance financial performance and investor trust. This directly supports H_3 and highlights the signaling effect of transparency in AI adoption, consistent with signaling theory. AI as a Transformative Force in Global Business (AITF1–AITF4) revealed moderate loadings (0.560–0.662), suggesting a reasonable but slightly weaker factor structure. This outcome is in line with Tekin and Polat (2020), who argue that while AI is strategically transformative, its effectiveness depends on how well firms communicate and operationalize these initiatives. Thus, findings cautiously support H_4, though some divergence in item strength indicates variation in stakeholder perceptions of AI's transformative impact.

Table 4: Factor loadings (pattern matrix) and unique variances

Scale	Variable	Factor 1	Factor 2	Uniqueness
Scale 1	FD 1	0.7581	0.4252	0.4252
	FD 2	0.8035	0.3544	0.3544
	FD 3	0.8463	0.2838	0.2838
	FD 4	0.8125	0.3398	0.3398
Scale 2	AFS 1	0.5235	−0.0288	0.7252
	AFS 2	0.6377	−0.0180	0.5930
	AFS 3	0.6924	0.02180	0.5204
	AFS 4	0.5109	0.0356	0.7377
Scale 3	AID 1	0.6883	-	0.5262
	AID 2	0.7518	-	0.4348
	AID 3	0.7155	-	0.4880
	AID 4	0.6209	-	0.6145
Scale 4	AITF 1	0.6620	−0.1340	0.5438
	AITF 2	0.5982	−0.1848	0.6080
	AITF 3	0.5700	0.1686	0.6466
	AITF 4	0.5599	0.1842	0.6526
Scale 5	SLRW 1	−0.6288	0.6618	0.1667
	SLRW 2	0.8603	0.4765	0.0328
	SLRW 3	0.8522	0.4900	0.0336
	SLRW 4	−0.6098	0.6747	0.1729
Scale 6	ECRC 1	0.6641	−0.3685	0.4232
	ECRC 2	0.7836	−0.2299	0.3332
	ECRC 3	0.5812	0.3530	0.5375
	ECRC 4	0.6190	0.3549	0.4909
Scale 7	BDP 1	0.6441	−0.2028	0.5440
	BDP 2	0.4665	0.2492	0.7203
	BDP 3	0.7857	−0.0612	0.3789
	BDP 4	0.7671	0.0814	0.4049

Challenges-related dimensions displayed more complex structures. For instance, Speculation and Lack of Real World Evidence (SLRW1–SLRW4) showed a two-factor pattern, reflecting the literature (Graham, 2025; Desiraju and Khan, 2023) that much AI research remains theoretical, with limited empirical validation. Ethical concerns and regulatory challenges (ECRC1–ECRC4) largely loaded on one factor (0.581–0.784), consistent with Chausson et al. (2024) and Korteling et al. (2021), though minor cross-loadings suggest overlapping issues between regulation and ethics. Algorithmic bias and data privacy (BDP1–BDP4) displayed a predominantly unidimensional structure but with weaker loadings for some items (notably BDP2), echoing Schweitzer (2024) and Sutton et al. (2016) that while AI bias is a well-recognized barrier, perceptions of its impact vary.

5. CONCLUSION

This study examined sustainable financial performance in the age of artificial intelligence (AI), emphasizing both the opportunities and challenges that emerge from its adoption in the financial sector. In particular, the results highlight AI's role in strengthening fraud detection, improving financial reporting accuracy, and enhancing investor confidence through proactive disclosure practices. These outcomes reinforce the argument that AI is not only a technological tool but also a strategic enabler of sustainable financial performance, consistent with signaling theory. At the same time, the findings point to significant challenges that limit AI's transformative potential. Ethical dilemmas, regulatory fragmentation, algorithmic bias, data privacy concerns, and the high costs of implementation remain key barriers to equitable and trustworthy adoption. Respondents consistently emphasized these risks, suggesting that the sustainable integration of AI depends as much on responsible governance and ethical deployment as it does on technological advancement.

From a theoretical perspective, the study contributes to the literature by demonstrating that AI's influence extends beyond efficiency gains to include transparency, governance, and corporate reputation, while also enriching signaling theory by showing how voluntary AI disclosures serve as signals of organizational credibility and long-term value creation. From a practical perspective, the findings suggest that firms aiming to achieve sustainable financial performance must balance innovation with responsibility by strengthening governance structures, ensuring ethical use of data, and adopting standardized disclosure frameworks that build stakeholder confidence. For regulators and policymakers, the results underscore the urgency of developing clear guidelines and accountability structures to mitigate systemic risks and ensure equitable access to AI-driven financial solutions.

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