SOCIAL SCIENCE REVIEW ARCHIVES
ISSN Online: 3006-4708
ISSN Print: 3006-4694
https://policyjournalofms.com

Green Finance and FinTech Adoption: Examining the Mediating Effects of Financial Literacy and Perceived Financial Benefit in Sustainable Banking

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DOI: https://doi.org/10.70670/sra.v3i3.884

Abstract

This study explores the influence of green finance on FinTech adoption in the context of sustainable banking, with a particular focus on the mediating roles of perceived financial benefit and financial literacy. Amid the global push toward environmental sustainability and the rapid proliferation of financial technology, the integration of these domains has gained scholarly and practical relevance. However, limited research exists on how cognitive and motivational factors influence the uptake of green FinTech solutions, especially in emerging economies. Grounded in the Technology Acceptance Model (TAM), this study aims to develop and empirically test a mediation model that examines whether perceived financial benefits and financial literacy mediate the relationship between green finance and FinTech adoption among banking professionals in Pakistan. A quantitative, cross-sectional survey design was employed, gathering data from 376 banking professionals across commercial and Islamic banks in Pakistan. Structural Equation Modeling (SEM) using SmartPLS 4 was applied to test the direct and indirect relationships among constructs. The findings reveal that green finance has a significant positive effect on FinTech adoption. Moreover, both perceived financial benefit and financial literacy significantly mediate this relationship, with perceived financial benefit demonstrating a stronger mediating effect. These results highlight the importance of addressing both the cognitive capacity and motivational orientation of users to enhance green FinTech adoption. The study contributes to theory by extending TAM through the integration of dual mediators and provides practical insights for policymakers, financial institutions, and FinTech developers.

Keywords: Green Finance, FinTech Adoption, Financial Literacy, Perceived Financial Benefit and Sustainable Banking

Introduction

Over the past decade, rapid advancements in financial technology (FinTech) and rising concerns about environmental sustainability have sparked growing interest in "green finance." Green finance integrates environmental considerations into financial decisions, mobilizing capital towards environmentally friendly projects (Dar et al., 2024). Concomitantly, FinTech adoption has

transformed financial intermediation by offering digital, cost-effective, and scalable services (Phan et al., 2021). Scholars increasingly examine how FinTech can drive green finance initiatives and improve financial outcomes for consumers and institutions (Zhang et al., 2024). Yet, understanding remains fragmented regarding how perceived financial benefits and financial literacy interplay to shape FinTech adoption in green finance contexts.

Existing studies suggest that FinTech uptake enhances both financial performance and sustainability metrics, particularly when organizations are financially literate and recognize personal gains (Basar et al., 2024; Suria et al., 2024). For instance, firms with higher financial literacy are more likely to adopt digital tools, which then mediate sustainable entrepreneurship (Basar et al., 2024). Meanwhile, perceived financial benefits, such as cost savings, convenience, or returns, increase adoption intention under Technology Acceptance frameworks (Scheller et al., 2023; Phan et al., 2021).

Climate change and fragmented regulations pose significant financial and environmental risks, prompting international bodies to support green finance to mobilize sustainable investments (Raihan, 2024; Okolo et al., 2023). Many emerging economies, including Pakistan, face barriers in accessing green capital due to limited FinTech infrastructure and low financial literacy (Jokhio et al., 2025). Professionals within the banking sector are at the forefront of implementing sustainable financial practices, yet they often face constraints in fully integrating digital green finance tools (Basar et al., 2024). These limitations are compounded by gaps in training, organizational inertia, and a lack of targeted FinTech adoption strategies among financial institutions (Dar et al., 2024). As digital financial platforms proliferate during the COVID-19 aftermath, regulatory bodies emphasize equipping bankers and financial professionals to make informed, green-oriented financial decisions.

Despite evidence linking FinTech and green finance, two critical gaps persist. First, the interplay between perceived financial benefits and financial literacy as co-determinants of FinTech adoption in green finance remains underexplored. Most studies isolate financial literacy's role (Basar et al., 2024) or investigate perceived benefits separately (Scheller et al., 2023), but integrated models capturing their joint influence are lacking. Second, mediation models testing whether perceived benefit and financial literacy simultaneously drive green FinTech uptake have received little empirical attention. Addressing this gap is particularly urgent in regions like Pakistan, where digital financial literacy within the banking workforce remains uneven despite increasing availability of green FinTech options. Theoretical frameworks such as the Technology Acceptance Model (TAM) have been adapted to financial innovations, yet they seldom incorporate both cognitive (literacy) and affective (benefit perception) antecedents in a unified model (Dar et al., 2024). This deficiency undermines understanding of how banking professionals evaluate and adopt green FinTech, limiting institutional capacity to implement evidence-based strategies that boost both capability (financial literacy) and motivation (perceived benefit) in sustainable finance. By investigating this dual mediating mechanism, the present research aims to clarify these relationships among professionals in Pakistan's banking sector, offering insights that are both contextually grounded and theoretically robust (Hidayat-ur-Rehman, 2024).

Understanding this integration is vital because green FinTech adoption can drive sustainable development while fostering institutional financial innovation. Banking professionals often remain hesitant to engage with green finance tools due to perceived complexity or insufficient returns, especially in environments with low digital literacy or organizational resistance. Without clarity on cognitive and motivational triggers, interventions may miss their mark, providing staff training without addressing perceived benefits, or vice versa. This could perpetuate digital inertia and stymie the growth of green financial products (Basar et al., 2024). Policymakers aiming to scale green finance must know whether to prioritize educational programs, digital transformation efforts, or incentive mechanisms. In Pakistan, a climate-vulnerable country with an evolving sustainable banking ecosystem, identifying these levers could accelerate green

investments, reduce systemic risks, and enhance institutional resilience (Hidayat-ur-Rehman, 2024). Integrating these factors into one holistic model advances theoretical precision, enabling scholars to predict FinTech adoption more accurately within regulated financial institutions. It also informs banks and regulatory authorities about how to structure internal policy, digital infrastructure, and communication strategies that align professional competence with financial and environmental objectives.

This research contributes by developing and empirically testing a unified mediation model in which perceived financial benefit and financial literacy influence green FinTech adoption. It fills the theoretical gap by integrating dual antecedents under the TAM framework and offers context-specific insights into adoption drivers in Pakistan's banking sector, information currently missing from the literature (Hidayat-ur-Rehman & Hossain, 2024). By bridging cognitive and affective dimensions, this study equips policymakers, central banks, and FinTech providers with evidence-based strategies to simultaneously enhance professional capacity and digital engagement.

The study's findings can inform banking curricula, regulatory reforms, and institutional product development that balance capacity-building with financial appeal. For example, banks could integrate sustainability-linked FinTech tools with continuous financial literacy modules and transparent performance metrics. Theoretically, the model extends TAM by embedding financial literacy and perceived benefit as dual mediators affecting behavioral intention. This unified lens advances adoption theory and can guide future cross-sectoral research in sustainable FinTech adoption across the financial services industry.

Technology Acceptance Model (TAM)

In the rapidly transforming financial ecosystem, understanding why individuals and organizations adopt emerging financial technologies remains a central concern for scholars and practitioners alike. The Technology Acceptance Model (TAM) remains to be a strong source of explanation to this phenomenon as it is one of the several theoretical frameworks that have been used to explain this phenomenon. It is argued that the willingness of a person to use a given technology depends on his or her attitude towards thinking that the technology is useful and can be easily utilized (Davis, 1989). The framework has been revisited, scholars have realized that technology adoption is seldom a matter of technical properties; the process is informed and influenced by the intricate matrix of contextual, cognitive, and motivation-based considerations (Dwivedi et al., 2023). Within a context of FinTech that has to be viewed as a disruptive mechanism towards financial inclusion and sustainability, it becomes critical to extend TAM to include such wider aspects of behaviour and structure. In the academic literature of recent years, an increasing attention towards the attempts to contextualize TAM to do it in the field of sustainability-driven financial behaviors has been paid (Frankel, 2020). With the increased popularity of green finance in the sphere of world policy, its interaction with FinTech becomes an object of new theoretical research (Hossain et al., 2025). Although FinTech boasts potentials of ultimate ease of accessibility, scalability, and more, it is not characterized by a blank state in which its functioning goes by unnoticed, where users are being required to see a certain particular value brought by participation, primarily, in financial terms. This is in line with active changes to TAM which propose that it should include belief-based constructs e.g. financial confidence and expected utility as antecedent to technology adoption (Luo et al., 2023).

The perceived financial benefits of using FinTech platforms to access green financial products become central to explaining behavioral intention. People are not willing to switch to platforms simply because they are user-friendly; rather, they are willing to do it because they anticipate that by using the platforms the tools will produce economic benefits to them or allows them to save money, a concept that is well-grounded in recent empirical studies (Scheller et al., 2023). The ability to understand and interact with digital finance. In the absence of the core knowledge in financial matters, technology acquisition can be highly stifled, as demonstrated in

the recent research, irrespective of utility perceived (Basar et al., 2024; Jokhio et al., 2025). TAM faces more and more criticism due to its short coverage of such enabling capacities. Academics have suggested adjustments that involve the inclusion of knowledge frameworks, particularly monetary literacy, as mental antecedents that regulate the manner in which people recognize utility and conveniences on the web-utilized financial sphere (Zhao et al., 2024). Green FinTech engagement is not only the product of the way technology is designed or even how directly it may benefit a person; rather, it is a product of the capacity of an individual to interpret, judge and trust information conveyed by means of digital flows. The fact that sustainability objectives, digital transformation, and individual decisions now overlap, leads to the necessity to redefine the TAM, and that should be a new way of looking at adoption through the prism of personal competence and motivational expectations. At the point of integrating both personality and financial literacy into the evaluative process as an embodied element, the model used in this study takes the understanding of TAM further toward behavioral realism. Such an approach not only aligns with current academic discourse but also provides a practical foundation for policy design, particularly in regions like Pakistan where digital inequality and environmental vulnerability intersect.

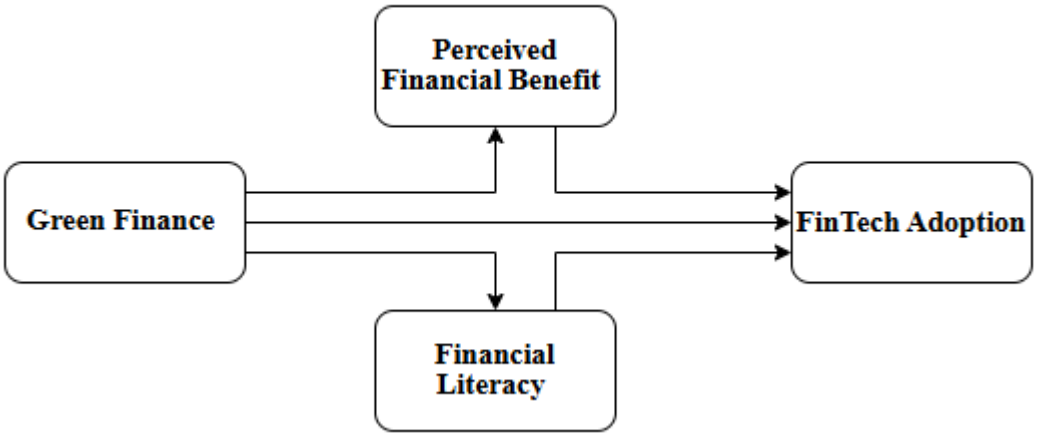

Figure 1: Research Model

Hypotheses Development

The emergence of green finance as a strategic priority across nations highlights the urgent need to reconfigure financial systems in ways that support environmental sustainability. Simultaneously, there is an emergence of digital transformation wherein FinTech innovation is leading the change in the way financial services are accessed and consumed. Though these two spheres, green finance and FinTech, have developed more or less side-by-side, current discussion implies their merging, where the tools used in FinTech could contribute to the more efficient application and wider deployment of instruments in the area of green finance (Zhang et al., 2024). Still, the extent to which, and in which ways, being in contact with a green finance can contribute to the overall use of FinTech is something that is not explored as much. The Technology Acceptance Model (TAM) offers an effective framework to question this relationship, especially as there is a construct of perceived usefulness that suggests the belief that the users will embrace a technology when they expect them to help them achieve desired results (Davis, 1989; Dwivedi et al., 2023).

From an empirical standpoint, individuals who interact with green finance offerings, such as green bonds, eco-loans, or carbon-credit platforms, are increasingly doing so through digital channels. This online platform can be used as a vehicle not just of green finance access as a builder

of the general FinTech literacy and ease. Empirical evidence indicates that interest to use relevant financial technologies, especially in the event of value-added digital services, rises in the case of a shifting matching with the personal or organizational objectives (Scheller et al., 2023). Green finance can contribute to the perceived usefulness of digital finance platforms because the former tends to address sustainable, transparent, and long-term benefits. Therefore, interest in green finance can have a positive effect on the implementation of FinTech solutions due to the formation of positive cognitive estimates in accordance with the assumptions of TAM. Green finance can also serve as a way to enter the digital finance environment, particularly in upcoming economies where the level of FinTech is spotty (Hossain et al., 2025). A contingent or induced user of sustainable finance can ultimately adopt the behavior through behavioral intention in that, a user will have a more positive attitude towards digital platforms because of the induced or contingent behavior. This is more not a transactional but a transformative interaction which is slowly changing the belief systems of the user on the financial technologies. Building on TAM and current empirical evidence, it can be posited that green finance exposure enhances perceived value and reduces psychological barriers to FinTech adoption.

Green finance positively influences the adoption of FinTech solutions.

In the ongoing shift toward environmentally conscious financial behavior, the integration of digital financial tools has emerged as a catalyst for enhancing the accessibility and efficiency of green finance. Availability of green financial products or FinTech services does not guarantee their adoption. What often determines the user's intention to engage with such innovations is the perceived financial value derived from doing so (Johri & Singh, 2024). The Technology Acceptance Model (TAM) emphasizes that the perceived usefulness of a system significantly drives its acceptance and use (Davis, 1989). In the context of green finance and FinTech adoption, perceived financial benefit can be conceptualized as a domain-specific extension of this usefulness, a belief that engaging with green financial products through digital means will yield tangible monetary advantages.

Green finance initiatives often emphasize long-term economic returns, tax incentives, and reduced operational costs through sustainable practices. When these outcomes are visible and understood by individuals or firms, they can shape the perception that FinTech-enabled green financial services are not only ethically responsible but also economically rewarding. Perceived financial benefits also play a substantial mediating role in the relationship between exposure to digital finance and users willing to deploy corresponding technologies (Scheller et al., 2023). It is possible that people willing to use green finance, as it will give them a monetary benefit in the form of finances saved by being energy-efficient, a lower interest rate when taking out a green loan, or profit on their investments in sustainability, may more strongly adopt the FinTech solutions that make this possible (Johri & Singh, 2024). Empirical research also indicates that the perceived economic gain is a psychological stimulus when it comes to getting past risk aversion and uncertainty, particularly in cases where digital literacy is not prevalent, and this would apply in the case of emerging markets (Zhang et al., 2024). This is especially applicable in the case of green finance, which is notoriously dyspeptic or risky (Ratnawati et al., 2024). Users will tend to positively assess the FinTech channels when there is clearly communication or experience of financial benefit as proposed by cognitive-evaluative pathway in TAM (Dwivedi et al., 2023). Therefore, the concept of financial gain is another mental construct that frequently turns the theory of green financing into practical FinTech implementation (Ratnawati et al., 2024). By positioning the perceived financial benefit as a mediator, the present research falls in line with a developing literature base that argues there is a need to tighten TAM by composing domain-specific convictions which would impact the perceived utility. Wanting to use FinTech can be due to green finance but it is actually the ability of the user to see how they will gain financially with such engagement.

H2: Perceived financial benefit mediates the relationship between green finance and FinTech adoption.

As financial ecosystems evolve to incorporate digital innovation and environmental responsibility, the capacity of individuals to make informed financial decisions becomes increasingly critical. Although green finance provides very helpful solutions in terms of economic tools to deal with economic challenges of climate, and FinTech a straightforward and scalable platform on which to implement such solutions, their effective combination is not just a technological or policy issue, it is a behaviour issue. Technology Acceptance Model (TAM) as a theory that notes the two essential understandings of technology adoption, namely effects of perceived usefulness and perceived ease of use, is a relatively good lens through which technology adoption can be seen (Davis, 1989). The concept needs to be extended to apply to more elaborate financial environments, like green finance, to support enabling mental capacities, including financial literacy.

Financial literacy plays a pivotal role in how individuals interpret and evaluate both the risks and benefits associated with financial innovations (Zaid et al., 2025). In green finance, people can be financially literate about the existence of environmentally friendly products, currently green bonds or environmentally friendly tools of financing, but they are not educated enough to evaluate their structure of costs, long-term non-financial returns, or the ways to access it digitally (Serdarušić et al., 2024). Consequently, chances of using FinTech to available such green products would be little, not by virtue of absence of technology, but inapt understanding (Jokhio et al., 2025). This mental block destroys easiness of use which is a major construct of TAM and falls short in behavioral intention to adoption (Dwivedi et al., 2023). According to Basar et al. (2024) financial literacy is one of the most crucial factors impacting the participation in digital financial lives, in particular, among young people in developing countries (Serdarušić et al., 2024). When one has knowledge on how to interpret financial intelligence, it would be more likely able to perceive digital platforms as manageable, trustworthy and tailored in accordance with their financial objectives (Sreenu, 2024). The decisions that involve sustainability, i.e., when there is a conflict between long-term returns and ethical concern, literacy will help to improve the ability of the user to analyze the seemingly complex or uncertain products. This mental capability can turn green finance into a viable and accessible solution using FinTech since it makes green finance no longer conjectural but rather expedient (Sharma et al., 2025). Green finances should be supported by financial literacy programs because they have more chances to become translated into FinTech implementation. The knowledgeable users will be more able to translate the worth of the green financial product and go around the online devices required to access the financial product. Financial literacy becomes a crucial mediating bridge between awareness of green finance and actual behavioral engagement with FinTech platforms.

H3: Financial literacy mediates the relationship between green finance and FinTech adoption.

Methodology

This study adopts a quantitative, cross-sectional research design aimed at empirically testing the hypothesized relationships between green finance, financial literacy, perceived financial benefit, and FinTech adoption within the context of sustainable banking. The cross-sectional approach is appropriate as it captures data at a single point in time, allowing for statistical analysis of the constructs and relationships (Saunders et al., 2019). The population for this study comprises banking professionals, including managers, officers, and operational staff, employed in commercial and Islamic banks operating in Pakistan that are involved or transitioning toward sustainable banking practices. These institutions are either offering green finance products or implementing digital banking innovations that support sustainability. The sample size is determined using the item-to-response ratio method, which is widely recommended in structural

equation modeling (Hair et al., 2022). Following the rule of thumb of 20 responses per indicator item, and given that the survey includes 28 items, a minimum sample size of 560 respondents is required. 560 were distributed and 376 received from respondents. A stratified random sampling technique employed to ensure proportional representation of employees from different types of banks (conventional and Islamic) and functional departments (e.g., finance, IT, retail, operations). This approach enhances the precision of estimates and reduces sampling bias (Etikan & Bala, 2017). Primary data collected using a structured questionnaire, administered both online and in-person. The data analyzed using SPSS (version 26) for descriptive statistics, reliability, and normality testing, while SmartPLS (version 4) used for Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess measurement and structural models, as recommended for exploratory models and small-to-medium sample sizes (Hair et al., 2022).

Measurements

All constructs measured using previously validated scales, adapted to the sustainable banking context. A five-point Likert scale (1 = strongly disagree to 7 = strongly agree) employed for all items. Green Finance measured using a 8-item scale adapted from Zhang et al. (2024), assessing accessibility, trust, and involvement in green financial products. FinTech Adoption measured using a 6-item scale based on Luo et al. (2023), reflecting perceived usage, behavioral intention, and engagement with digital financial tools. Perceived Financial Benefit measured using a 6-item scale from Scheller et al. (2023), evaluating users' perception of cost savings, return on investment, and financial efficiency through FinTech platforms. Financial Literacy assessed using a 8-item scale adapted from Basar et al. (2024), focusing on respondents' ability to understand, analyze, and make informed financial decisions in digital contexts.

Data Analysis

Table 1: Factor Loadings

Variables	Items	FA	FL	GF	PFB
Fintech Adoption	FA1	0.856			
	FA2	0.895			
	FA3	0.865			
	FA4	0.905			
	FA5	0.841			
	FA6	0.869			
Financial Literacy	FL2		0.760		
	FL3		0.762		
	FL4		0.794		
	FL5		0.846		
	FL6		0.757		
	FL7		0.815		
Green Finance	GF1			0.893	
	GF2			0.874	
	GF3			0.856	
	GF4			0.839	
	GF5			0.875	
	GF6			0.901	
	GF7			0.834	
	GF8			0.919	

Perceived Financial Benefit	PDB3				0.817
	PFB1				0.808
	PFB2				0.811
	PFB4				0.868
	PFB5				0.855
	PFB6				0.788

The measurement model's reliability and validity, factor loadings are a critical indicator of how well each observed item reflects its underlying latent construct. Hair et al. (2022) stipulate that a factor loading should be above 0.70 to be acceptable since it means that more than 50 percent of the variance in the observed variable is represented by the latent factor. Loadings ranging between 0.60 and 0.70 can still be maintained in case the model reliability is high but those with low values of 0.60 and below can be considered as item deletion weakly representing the construct. The convergent validity of the constructs is accepted by the fact that all of the retained items show loadings that are greater than the acceptable 0.70. As a case in point, the latent variables, FinTech Adoption (FA1 0.841 0.905) have a strong and homogenous connection with their indicators. On the same note, items that measure Green Finance (GF1-GF8) have the loading values that range between 0.834 and 0.919, which is higher than the minimum level indicating substantial evidence of construct validity. The reliability of (FL2 FL7) of the Financial Literacy items varies between 0.757 and 0.846, which means that they have adequate reliability, and there are no reasons to promptly delete the items. The fact that the items FL1 and FL8 seem to have been omitted by the model is probably the result of loading being below the suggested level (Hair et al., 2022). Its deletion has been able to enhance the overall average variance extracted (AVE) and composite reliability (CR) of the model. This generally occurs in the purification of scales as long as theoretical justification of the removal of items is made and it does not affect the content validity (Fornell & Larcker, 1981). In the same measure, the construct Perceived Financial Benefit (PFB1-PFB6) indicates the loadings as 0.788-0.868, which is more than the acceptable cut-off implying that the items measure the latent construct satisfactorily. PFB3 and PFB5 display some of the highest loadings (0.817 and 0.855, respectively), indicating that these indicators are particularly central to respondents' perception of financial advantage in using green FinTech services.

Convergent Validity

Table 2: Reliability Analysis

Variables	Cronbach's alpha	(rho_a)	(rho_c)	(AVE)
Fintech Adoption	0.937	0.939	0.950	0.761
Financial Literacy	0.879	0.880	0.908	0.623
Green Finance	0.956	0.958	0.963	0.764
Perceived Financial Benefit	0.906	0.906	0.927	0.680

Evaluating the reliability and validity of latent constructs is a critical step in validating any measurement model, particularly when employing structural equation modeling techniques such as PLS-SEM. Cronbach Alpha is traditionally the scale used to measure internal consistency of any specific construct and below 0.70, it should be taken as unacceptable and below 0.90, it should be regarded as having excellent reliability (Hair et al., 2022). In our analysis, all three constructs exceed this value: in FinTech Adoption, it is 0.937, the score of Financial Literacy is 0.879, and Green Finance reaches 0.956, and Perceived Financial Benefit has a value of 0.906. The alpha values are high and this rapport indicates that items in each construct are quite cohesive.

Another closer estimator of construct reliability in PLS-SEM, Rho_A, indicates strong results of between 0.880 and 0.958, which further confirms the reliability of internal consistency (Dijkstra & Henseler, 2015).

Composite Reliability (rho_c) further confirms the consistency of the constructs, with all values well above the recommended 0.70 threshold (Hair et al., 2022). FinTech Adoption and Green Finance displays very high scores in the composite reliability (0.950 and 0.963, respectively), which leads to the fact that both of these constructs are measured to a high extent of precision. Financial Literacy and Perceived Financial Benefit have also shown to be confer strong reliability with values of rho c of 0.908 and 0.927 respectively. In addition to reliability, the Average Variance Extracted (AVE) gives evidence of convergent validity that shows the degree to which each construct describes the variance in its indicators. Convergent validity cannot be approved unless a minimal AVE of 0.50 is met which in the case is fulfilled by all constructs (Fornell & Larcker, 1981). FinTech Adoption (0.761), Green Finance (0.764), Financial Literacy (0.623) and Perceived Financial Benefit (0.680) are all meeting this condition one, which is that more than half (50+ percent) of the variance in a given set of items is captured by the respective construct.

Discriminant Validity

Table 3: HTMT Ratio

Variables	FA	FL	GF	PFB
Fintech Adoption				
Financial Literacy	0.453			
Green Finance	0.574	0.439		
Perceived Financial Benefit	0.623	0.463	0.629	

The presented table displays the Heterotrait-Monotrait Ratio (HTMT), a modern and stringent criterion for assessing discriminant validity in structural equation modeling. Henseler et al. (2015) state that, in the case where two constructs of conceptual distinctness are being tested, HTMT should all be less than 0.85, whereas in the condition where two conceptually similar constructs are being tested, HTMT values of less than 0.90 are acceptable. All the HTMT values are very much within the range of acceptable limits: FinTech Adoption and Perceived Financial Benefit (0.623), Green Finance and Perceived Financial Benefit (0.629), and Financial Literacy and Green Finance (0.439). The maximum value of HTMT is 0.629 that is well within the conservative top mark of 0.85. Such findings attest to the fact that each of the latent constructs has a discriminatory validity and this implies that they are empirically different despite this theoretical relationship. The measurement model fulfills the HTMT condition and approves validity of the suggested structural model (Hair et al., 2022; Henseler et al., 2015).

Model Fitness Indicators

Table 4: Model Fitness Values

	Saturated model	Estimated model
SRMR	0.061	0.071
d_ULS	1.296	1.778
d_G	0.729	0.740
Chi-square	1571.812	1573.055
NFI	0.822	0.822

The provided model fit indices assess the global model fit in Partial Least Squares Structural Equation Modeling (PLS-SEM), offering insights into how well the hypothesized model represents the empirical data. The Standardized Root Mean Square Residual (SRMR) is a key

indicator, where values below 0.08 are considered acceptable, indicating a good fit (Hair et al., 2022). Here, both the saturated model (0.061) and estimated model (0.071) meet this criterion, suggesting satisfactory model-data consistency. The d_ULS and d_G values, which compare the squared Euclidean and geodesic distances between empirical and model-implied correlation matrices, are not judged by fixed thresholds but should be lower and closer between the two models, as is observed here (d_ULS = 1.296 vs. 1.778; d_G = 0.729 vs. 0.740) (Henseler et al., 2016). The Normed Fit Index (NFI) is 0.822, slightly below the ideal ≥0.90 threshold, but still indicates an acceptable fit for exploratory models. Overall, these values confirm the model's adequate global fit.

R Square Values

Table 5: R Square

Variables	R-square	R-square adjusted
Fintech Adoption	0.420	0.415
Financial Literacy	0.165	0.163
Perceived Financial Benefit	0.349	0.347

The R-square (R^2) and adjusted R-square values reflect the explanatory power of the independent variables over each dependent construct in the structural model. According to Hair et al. (2022), R^2 values of 0.75, 0.50, and 0.25 can be considered substantial, moderate, and weak, respectively. The FinTech Adoption construct exhibits an R^2 of 0.420, indicating a moderate level of explanatory power, meaning that 42% of the variance in FinTech Adoption is explained by the predictor variables. Similarly, Perceived Financial Benefit has an R^2 of 0.349, reflecting a low-to-moderate explanatory strength, while Financial Literacy has a relatively weak R^2 of 0.165, suggesting that its predictors explain only 16.5% of its variance. The adjusted R^2 values, slightly lower than the R^2 values—confirm model robustness while accounting for the number of predictors. These results indicate that the model explains a meaningful but improvable proportion of variance in the target constructs.

Structural Equation Modelling (SEM)

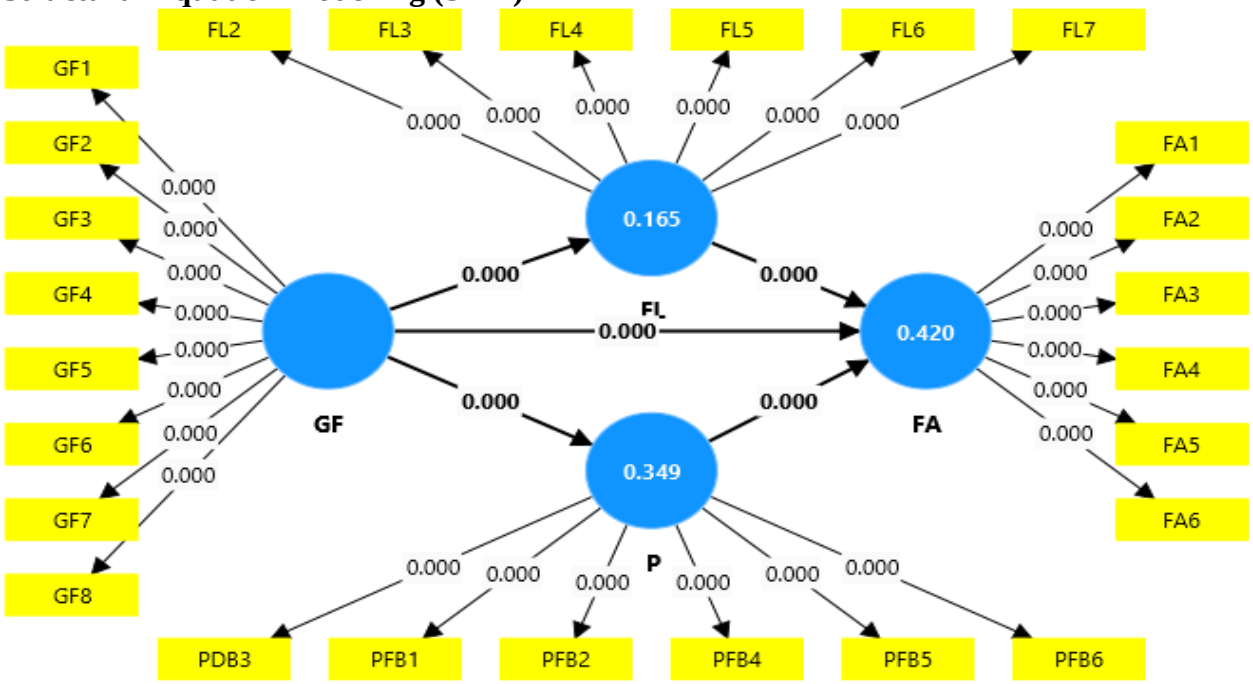

Figure 2: Hypotheses (Smart PLS)

Table 6: Hypotheses Results

Hypotheses	Original sample	Sample mean	Standard deviation	T statistics	P values
GF -> FA	0.279	0.278	0.051	5.446	0.000
GF -> FL -> FA	0.067	0.067	0.021	3.244	0.001
GF -> PFB -> FA	0.203	0.204	0.035	5.789	0.000

Green Finance (GF), Fintech Adoption (FA), Financial Literacy (FL), Perceived Financial Benefit (PFB)

The structural model results indicate statistically significant direct and indirect relationships among the studied variables, offering strong empirical support for the proposed hypotheses. The direct path from Green Finance (GF) to FinTech Adoption (FA) shows a standardized coefficient of 0.279 with a T-value of 5.446 and a p-value of 0.000, confirming a strong and significant positive effect. The indirect path through Financial Literacy (GF → FL → FA) yields a coefficient of 0.067, with a T-value of 3.244 and a p-value of 0.001, suggesting that financial literacy significantly mediates the relationship, albeit with a smaller effect size. More notably, the mediation through Perceived Financial Benefit (GF → PFB → FA) exhibits a coefficient of 0.203, a T-value of 5.789, and a p-value of 0.000, indicating a stronger and more influential mediating effect. Collectively, these findings support both the direct and dual-mediation effects, validating the theoretical model grounded in TAM and sustainability contexts.

Discussion:

The results confirm a significant positive relationship between green finance and FinTech adoption, supporting H1. It means that people or the professionals that use green financial instruments will be more prone to use the digital technologies in the financial sphere. This observation is in line with the findings of the past studies, which conclude that the exposure to the sustainability-related finances positively affects the feeling of technology usefulness, a critical principle of the Technology Acceptance Model (Davis, 1989; Dwivedi et al., 2023). By using

green finance, including eco-loans or green investments platforms, the user will not only realize its environmental merit but also will be subjected to the digital convenience through FinTech device usage (Zhang et al., 2024). This correlation becomes especially applicable in the context of emerging economies in the Asian region, with Pakistan being the example, where green finance is both a drive and an on-ramp toward digital financial interactions (Hossain et al., 2025). The direct effect of green finance on the usage of FinTech instruments supports the study that financially responsible actions toward the environment enter the domain of digitally enabled transactions even more and digital transformation initiatives in sustainability forms aid the study (Dar et al., 2024).

H2 is supported by the results, with a significant indirect effect from green finance to FinTech adoption through perceived financial benefit. Which means that the introduction of FinTech into the sphere of green finance is not only promoted by the environmental attitudes or technological progress, but also promoted by the thought of economic benefits of utilizing such tools. The users are also likely to consider using green FinTech platform using perceived benefits like cost savings, better returns or more efficiency (Scheller et al., 2023; Johri & Singh, 2024). Such finding brings out TAM axiom that behavioral intention is influenced straight away by perceived usefulness (Davis, 1989), and also expands TAM in considering motivation-related constructs domain-specific. Perceived benefits also serve as the driving force in improving the rate of digital adoption since such factors can break the resistance to digital adoption in the developing economies where financial uncertainty and technological apprehension are rife (Ratnawati et al., 2024). Perceived financial benefit therefore plays the mediating role between being mindful to the environment and the financial product and interaction with the underpinning digital infrastructure (Zhao et al., 2024). This finding helps in developing a subtle perspective about technology adoption because it reveals that economic incentives can influence environmentally aligned digital behaviors in a big way.

The third hypothesis is also supported, with a statistically significant mediating effect of financial literacy between green finance and FinTech adoption. It shows that financial literacy, although to a lesser extent, can also be used as an effective factor in converting the engagement in green finance into the introduction of actual FinTech. Being financially literate, people are better able to assess the cost-benefit setting, risk commitments and longer-term returns related to environmentally friendly financial products, raising their opportunity to use digital channels (Basar et al., 2024; Jokhio et al., 2025). The present finding is especially relevant to the Pakistani context, where the inequalities in digital and financial education remain. The logical implication expressed in the publications of TAM scholars is that the adoption model should be supplemented with enabling cognitive skills, including literacy that could be used to better anticipate behaviors within complex technological contexts (Zhao et al., 2024). Financial literacy is seen to increase the perception of ease of use and reduce cognitive challenges so that the users can be in a better position to use the FinTech solutions facilitating green finance (Serdarušić et al., 2024). Even though financial literacy does not represent a strong mediator, it is needed to supplement the effects of motivational factors such as perceived benefit to facilitate the development of an overall digital involvement.

Limitations and Future Directions

Despite the valuable insights offered by this study, several limitations should be acknowledged, which open avenues for future research. First, the cross-sectional design restricts the ability to infer causality between green finance, financial literacy, perceived financial benefit, and FinTech adoption. Future studies should employ longitudinal or experimental methods to capture dynamic behavioral changes over time. Second, the study focuses exclusively on banking professionals in Pakistan, limiting the generalizability of findings across industries or cultural contexts. Comparative studies involving different sectors (e.g., insurance, microfinance) or countries, particularly those with varying levels of digital infrastructure, could yield more

comprehensive insights into FinTech adoption patterns. While the study integrates cognitive (literacy) and affective (perceived benefit) mediators, it does not account for potential moderating variables such as organizational support, digital trust, or environmental concern, which could significantly shape adoption behavior. Future research could incorporate these contextual and psychological factors to develop a more holistic model. Financial literacy was treated as a static trait; innovative approaches could explore its development over time via digital learning interventions or gamified financial education modules, assessing their impact on FinTech adoption in green finance contexts. Emerging technologies like blockchain and AI-driven financial advisory systems represent the next frontier in sustainable finance. Future investigations should examine how these technologies intersect with green finance objectives and whether their adoption is similarly influenced by perceived utility and user competence. This would not only extend TAM but also provide actionable insights for designing inclusive, tech-enabled sustainability strategies.

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