

Role Of AI-Driven Fintech Innovations in Sustainable Development and Green Finance in Pakistan

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Abstract

This study examines the role and readiness of AI-driven FinTech innovations to advance sustainable development and green finance in Pakistan. A survey of ~100-120 respondents, primarily youth aged 18-25 years (74%), students (76%), and urban residents (77%), was conducted to assess user experience, acceptance, and perceptions of AI-FinTech for sustainability goals. Findings reveal strong positive intent: 71% perceive AI-FinTech as useful, 74% as important, and 67% report high motivation to use it. Acceptability (59%), comfort (59%), and likelihood of adoption (66%) are also high, with low perceived stress (27%). This suggests that young, educated users see AI tools — such as green credit scoring, ESG investing, and carbon-tracking wallets — as viable enablers of SDG 8 and SDG 13. However, key limitations emerge. Trust (48%), safety (49%), and reliability (48%) are moderate, with ~33% neutral responses. Knowledge (45%) and familiarity (50%) also show awareness gaps. The sample's urban-student bias further limits generalizability to rural and SME populations who are central to green microfinance. The study concludes that while AI-driven FinTech has significant potential to promote green finance in Pakistan, its impact depends on addressing trust deficits, improving digital and ESG literacy, and designing inclusive, impact-transparent products. Policymakers and FinTechs should prioritize regulatory clarity, rural outreach, and sustainability-focused features to translate user intention into actual sustainable financial behavior.

Introduction

The global push toward sustainable development has made green finance a critical tool for funding climate action, renewable energy, and inclusive growth. Pakistan, being among the most climate-vulnerable countries, requires substantial investment to achieve its Nationally Determined Contributions and the UN Sustainable Development Goals by 2030. Traditional financial systems in Pakistan struggle with limited reach, high transaction costs, and inadequate data for assessing environmental risks. Meanwhile, the rapid growth of Financial Technology, combined with Artificial Intelligence, offers new opportunities to bridge this gap. AI-driven FinTech can enable data-driven credit scoring, real-time ESG monitoring, automated risk assessment, and personalized financial services for green projects. This study focuses on understanding how AI-driven FinTech innovations can enhance access to, and effectiveness of, green finance in Pakistan. It examines their potential to promote financial inclusion, support sustainable projects, and contribute to Pakistan's climate resilience and SDG targets.

Background of the Study:

Pakistan faces significant climate and development challenges, including floods, water stress, and energy insecurity, which require large-scale green investments to meet its SDGs and NDC targets by 2030. However, traditional banking in Pakistan is constrained by low financial inclusion, limited access to credit for rural communities and MSMEs, and a lack of robust ESG risk

assessment tools. The rapid growth of FinTech, coupled with Artificial Intelligence, offers a new pathway to address these gaps. AI-driven FinTech platforms can enable alternative credit scoring, real-time monitoring of green projects, fraud/greenwashing detection, and targeted delivery of climate finance products like solar loans and micro-insurance. Despite this potential, there is limited empirical evidence on how AI-driven FinTech is currently shaping green finance and sustainable development outcomes in Pakistan. Understanding this role is essential to inform policymakers, SBP, and FinTech firms on leveraging technology to close Pakistan's climate finance gap.

Problem Statement:

AI-Fintech integration in green finance: Limited research on how AI-driven Fintech innovations enhance green finance adoption and sustainability.

Impact on financial inclusion: How AI-powered Fintech solutions promote financial inclusion and green investments in developing economies like Pakistan.

Risk evaluation and decision-making: Role of AI in improving risk assessment and decision-making for sustainable investments in green finance.

Technological backbone of Fintech: Research on how technologies like blockchain, cloud computing, and IoT support green finance initiatives.

Empirical evidence on joint effects: Limited empirical evidence on the combined impact of AI, Fintech, and green finance on sustainable development.

(Duresa Kilaj and Aulonë Cenaj, 2026).

Research Questions:

- Acceptability
- Agreement
- Attitude Clarity
- Comfort
- Confidence
- Difficulty
- Effectiveness
- Expectations
- Familiarity
- Frequency
- Importance
- Knowledge
- Likelihood
- Liking
- Motivation
- Performance
- Quality
- Reliability
- Safety
- Satisfaction
- Stress level
- Support
- Trust
- Usefulness

Purpose of the Study:

- Assess the current adoption of AI-driven FinTech tools in delivering green financial products and services across Pakistan.

- Evaluate their impact on improving financial inclusion, ESG risk assessment, and access to climate finance for MSMEs and rural communities.
- Identify key challenges such as regulatory gaps, data privacy, algorithmic bias, and digital literacy that hinder effective implementation.
- Provide recommendations for policymakers, SBP, and FinTech stakeholders to leverage AI responsibly and scale green finance in alignment with Pakistan's SDG and NDC targets.

Significance of the Study:

- **Policy & Regulatory Insight:** It provides evidence for SBP, SECP, and the Ministry of Climate Change to design supportive policies and regulatory sandboxes that enable safe, responsible adoption of AI in green finance.
- **Closing the Climate Finance Gap:** By identifying how AI can improve ESG data, risk scoring, and outreach, the study highlights practical ways to channel capital toward renewable energy, climate adaptation, and sustainable agriculture in Pakistan.
- **Financial Inclusion:** It explores how AI-driven FinTech can extend green loans, micro-insurance, and carbon credits to underserved MSMEs, women, and rural communities who are most affected by climate change.
- **Academic Contribution:** There is limited local research on AI-FinTech and green finance in Pakistan. This study fills that gap and creates a baseline for future research on digital sustainability.
- **Industry Application:** FinTech firms and banks can use the findings to develop AI models that reduce greenwashing, improve credit decisions, and lower transaction costs for green projects.

Outline of the Study

It covers key areas such as identifying factors influencing Role of AI-driven FinTech Innovations in Sustainable Development and Green Finance in Pakistan. The mixed-methods approach includes a survey of 100 FinTech users and experts and interviews, analyzing data through descriptive statistics. The findings highlight the importance of regulatory clarity, security measures, customer support, and financial inclusion. The recommendations suggest developing clear frameworks and strategies for emerging FinTech services, enhancing security and customer support, promoting financial inclusion, and implementing stricter regulations and transparent data usage policies.

Definitions of Terms

- **Artificial Intelligence (AI)**
Computer systems and algorithms that can perform tasks typically requiring human intelligence — such as learning from data, pattern recognition, decision-making, and predictive analytics. In finance, it includes machine learning, natural language processing, and neural networks.
- **Financial Technology (FinTech)**
Technology-enabled innovations in financial services that improve, automate, and expand the delivery and use of products like payments, lending, insurance, and investments. Examples in Pakistan: Easypaisa, JazzCash, Finja, SadaPay.
- **AI-driven FinTech**
FinTech solutions that use AI/ML to enhance core functions such as credit scoring, fraud detection, customer onboarding, risk assessment, and personalized financial advice.
- **Sustainable Development**

Development that meets present economic, social, and environmental needs without compromising the ability of future generations to meet their own. Measured in Pakistan primarily through the UN Sustainable Development Goals (SDGs).

- **Green Finance**

Financial activities that support environmentally sustainable projects and mitigate climate change. Includes green bonds, green loans, ESG investing, carbon credits, and climate insurance.

- **ESG (Environmental, Social & Governance)**

A framework used to evaluate the sustainability and ethical impact of an investment or business. AI-driven FinTech uses ESG data for risk modeling and green project assessment.

- **Climate Finance**

A subset of green finance focused specifically on funding adaptation and mitigation actions to address climate change, e.g., financing solar farms, flood resilience, or drought-resistant agriculture in Pakistan.

- **Financial Inclusion**

The availability and usage of affordable, accessible financial products and services by individuals and MSMEs, especially underserved rural and low-income populations.

- **Nationally Determined Contributions (NDCs)**

Pakistan's climate action commitments under the Paris Agreement, which outline targets for reducing emissions and mobilizing green finance by 2030.

Literature Review

Digital financial innovations, particularly AI and FinTech, are reshaping Pakistan's financial landscape by expanding credit access, improving banking efficiency, and enabling green finance. In a context where SMEs face funding constraints, low digital literacy, and weak institutional support, AI-enabled lending platforms, blockchain, big data, and mobile payments offer pathways to financial inclusion, green entrepreneurship, and sustainable growth. Empirical studies using SEM, PLS-SEM, GMM, and ARDL show that FinTech and AI adoption positively influence SME performance, banking efficiency, ESG outcomes, and ROA, often through mediators like organizational innovation, financial literacy, and green finance. Systematic reviews further highlight that FinTech enhances transparency and access to sustainable investments, while green finance directs capital toward low-carbon and climate-resilient projects. Despite these gains, regulatory gaps, greenwashing risks, and digital divides limit impact. Collectively, the literature underscores that integrating AI and FinTech with supportive ecosystems and policies is critical for achieving financial inclusion and sustainability goals in emerging economies like Pakistan. How AI and FinTech adoption influence financial inclusion, banking efficiency, SME growth, green entrepreneurship, and sustainability performance in Pakistan. Specifically, the studies aim to: Assess impacts – Test the direct, indirect, and mediating effects of AI-enabled lending, FinTech, and green finance on SME expansion, financial inclusion, banking efficiency, and firm financial performance. Explore mechanisms – Investigate how organizational innovation, financial literacy, perceived benefits, and green finance transmit the effects of digital adoption on sustainability and entrepreneurial outcomes. Evaluate green finance integration – Analyze how AI-driven tools like blockchain, ESG analytics, and green bonds enhance transparency, capital allocation, and climate risk management. Identify barriers & solutions – Map regulatory gaps, digital divides, and standardization challenges, and propose policy, institutional, and ecosystem strategies to strengthen FinTech-green finance linkages for sustainable development.

Across studies in Pakistan, AI and FinTech are emerging as transformative tools for financial inclusion, banking efficiency, SME growth, and sustainability. Challenges: Regulatory gaps, greenwashing risk, low digital literacy, and lack of global standards limit impact. Implication: A coordinated approach — integrating AI/FinTech with green finance, ecosystem support, and policy reform — is critical for achieving inclusive, sustainable growth in Pakistan's emerging economy. AI and FinTech are strategic enablers of financial inclusion, banking efficiency, and

sustainable SME growth in Pakistan, but their impact requires aligned policy, regulation, and ecosystem support.

Underpinning and Supporting Theories / Models:

AI-powered digital lending platforms are transforming financial systems by expanding credit access, minimizing information gaps, and improving the speed and accuracy of financial decisions. In developing countries like Pakistan, where SMEs continue to struggle with funding limitations, these platforms offer a viable route to broader financial inclusion and more sustainable business growth. This study investigates how AI-enabled lending platforms affect financial inclusion, green entrepreneurship, and the long-term sustainability of SMEs in Pakistan. Using a quantitative approach, Structural Equation Modeling (SEM) was applied to examine the direct, indirect, and mediating effects among the variables. Results show that AI-driven lending platforms significantly boost financial inclusion, which subsequently fosters green entrepreneurship and sustainable SME expansion. Financial inclusion also partially mediates the link between AI-based lending and sustainability-focused entrepreneurial outcomes. However, regulatory gaps, technological limitations, and low digital literacy hinder the impact of these platforms. The study underscores AI's potential to connect financial innovation with sustainability goals in emerging markets and adds value to the literature on fintech, entrepreneurship, and sustainable development, while providing actionable recommendations for policymakers, banks, and SME actors in Pakistan. Raza, Mohsin, et al. (2026). The link between fintech-enabled inclusive finance (FBIF) and banking efficiency (BE) in Pakistan, with artificial intelligence (AI) tested as a mediating mechanism. A quantitative, positivist approach was adopted. Primary data were collected from bank employees using a structured questionnaire and analyzed with Partial Least Squares Structural Equation Modeling (PLS-SEM). The results show that FBIF positively influences BE. This effect is strengthened when AI acts as a mediator by improving decision-making, enhancing customer experience, and advancing risk management, consistent with the Resource-Based View (RBV). While the empirical focus is on Pakistani banks, the findings offer implications for financial institutions, regulators, and policymakers to leverage AI for better decision-making in inclusive finance and to improve overall financial sector performance. To the authors' knowledge, limited prior empirical work in emerging economies has positioned AI as both a mediating and moderating variable in the FBIF–BE relationship to explain how digitalization drives banking efficiency. Naeem, Muhammad, Shoukat Ali, and Naeem Ahmed. (2025).

Empirical Reviews:

The adoption of artificial intelligence (AI) and green finance practices influence the financial performance of firms in Pakistan's green finance sector from 2014 to 2023. With rising global emphasis on environmental sustainability, AI-enabled green finance has the potential to reshape investment decision-making and portfolio construction. The study assesses the effects of AI-driven green finance practices — including green bond issuance, regulatory strength, ESG integration, and carbon footprint reduction — on Return on Assets (ROA). Using firm-level data from Pakistani financial institutions, the Generalized Method of Moments (GMM) was applied to mitigate potential endogeneity. The findings reveal that AI adoption, regulatory strength, green bond issuance, and ESG scores all have a positive and statistically significant impact on financial performance. In addition, stronger regulatory oversight amplifies the beneficial effect of AI. These results underscore the strategic importance of AI for improving the financial outcomes of firms committed to sustainable finance, while also supporting broader environmental objectives. The study offers actionable insights for policymakers, investment firms, and financial institutions seeking to leverage AI within green finance strategies to achieve both financial and environmental goals. Kumar, Narvind, et al. (2025).

Anchored in the Technology Acceptance Model, this research explores the impact of green finance on FinTech adoption within Pakistan's banking sector. It proposes and empirically validates a mediation model in which perceived financial benefit and financial literacy transmit the effect of green finance on adoption intentions. The results confirm that green finance has a

direct positive impact on FinTech adoption, with both perceived financial benefit and financial literacy serving as significant mediators. The study provides theoretical extensions to TAM and practical implications for policymakers and FinTech developers targeting sustainable finance in emerging economies. Ejaz, Maheen, et al. (2025). SMEs are a key driver of economic growth in Pakistan, yet their expansion and financial inclusion are hindered by restricted access to capital, inadequate institutional support, and limited uptake of advanced digital tools. To address these barriers, the adoption of Artificial Intelligence (AI), Financial Technology (FinTech), and the development of a robust entrepreneurial ecosystem have become vital catalysts for SME transformation. This study investigates how AI adoption, FinTech adoption, and entrepreneurial ecosystem development affect SME growth and financial inclusion in Pakistan. Anchored in the Technology–Organization–Environment (TOE) framework, it proposes and empirically tests an integrated model that captures the interplay of technological and institutional determinants. The results show that AI adoption, FinTech adoption, and ecosystem development all have significant positive impacts on SME growth and financial inclusion. FinTech adoption exhibited the strongest effect on financial inclusion, and the combined model accounted for a large share of the variance in SME performance. These findings suggest that a coordinated approach to digital transformation and ecosystem support can improve SME competitiveness, access to finance, and long-term sustainability in emerging markets. The study contributes to the digital finance and entrepreneurship literature by offering an empirically validated framework for SME development in Pakistan. Tahir, Mohammad, et al. (2026).

Research Framework:

The overarching objective of this study is to examine how FinTech innovations can reshape green finance by improving its efficiency, transparency, and accessibility for local communities, thus advancing environmental sustainability and climate mitigation. Using a systematic literature review and content analysis, this research synthesizes peer-reviewed articles, industry reports, and regulatory documents from 2014–2024. It maps key developments related to ESG factors, market barriers, product structuring and distribution, regulatory frameworks, and stakeholder impacts. The findings indicate that FinTech tools — including blockchain, smart contracts, and digital platform ecosystems — significantly enhance the accuracy and scope of ESG data reporting and compliance, improve capital liquidity, address standardization challenges, and enable new models for structuring and distributing green finance instruments. Despite this progress, persistent challenges remain, such as regulatory gaps, greenwashing risks, and the lack of globally harmonized standards. The study concludes that integrating FinTech into green finance presents a major opportunity to advance sustainable finance. Key recommendations include establishing unified global standards, fostering regulatory innovation, encouraging cross-sector collaboration, and investing in stakeholder education. These insights not only clarify current applications but also lay the groundwork for future empirical research on the social and environmental outcomes of FinTech in green finance. The study thus contributes both to the specific discourse on technology's impact on green finance markets and to the broader body of empirical finance literature on FinTech. Babar, Zohaib Naeem, and Wan Wu. (2025). Sustainability has emerged as a strategic priority for manufacturing SMEs due to tightening environmental regulations and rising stakeholder pressure. Yet, limited research examines how digital financial innovations, specifically FinTech, influence sustainability performance in resource-constrained SME settings. To address this gap, this study examines the effect of FinTech adoption (FA) on the sustainability performance (SP) of manufacturing SMEs in Pakistan, and investigates the mediating roles of organisational innovation (OI) and green finance (GF). Drawing on the resource-based view (RBV), the study proposes a conceptual model that connects digital capabilities to sustainable outcomes. Using a quantitative approach, data were collected from 340 manufacturing SMEs and analyzed with Structural Equation Modeling (SEM). The findings show that FA enhances SP both directly and indirectly via OI and GF. Additionally, FA mediates the link between GF and SP, highlighting its function in channeling sustainable financial flows. The study provides empirical support that when FA is aligned with innovation and green financial practices, it serves as a key

enabler of sustainability in SMEs. Theoretically, it extends the RBV by positioning digital and green financial resources as dynamic capabilities for achieving environmental objectives. Rashid, Sana, et al. (2025).

Hypothesis

Hypothesis		Result	Evidence from Study
ARDL Study – Pakistan			
H1	Investment and savings positively affect GDP growth	Supported	Results show that investment and savings propel GDP development
H2	Gaps in innovation and environmental issues negatively affect long-term growth	Supported	Unused innovations and environmental challenges hinder long-term advancement
H3	Renewable energy usage reduces CO ₂ emissions	Supported	Renewable energy has the potential to lower emissions
H4	Renewable energy impact is conditional on funding and regulatory support	Supported	Effect depends on funding and legislative changes
H5	AI-driven technology/ICT adoption supports balancing growth and sustainability	Supported	Study highlights necessity of implementing AI-based technology
FinTech–Green Finance Review – PRISMA			
H6	FinTech adoption promotes financial inclusion and lowers transaction costs	Supported	FinTech is found to promote financial inclusion, lower transaction costs, and enhance service accessibility
H7	Green finance channels capital into low-carbon tech, renewables, and climate-resilient infrastructure	Supported	Green finance directs capital into “low-carbon” technologies, renewable energy, and climate-resilient infrastructure
H8	FinTech and green finance have a mutually reinforcing relationship	Supported	Mechanisms are mutually reinforcing digital platforms enhance access to sustainable investments, and green finance increases demand for efficient FinTech
H9	FinTech–green finance nexus most strongly supports social sustainability vs. environmental	Supported	Nexus most strongly supports social sustainability through inclusion; environmental impacts remain context-dependent
FinTech & SDGs Review			
H10	FinTech contributes to SDG 10, 12, and 13 via green finance, impact investment, and climate risk tools	Supported	Review highlights support for SDG 13, SDG 12, and SDG 10 through green bonds, crowdfunding, AI, and big data
H11	FinTech improves financial access for underserved/marginalized groups	Supported	Financial inclusion improved tremendously; underserved populations gain access to basic services
H12	Blockchain, AI, and big data enhance climate risk analysis and green investment	Supported	AI and big data enhance risk analysis; blockchain democratizes green investment
H13	Barriers prevent full realization of FinTech’s sustainability potential	Supported	Multiple obstacles should be overcome to enjoy advantages in terms of sustainability

Usman, Muhammad, et al. (2025), (Khan, et al. 2025), (Munir, et al. 2025)

Research Method

Research Approach:

Method

This study employs an applied research method to identify Role of AI-driven FinTech Innovations in Sustainable Development and Green Finance in Pakistan. The focus is on practical solutions and actionable insights for policymakers and industry stakeholders, aiming to bridge gaps in the current regulatory environment.

Purpose

The research serves an explanatory purpose, aiming to elucidate the impact of Role of AI-driven FinTech Innovations in Sustainable Development and Green Finance in Pakistan. By understanding these dynamics, the study provides insights into how AI adjustments can promote or hinder Fintech development.

Source

Primary data is collected directly from Fintech users in Pakistan through a structured survey. This approach ensures original, firsthand insights into the innovation challenges and opportunities in Pakistan's Fintech sector.

Research Design:

Field

Real world environment used for gathering insights on AI-driven FinTech Innovations in Sustainable Development and Green Finance in Pakistan. The survey is designed to capture nuanced views from Pakistan's Fintech

Model

The study adopts a mixed-methods approach, combining quantitative analysis of survey data with qualitative insights from open-ended responses. This blend provides a comprehensive understanding of Role of AI-driven FinTech Innovations in Sustainable Development and Green Finance in Pakistan.

Structure

The survey is structured to capture Fintech users' perceptions on Role of AI-driven FinTech Innovations in Sustainable Development and Green Finance and challenges in Pakistan. Questions are designed to elicit actionable insights for policymakers and industry players.

Selection

The study uses random sampling to select 100 Fintech users and experts in Pakistan, ensuring a representative sample of the country's diverse Fintech landscape.

Control Strategies

Randomization control strategies are employed to minimize selection bias, ensuring the sample represents Pakistan's Fintech sector accurately. This enhances the study's validity and generalizability.

Manipulation Strategies

The research considers natural experiment manipulation strategies to analyze the impact of Role of AI-driven FinTech Innovations in Sustainable Development and Green Finance in Pakistan. This approach provides insights into how policy shifts influence the sector.

Reasoning

Deductive reasoning is applied to test hypotheses on the relationship between regulatory frameworks and Fintech growth. This guides data analysis and helps derive conclusions on effective regulatory strategies.

Paradigm

The pargination paradigm guides the analysis of Role of AI-driven FinTech Innovations, focusing on incremental improvements to foster Sustainable Development and Green Finance in Pakistan. This approach recognizes the evolving nature of regulations and technology.

Sampling Design:

Determination

The sample size of 100 is determined using a formula-based approach, ensuring statistical significance and representativeness for Pakistan's Fintech sector.

Variable

Control variables like age, occupation and education are included to isolate the impact of regulatory frameworks on Fintech growth, enhancing the study's analytical rigor.

Type

The study uses a cross-sectional design, capturing data at a specific point in time to analyze Fintech users' perceptions and impacts.

Relationship

The research examines the positive relationship between Role of AI-driven FinTech Innovations in Sustainable Development and Green Finance in Pakistan, aiming to identify supportive strategies for the sector.

Instrument of Data Collection:

Google Forms is used for online data collection, with settings optimized for accessibility and data quality in Pakistan's context.

Procedure of Data Collection:

Timeline

Data collection is completed within four months, ensuring timely insights for policymakers and Fintech stakeholders in Pakistan.

Mode:

The survey is distributed via email and social media channels, targeting Fintech users and experts across Pakistan for broad outreach.

Statistical Technique:

Descriptive Statistics for FinTech Survey Data

i. Demographic Variables:

- Age: Frequency distribution and percentage
- Gender: Frequency distribution and percentage
- Occupation: Frequency distribution and percentage
- Education: Frequency distribution and percentage
- Area: Frequency distribution and percentage

ii. Acceptability, Agreement, Attitude Clarity, Comfort, Confidence, Difficulty, Effectiveness, Expectations, Familiarity, Frequency, Importance, Knowledge, Likelihood, Liking, Motivation, Performance, Quality, Reliability, Safety, Satisfaction, Stress Level, Support, Trust, Usefulness:

- Strongly agree,
- Agree,
- Neutral,
- Disagree,
- Strongly disagree



Results & Findings

Descriptive profile of the data:

Demographics

- Age: 74% (18-25 years), 21% (26-35 years), 4% (36-45 years), 1% (46-55)
- Gender: 42% (Female), 58% (Male)
- Occupation: 76% (Student), 20% (Employed), 4% (Business)
- Education: 6% (Matric), 21% (Inter), 52% (Bachelors), 19% (Masters), 2% (Ph.D)
- Area: 77% (Urban), 23% (Rural)

User Experience

- Acceptability: 12% Strongly Disagree, 8% Disagree, 21% Neutral, 26% Agree, 33% Strongly Agree
- Agreement: 9% Strongly Disagree, 8% Disagree, 14% Neutral, 31% Agree, 38% Strongly Agree
- Attitude Clarity: 13% Strongly Disagree, 4% Disagree, 24% Neutral, 35% Agree, 24% Strongly Agree
- Comfort: 13% Strongly Disagree, 6% Disagree, 22% Neutral, 39% Agree, 20% Strongly Agree
- Confidence: 14% Strongly Disagree, 7% Disagree, 25% Neutral, 34% Agree, 20% Strongly Agree
- Difficulty: 24% Strongly Disagree, 16% Disagree, 33% Neutral, 18% Agree, 9% Strongly Agree
- Effectiveness: 12% Strongly Disagree, 7% Disagree, 21% Neutral, 36% Agree, 24% Strongly Agree
- Expectations: 10% Strongly Disagree, 8% Disagree, 30% Neutral, 32% Agree, 20% Strongly Agree
- Familiarity: 9% Strongly Disagree, 13% Disagree, 28% Neutral, 31% Agree, 19% Strongly Agree
- Frequency: 11% Strongly Disagree, 10% Disagree, 20% Neutral, 30% Agree, 29% Strongly Agree
- Importance: 10% Strongly Disagree, 4% Disagree, 12% Neutral, 36% Agree, 38% Strongly Agree
- Knowledge: 11% Strongly Disagree, 12% Disagree, 32% Neutral, 29% Agree, 16% Strongly Agree

- Likelihood: 9% Strongly Disagree, 8% Disagree, 17% Neutral, 37% Agree, 29% Strongly Agree
- Liking: 8% Strongly Disagree, 10% Disagree, 15% Neutral, 36% Agree, 31% Strongly Agree
- Motivation: 7% Strongly Disagree, 8% Disagree, 18% Neutral, 41% Agree, 26% Strongly Agree
- Performance: 10% Strongly Disagree, 11% Disagree, 37% Neutral, 25% Agree, 17% Strongly Agree
- Quality: 16% Strongly Disagree, 12% Disagree, 31% Neutral, 29% Agree, 12% Strongly Agree
- Reliability: 11% Strongly Disagree, 13% Disagree, 28% Neutral, 35% Agree, 13% Strongly Agree
- Safety: 11% Strongly Disagree, 8% Disagree, 32% Neutral, 33% Agree, 16% Strongly Agree
- Satisfaction: 9% Strongly Disagree, 13% Disagree, 32% Neutral, 33% Agree, 13% Strongly Agree
- Stress level: 28% Strongly Disagree, 17% Disagree, 28% Neutral, 16% Agree, 11% Strongly Agree
- Support: 13% Strongly Disagree, 12% Disagree, 26% Neutral, 34% Agree, 15% Strongly Agree
- Trust: 9% Strongly Disagree, 10% Disagree, 33% Neutral, 33% Agree, 15% Strongly Agree
- Usefulness: 9% Strongly Disagree, 6% Disagree, 14% Neutral, 45% Agree, 26% Strongly Agree

Validation of model:

Demographic Profile

Construct	Items	Overall Trend
Perceived Usefulness	Usefulness, Effectiveness, Performance, Importance	Strongly positive: ~71% Agree/Strongly Agree
Perceived Ease of Use	Comfort, Confidence, Difficulty, Clarity	Positive: ~59% A/SA. Difficulty is reverse-coded → 40% Disagree/Strongly Disagree = "not difficult"
Trust & Security	Trust, Safety, Reliability, Support	Moderate: ~48-49% A/SA, ~30% Neutral. Trust gap visible
Behavioral Intention	Likelihood, Motivation, Frequency, Liking, Expectations	Very positive: ~60-67% A/SA
Knowledge/Self-Efficacy	Knowledge, Familiarity, Acceptability, Agreement	Mixed-Moderate: ~45-50% A/SA, ~28-32% Neutral
Satisfaction	Satisfaction, Quality	Moderate: ~42-46% A/SA, ~31-32% Neutral
Emotional Response	Stress level	Low stress: 45% Disagree/Strongly Disagree with stress

Structural Model Validation

- R^2 : 0.25 = weak, 0.50 = moderate, 0.75 = strong
- Q^2 : > 0 = predictive relevance via blindfolding
- f^2 : 0.02 = small, 0.15 = medium, 0.35 = large effect
- Path β + t-value: Bootstrapping 5000. $p < 0.05$ = significant

Key Insights

- **High acceptability:** ~71% find AI-FinTech useful + important. Intention items ~60-67% positive.
- **Trust gap:** Only ~48% agree on Trust/Safety/Reliability vs ~71% on usefulness. This is a common bottleneck for FinTech in emerging markets like Pakistan.
- **Neutral zone:** ~30% are “Neutral” on Knowledge, Satisfaction, Trust. Suggests awareness/education issue.
- **Low stress:** 45% disagree that AI-FinTech is stressful → good for adoption.

Hypotheses Testing:

Hypothesis		Result	
H1	AI-driven FinTech is perceived as useful for financial needs	Supported	Usefulness: 45% + 26% = 71%
H2	AI-driven FinTech is perceived as effective	Supported	Effectiveness: 36% + 24% = 60%
H3	AI-driven FinTech is easy to use / comfortable	Supported	Comfort: 39% + 20% = 59%; Confidence: 34% + 20% = 54%; Difficulty* R-Coded: 24%+16% = 40% disagree = not difficult
H4	Users have positive attitude/acceptability toward AI-FinTech	Supported	Acceptability: 26% + 33% = 59%; Agreement: 31% + 38% = 69%; Liking: 36% + 31% = 67%
H5	Users have sufficient knowledge/familiarity with AI-FinTech	Partially Supported	Knowledge: 29% + 16% = 45%; Familiarity: 31% + 19% = 50%; High Neutral = 28-32%
H6	AI-driven FinTech builds user trust & perceived safety	Partially Supported	Trust: 33% + 15% = 48%; Safety: 33% + 16% = 49%; Reliability: 35% + 13% = 48%; ~32-33% Neutral
H7	AI-driven FinTech leads to user satisfaction	Partially Supported	Satisfaction: 33% + 13% = 46%; Quality: 29% + 12% = 41%; Performance: 25% + 17% = 42%; ~32-37% Neutral
H8	AI-driven FinTech creates behavioral intention to use	Supported	Likelihood: 37% + 29% = 66%; Motivation: 41% + 26% = 67%; Frequency: 30% + 29% = 59%; Expectations: 32% + 20% = 52%
H9	AI-driven FinTech is perceived as important for sustainable/green finance	Supported	Importance: 36% + 38% = 74%
H10	AI-driven FinTech does not cause high stress	Supported	Stress Level: 28% + 17% = *45% disagree that it causes stress; only 27% agree

Hypotheses Assessment Summary:

Key Interpretation

Strongly Supported: Usefulness, Importance, Intention/Motivation, Acceptability → ~60-74% A/SA. Users see AI-FinTech as valuable and want to use it.

Partially Supported/Neutral Gap: Trust, Satisfaction, Knowledge → ~41-50% A/SA but ~30-33% Neutral. This is the main adoption barrier in Pakistan context.

No hypotheses rejected: <25% Strongly Disagree on any positive item. Even Difficulty/Stress are low.

Final Outcome

Discussion

The survey data (n≈100-120) shows that AI-driven FinTech is perceived positively by Pakistan's young, urban, educated population. 74% of respondents are 18-25 years old, 76% are students, and 77% are from urban areas.

Conclusion

AI-driven FinTech in Pakistan is perceived as useful, important, and motivating for sustainable/green finance among youth. However, the path from "intention" to "impact" is constrained by trust deficits and knowledge gaps. Closing these gaps through education, regulation, and impact-transparent design will be key to unlocking FinTech's role in SDGs.

Implications

AI-driven FinTech has strong potential to support SDG 8 and SDG 13 by improving access to sustainable finance among youth. However, to translate "intention" into actual green finance adoption, FinTechs and regulators must address the trust deficit and improve financial/ESG literacy, especially for rural and non-student segments who are underrepresented in this sample.

Limitations

Sample Bias: The sample is dominated by young, urban, and educated users — 74% are 18-25 years, 76% are students, and 77% are from urban areas. This limits generalizability to older adults, rural populations, SMEs, and farmers who are primary targets for green microfinance and sustainable development.

Trust and Knowledge Gaps: While usefulness (71%) and importance (74%) are high, trust (48%), safety (49%), and knowledge (45%) are moderate, with ~30-33% neutral responses. This suggests users see potential but remain unsure about data security, algorithmic transparency, and the link between AI-FinTech and green finance.

Methodological Limits: The data is self-reported and cross-sectional, capturing attitudes and intention (66% likelihood to use) but not actual green finance behavior. High neutral scores on quality, satisfaction, and support also indicate limited exposure to AI-FinTech in sustainability contexts.

Recommendations

Build Trust & Transparency: Regulators like SBP/SECP should provide AI governance guidelines, and FinTechs should use explainable AI dashboards to address concerns on safety (49%) and reliability (48%).

Enhance Green Finance Literacy: Launch targeted awareness campaigns and in-app tutorials to reduce the ~30% neutral responses on knowledge and familiarity, helping users connect AI-FinTech with green loans, ESG investing, and carbon tracking.

Ensure Inclusive Access: Expand beyond the current urban-student base (77% urban, 76% students) by developing local-language, low-data interfaces and partnering with rural agents to reach farmers and SMEs for green microfinance.

Design for Impact: Leverage high importance (74%) and low stress (27%) by adding sustainability dashboards and rewards that show real-world impact, e.g., "your investment funded X kWh of solar," to improve satisfaction (46%) and quality (41%).

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