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Exploring the Impact of Fintech on ESG (Environmental, Social and Governance) Investments: An Empirical Analysis of Technological Innovations Shaping Sustainable Financial Practices

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Abstract *This empirical study investigates the transformative influence of the Fintech on Environmental, Social and Governance (ESG) investments, delving into the intricate relationship between technological innovations and the evolution of sustainable financial practices. Financial technology (Fintech) has revolutionised the financial industry, creating new opportunities and challenges in taking investment decisions. Exploring the impact of Fintech on ESG investment, our study aims to analyse the empirical evidence of technological innovation shaping sustainable financial practices. Objectives include assessing Fintech's influence on ESG decision-making. Methodology involves quantitative analysis using regression models. Regression analysis is used to identify significant predictors of digital transaction adoption, and structural equation modeling allows for a nuanced exploration of the complex interplay among Fintech and ESG Investments by incorporating the Technology Acceptance Model. Findings reveal a positive correlation between Fintech adoption and ESG performance. Policy implications highlight the need for regulatory frameworks aligning Fintech with sustainable finance goals.*

Keywords *Fintech, Environmental, Social and Governance (ESG), Sustainable Finance, Technological Innovations, Investment Decision-Making, Digital Transaction Adoption*

INTRODUCTION

In the contemporary global economic landscape, Fintech has garnered substantial attention from both industry practitioners and academic scholar (Croutzet & Dabbous, 2021; Rehman Khan & Yu, 2021). Fintech is recognised as a preeminent and innovative domain in the contemporary epoch, encapsulating the forefront of technological advancements applied to pioneering financial products and services (Liu et al., 2021). In order to maintain competitiveness, organisations have embarked on a trajectory of innovation, adopting digitalisation and automation across diverse domains, including Fintech, for the facilitation of payment processes (*FINAL12DoghanandKwongIJOQM.Pdf*, n.d.). And an overview of the emerging Environmental, Social and Governance (ESG) Fintech landscape is given to the reader in this paper, along with information on how essential ESG aspects are starting to become for the Fintech industry. Fintech's potential has received very little attention, despite the fact that these crucial concerns are of global relevance. This paper, which makes use of an ESG framework, addresses the enormous, unrealised potential of Fintech to have a significant impact. Among other things, this potential can be realised through the use of complex and large datasets, the application of cutting-edge statistical techniques, like artificial intelligence (AI), and creative applications of block chain technologies. The fast-expanding global economy of today has given rise to a variety of powerful tools for investors who want to balance their financial goals with their moral and environmental values. An increasing understanding of businesses' significant impact on society and the environment has led to the development of ESG investing as a significant force in the financial industry. ESG investing makes an effort to allay these worries by including non-financial factors in investment choices (Pati et al., 2024).

Therefore, the integration of Fintech has become a widely used metric that has been widely applied within the framework of environmental sustainability. Tian and associates (2023). The use of Fintech during the last ten years has significantly altered sustainability. Fintech adoption has been further accelerated by access to financing, which has also acted as a driver to improve green company practices. It makes it easier for people to get involved, promotes investment in technology and democratises the possibilities for companies and individuals to use Fintech solutions.

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Objectives of the Study

- To know the Fintech's influence on ESG decision-making.
- To explore the technological innovation shaping sustainable financial.

LITERATURE REVIEW

Fintech Adoption

In the account of economic growth and financial inclusion, the pivotal chapter revolves around Fintech, a term coined from "financial" and "technology" (Ryu, 2018). This narrative hinges on the successful integration of Fintech, and its impact on broadening financial inclusion is carefully navigated by vigilant regulatory oversight. Delving into the Indian landscape provides a captivating backdrop, offering insights into varying degrees of accomplishment in the adoption of Fintech services (Guild, 2017). In this evolving narrative, Fintech emerges as an innovative and attention-grabbing field, attracting substantial investments (Ryu, 2018). The story unfolds as Fintech becomes the storyteller of innovations, seeking to refine the very fabric of how financial services are processed, delivered and embraced. Within this narrative tapestry, we encounter a rich array of advancements, from digital currency to online payments, digital invoicing, online investment, wealth management, digital leasing, advisory services, online insurance and the communal spirit of crowdfunding (Nangin et al., 2020). The plot thickens as the integration of blockchain and artificial intelligence takes center stage, introducing efficiency into the core of financial institutions (Sajid et al., 2023). Thus, the story of Fintech unfolds—a captivating saga of technological innovation reshaping the landscape of financial inclusion and economic growth.

ESG Investments

ESG factors, as identified by Bonfanti in 2023, stand as the fundamental pillars of sustainability. This paper offers an insightful glimpse into the emerging landscape of ESG Fintech, emphasising the growing importance of ESG considerations within the Fintech sector. Despite the global relevance of these critical concerns, Fintech's potential in addressing them has been relatively overlooked. Acknowledging ESG as a key driver of corporate long-term value and sustainable future profits, as highlighted by Edmans in 2022, the discourse on corporate purpose has recently been dominated by ESG considerations, acting as a catalyst to address global environmental issues and climate change, as noted by Larcker et al. in 2022. Employing an ESG framework, this paper delves into the untapped potential of Fintech to make a substantial impact, utilising intricate datasets, advanced statistical techniques such as artificial intelligence (AI) and innovative applications of blockchain technologies, as emphasised by Dicuonzo et al. in 2024. Beyond the production of goods and services, companies often generate negative externalities with adverse effects on society and public health, prompting the need for increased ESG-related and sustainability-oriented practices, as underscored by Ding et al. in 2024.

ESG Investment Decision-Making

ESG investing has gained prominence among institutional, retail investors and public sector authorities aiming to integrate long-term financial risks and opportunities into their decision-making processes for sustained value creation. This approach is not solely profit-driven, as it also caters to ethical or impact investing, aligning portfolios with societal values such as climate change mitigation, socially just practices and robust corporate governance standards (Boffo & Patalano, 2020). Due to the growing focus of institutional investors on sustainability, investment decisions in the financial sector are increasingly focused on ESG aspects. In this scenario, together with technological progress, sustainable finance, unlike traditional finance, directs capital towards operations that generate positive impacts for the environment and society. Fintech, considered an accelerator of sustainable economic growth, is part of the technological innovations related to sustainable finance (Galeone et al., 2024).

Digital Technology

The core of sustainable development lies in technological innovation, as highlighted by Anadon et al. (2016). Financial institutions can enhance their services by leveraging technologies such as the Internet and mobile communications, allowing them to move away from traditional physical outlets like ATMs and business halls. This shift fosters innovation in financial services such as credit, finance and payments, ultimately improving service efficiency and reducing transaction costs. Research by Yao and Song (2021) indicates that Fintech plays a crucial role in diminishing information costs for transaction participants, leading to increased market transparency. Consequently, Fintech development has the potential to enhance corporate loan accessibility, alleviate financing constraints for businesses and contribute to the effective fulfillment of corporate social responsibility, ultimately enhancing corporate ESG performance. Scholars, including Wang et al.

(2022), underscore that Fintech involves digital technologies with disruptive impacts, representing complex tools for delivering financial products and services that differ from existing technologies.

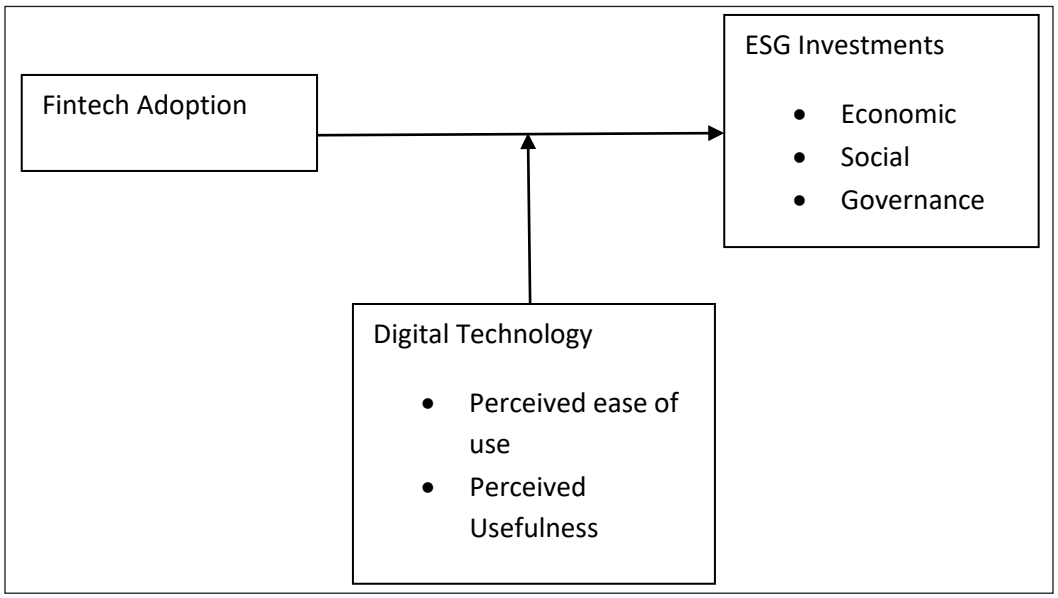


Fig. 1: Proposed Conceptual Model

Hypothesis

H1: Fintech adoption significantly influence on ESG investment.

H2: Digital technology significantly influence on ESG investment.

H3: Digital technology positively mediates between Fintech adoption and ESG investment.

Table 1: Measurement Instrument

Constructs	Code	Items
Adoption of Fintech services (AFS)	AFS1	I am likely to adopt Fintech services if I see positive reviews from trusted sources
	AFS2	I worry about the potential negative consequences of using Fintech services.
	AFS3	I believe that Fintech services maintain a high level of data security.
	AFS4	Using Fintech services would help me save time and effort.
Digital technology	DT1	Digital technology usage enhances my perception of how easy it is to use Fintech services.
	DT2	The more I use digital technology, the more I perceive Fintech services as user-friendly.
	DT3	Digital technology improves my access to valuable financial information.
ESG investment	ESG1	I believe that the companies take care of their Employee job Satisfaction and work-life balance.
	ESG2	I am aaware that the company are involved in philanthropic efforts and corporate social responsibility (CSR) activities.
	ESG3	I know that the company is actively involved in Customer satisfaction and brand reputation.
	ESG4	I believe that the company is actively involved in reducing the Carbon Footprint.
	ESG5	The organisation adheres to the Environmental Compliance regulations and standards.
	ESG6	The organisation invests in Environmental friendly Innovation, technologies and practices
	ESG7	I believe that the board of directors follows governance.
	ESG8	I believe that the company follows Ethical Governance practices such as adherence to ethical standards, including its code of conduct and anti-corruption policies.
	ESG9	I believe that the company is responsive to its Shareholder Rights.

Data Analysis

The research utilised a standardised questionnaire to collect data, engaging 250 investors in the survey. Statistical methods, including descriptive statistics, Pearson's correlation and Cronbach alpha, were applied for data analysis and the study employed Smart PLS3 in the model-building process to establish a comprehensive understanding of the relationships among variables, conducting multiple phases of data evaluation as outlined by Nadiger et al. (2023). Variables and the financial literacy were examined by analysing descriptive statistical findings obtained from 250 surveys, as highlighted by Hiremath et al. (2023).

RESULTS AND DISCUSSION

The Table 2 shows that the correlation pattern is consistent with the projected correlations. These correlations provide insights into the relationships between different latent variables. The correlation matrix indicates the pair wise correlations between Fintech adoption, digital transactions (DT) and ESG Investment; it seems to have relatively strong positive correlations with most other constructs.

Table 2: Pearson Correlation

	Adoption of Fintech Services	Digital Transaction	ESG Investment
Adoption of Fintech Services	1		
Digital Transaction	0.732	1	
ESG Investment	0.847	0.783	1

The correlation matrix indicates relationships among the variables studied. A strong positive correlation of 0.732 suggests that as the adoption of Fintech services increases, there is a noticeable tendency for a rise in DT. Additionally, the robust positive correlation of 0.847 between the adoption of Fintech services and ESG investment implies a significant positive link, indicating that a higher adoption of Fintech is associated with increased integration of ESG considerations in investment decisions. The correlation of 0.783 between DT and ESG investment also points to a substantial positive association, suggesting that a higher prevalence of DT aligns with a greater inclination towards ESG-conscious investments. In essence, these correlations underscore meaningful connections between Fintech adoption, DT and ESG investment practices, revealing potential synergies in these domains.

Scale Reliability and Validity-Findings

The table presents the factor loadings, internal consistency measures and reliability indices for three key variables: Adoption of Fintech Services (AFS), DT and ESG Investment. For AFS, factor loadings ranging from 0.727 to 0.903 indicate the strength of each item's association with the underlying factor. The Cronbach's alpha of 0.811 signifies good internal consistency, and the Composite Reliability (rho_a) of 0.855 and Composite Reliability (rho_c) of 0.873 demonstrate high reliability. The Average Variance Extracted (AVE) of 0.633 for AFS indicates moderate convergent validity. Similarly, for DT, factor loadings range from 0.796 to 0.857, ensuring a robust connection with the underlying factor. The internal consistency is good with a Cronbach's alpha of 0.784, and the reliability indices (rho_a and rho_c) of 0.8 and 0.873, respectively, demonstrate high reliability. The AVE of 0.696 for DT indicates reasonable convergent validity. Regarding ESG Investment, factor loadings range from 0.726 to 0.967, suggesting strong associations with the underlying factor. The exceptionally high Cronbach's alpha of 0.962 reflects excellent internal consistency, and the reliability indices (rho_a and rho_c) of 0.968 indicate exceptional reliability. The AVE of 0.77 for ESG Investment highlights good convergent validity. Overall, these findings attest to the reliability and validity of the measurement model for the studied variables.

Table 3: Validity and Reliability of the Scale

Items	Factor Loadings	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance Extracted (AVE)
AFS1 <- Adoption of Fintech Services	0.727	0.811	0.855	0.873	0.633
AFS2 <- Adoption of Fintech Services	0.756				
AFS3 <- Adoption of Fintech Services	0.903				
AFS4 <- Adoption of Fintech Services	0.785				
DT1 <- Digital Transaction	0.848	0.784	0.8	0.873	0.696
DT2 <- Digital Transaction	0.796				
DT3 <- Digital Transaction	0.857				

Items	Factor Loadings	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance Extracted (AVE)
ESG1 <- ESG Investment	0.726	0.962	0.968	0.968	0.77
ESG2 <- ESG Investment	0.942				
ESG3 <- ESG Investment	0.887				
ESG4 <- ESG Investment	0.967				
ESG5 <- ESG Investment	0.906				
ESG6 <- ESG Investment	0.863				
ESG7 <- ESG Investment	0.848				
ESG8 <- ESG Investment	0.882				
ESG9 <- ESG Investment	0.855				

Test of the Structural Model

The researcher has examined and tested the fit of the structural model that represented the suggested model in Fig. 1.

Table 4: Hypothesis Testing

Relationship	Path Coefficients	P-Value	Results
Adoption of Fintech Services -> Digital Transaction	0.732	0	Accepted
Digital Transaction -> ESG Investment	0.783	0	Accepted

The observed path coefficients and associated p-values for the relationships among the variables reveal insightful findings. The path from AFS to DT exhibits a significant positive coefficient of 0.732 with a p-value of 0, indicating a strong and accepted relationship. This implies that as the AFS increases, there is a notable positive impact on the prevalence of DT. Similarly, the path from DT to ESG Investment demonstrates a significant positive coefficient of 0.783 with a p-value of 0, reinforcing the accepted relationship. This signifies that a higher engagement in DT is positively associated with an increased inclination towards ESG-conscious investments. In essence, these results affirm the positive and statistically significant connections between Fintech adoption, DT and ESG investment, providing valuable insights into the interplay among these key factors.

Table 5: Total Effect

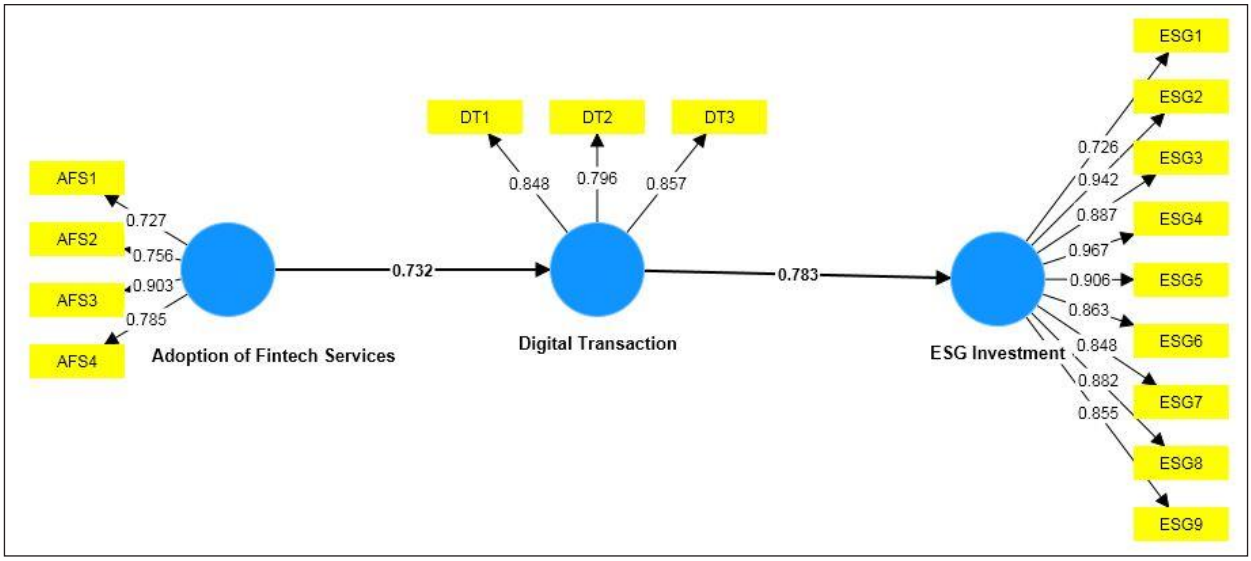
Relationship	Total Effects	P-Value
Adoption of Fintech Services -> Digital Transaction	0.732	0
Adoption of Fintech Services -> ESG Investment	0.773	0
Digital Transaction -> ESG Investment	0.783	0

Mediating Effect among Constructs

Table 6: Mediating Effect

Relationship	Total Effect	Direct Effect	Specific Indirect Effects	P-Value	Results
Adoption of Fintech Services -> Digital Transaction -> ESG Investment	0.773	0.2	0.573	0	Full Mediation

The analysis of the relationship between AFS, DT and ESG investment reveals compelling insights. The total effect of 0.773 signifies the overall impact of AFS on ESG Investment, considering both direct and indirect pathways. The direct effect, isolated from the mediation of DT, is measured at 0.2. Notably, the specific indirect effects through DT amount to 0.573, indicating a substantial mediating role. The p-value of 0 underscores the statistical significance of these effects. In essence, these results suggest that the influence of AFS on ESG investment is not only partially mediated by DT but is also characterised by a full mediation effect. This implies that DT play a significant role in explaining the relationship between Fintech adoption and ESG investment, emphasising the intricate interplay and potential mediating mechanisms within this dynamic framework.



Source: Authors own.

Fig. 2: Path Coefficient

The above figure illustrates the results, which indicate that the t value of FL for SI was greater than 1.96. The latter was significantly impacted by the former (β = 0.485, t = 3.440), FL for FRA (β = 0.881, t = 31.220), FRA for SI (β = 0.494, t = 3.680), indicating that hypothesis H1, H2, H3 and H4, were satisfied. An important mediating role for Financial Risk & Attitude was seen in the interactions between FL and Sustainable Investment. The impact of FRA (β = 0.454, t = 3.671) on Sustainable Investment was noteworthy.

DISCUSSION

Implications of the Findings

The implications drawn from the findings of the analysis on the relationships among AFS, DT and ESG Investment carry significant ramifications across various sectors. For businesses in the Fintech industry, there is an opportunity to strategically position themselves by emphasising the integration of ESG considerations within their DT, potentially attracting a socially conscious user base. Investors and financial institutions can use these insights to inform their strategies, prioritising companies that exhibit strong Fintech adoption and a commitment to sustainable and socially responsible financial practices. Policymakers and regulators may consider these findings in shaping regulatory frameworks, aiming to incentivise responsible practices within the dynamic Fintech landscape. Fintech developers and innovators can leverage the results to guide their technological advancements, focusing on solutions that enhance transparency and traceability of ESG factors within DT. Consumer awareness campaigns can educate individuals on the role of DT in contributing to broader sustainability goals. Companies can align their Corporate Social Responsibility (CSR) initiatives with these findings, and financial institutions can explore sustainable finance initiatives that incorporate Fintech solutions, contributing to a more sustainable, technologically advanced and socially responsible financial ecosystem.

Practical Recommendations

Practical recommendations stemming from the analysis of the relationships among AFS, DT and ESG Investment are crucial for guiding businesses, policymakers and financial institutions. Firstly, there is a need to actively promote Fintech adoption with a specific focus on its potential to enhance ESG-conscious practices. Businesses should be encouraged to integrate Fintech tools that facilitate DT, given the observed positive impact on ESG investment. Fintech developers should prioritise the creation of innovative solutions explicitly designed to address ESG considerations, fostering a more sustainable financial landscape. Stakeholders should be educated about the interconnectedness of Fintech adoption, DT and ESG investment, emphasising the mediating role of DT. Regulatory support for sustainable Fintech practices is essential, and policymakers should explore frameworks that incentivise businesses aligning with ESG principles. Collaborative efforts between Fintech firms, traditional financial institutions and ESG experts can drive innovation, leading to advanced technologies supporting

sustainable financial practices. Continuous monitoring and adaptation strategies are crucial, acknowledging the dynamic nature of the Fintech and ESG landscape. Overall, these recommendations aim to contribute to the development of a more sustainable, technologically advanced and socially responsible financial ecosystem.

CONCLUSION

In conclusion, our analysis delving into the relationships among AFS, DT and ESG Investment yields valuable insights. The observed total effect of 0.773 underscores the comprehensive impact of Fintech adoption on ESG Investment, taking into account both direct and indirect pathways. The direct effect, isolated from the mediation of DT, is determined to be 0.2, while the substantial specific indirect effects through DT amount to 0.573. The statistical significance of these effects, indicated by a p-value of 0, solidifies their credibility. Our findings point to a scenario of full mediation, emphasising that DT play a crucial role in elucidating the relationship between Fintech adoption and ESG Investment. This nuanced understanding highlights the intricate dynamics within this triad of variables and underscores the pivotal role of DT as a mediating factor in influencing the integration of ESG considerations within Fintech-driven financial practices. These results contribute to a deeper comprehension of the mechanisms at play and have implications for fostering sustainable and technologically advanced financial ecosystems.

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