

FinTech Adoption and Financial Inclusion in Rural Communities: The Role of Awareness, Trust, and Perceived Risk

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Abstract

Financial technology (FinTech) has emerged as a significant driver of financial inclusion by improving access to financial services, reducing transaction costs, and facilitating digital financial participation among underserved populations. Despite rapid growth in digital financial services in India, the adoption and utilization of FinTech solutions remain uneven across rural communities. Therefore, this study examines the impact of FinTech adoption on financial inclusion in rural Gujarat and investigates the influence of awareness, trust, and perceived risk on FinTech adoption. A quantitative research approach was employed using a structured questionnaire administered to 210 rural respondents in Gujarat. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The measurement model demonstrated satisfactory reliability and validity, with Cronbach's alpha and Composite Reliability values exceeding the recommended threshold of 0.70 and Average Variance Extracted (AVE) values above 0.50. The structural model results revealed that awareness ($\beta = 0.34$, $p < 0.001$) and trust ($\beta = 0.29$, $p < 0.001$) positively influence FinTech adoption, whereas perceived risk negatively affects adoption behavior ($\beta = -0.18$, $p < 0.01$). Furthermore, FinTech adoption was found to have a significant positive impact on financial inclusion ($\beta = 0.62$, $p < 0.001$). Mediation analysis indicated that FinTech adoption significantly mediates the relationship between awareness, trust, perceived risk, and financial inclusion. The findings support the Technology Acceptance Model and Diffusion of Innovation Theory by highlighting the importance of behavioral factors in promoting digital financial service adoption. The study offers practical implications for policymakers, financial institutions, and FinTech providers seeking to enhance financial inclusion through awareness-building initiatives, trust-enhancing mechanisms, and risk mitigation strategies in rural areas.

Keywords: FinTech Adoption, Financial Inclusion, Digital Financial Services, Trust, Perceived Risk, Awareness, Rural Gujarat, PLS-SEM.

1. Introduction

Financial inclusion has emerged as a critical policy objective globally, owing to its potential to foster economic growth, alleviate poverty, and enhance social welfare. Access to formal financial services enables individuals and enterprises to save, borrow, invest, manage risks, and participate meaningfully in economic activities. Consequently, financial inclusion is broadly recognized as a foundational pillar of sustainable and

equitable economic development (*Global Findex Database 2017*, 2018); (P. Ozili, 2020). Despite the fact that the reach of financial services has been notably broadened, a large share of the population in developing economies is still excluded from formal financial systems. This exclusion is particularly acute in rural areas, where inadequate banking infrastructure, geographical remoteness, limited financial literacy, and prohibitive transaction costs continue to impede access to formal financial services (Morgan & Long, 2020); (Sha'ban et al., 2020).

The beginning of Financial Technology (FinTech) has fundamentally transformed the financial services landscape by harnessing digital technologies to deliver innovative, accessible, and cost-efficient financial solutions. FinTech encompasses a broad spectrum of technological innovations, including mobile banking, digital wallets, internet banking, peer-to-peer lending, digital insurance, and real-time payment structures (GOMBER et al., 2018); (Thakor, 2019). These innovations have substantially disrupted conventional financial service delivery models and have created significant opportunities to extend financial services to previously underserved and unbanked populations (Gabor & Brooks, 2017); (Philippon, 2019).

One of the world's most dynamic digital financial ecosystems has rapidly been established in India. Landmark government-led initiatives, including the Pradhan Mantri Jan Dhan Yojana (PMJDY), the Digital India programme, Aadhaar-enabled payment services, and the Unified Payments Interface (UPI), have collectively accelerated the adoption and penetration of digital financial services across the country (Barik & Sharma, 2019); (Khera et al., 2022). The exponential growth of UPI and allied digital payment platforms bears testimony to the transformative power of technology in reshaping financial behaviour and broadening financial access across both urban and rural geographies (Alhassan et al., 1 C.E.). However, the mere availability of digital financial services does not guarantee their widespread adoption. Extant literature consistently indicates that behavioural and psychological factors exert a critical influence on individuals' propensity to adopt FinTech services (Lim et al., 2019); (Luo et al., 2010). It is posited by the Technology Acceptance Model (TAM), originally formulated by (Davis & Davis, 1989), that technological innovations are more likely to be adopted by users when these innovations are perceived by them as useful and easy to use. Building upon this foundation, subsequent extensions of TAM have incorporated constructs such as trust, perceived risk, and social influence to more comprehensively explain digital technology adoption behaviour (Gefen et al., 2003); (Venkatesh et al., 2003). Similarly, (Rogers, 2003) Diffusion of Innovation (DOI) Theory underscores the critical role of awareness, communication channels, perceived relative advantage, and social influence in shaping adoption decisions.

Among the various determinants of FinTech adoption, awareness, trust, and perceived risk occupy a particularly prominent position in the literature. Awareness enhances individuals' comprehension of digital financial services and their associated benefits, thereby reducing informational asymmetries that hinder adoption (Hasan et al., 2021); (Lwoga & Lwoga, 2017). Trust reinforces users' self-assurance in the security, consistency, and integrity of digital financial platforms, serving as a critical antecedent of continued engagement with FinTech services (Featherman & Pavlou, 2003). In contrast, perceived risk encompassing concerns related to financial fraud, data privacy breaches, and cyber security vulnerabilities functions as a significant inhibitor of FinTech adoption, particularly among risk-averse rural populations (Featherman & Pavlou, 2003); (Yang et al., 2012).

Although a growing body of scholarship has examined FinTech adoption and its relationship with financial inclusion, empirical evidence from rural regions of developing economies remains limited (Kass-Hanna et al., 2022); (P. K. Ozili, 2018). Moreover, existing studies frequently investigate awareness, trust, and perceived risk in isolation, rather than integrating these constructs within a comprehensive analytical framework that captures their joint influence on financial inclusion outcomes (Lim et al., 2019).

Evidence specific to rural Gujarat is particularly sparse, despite the state's rapid improvements in digital infrastructure and the increasing diffusion of digital financial services among its rural populace.

Against this backdrop, the present study investigates the impact of FinTech adoption on financial inclusion in rural Gujarat. Specifically, the study examines the influence of awareness, trust, and perceived risk on FinTech adoption behaviour, and evaluates how FinTech adoption, in turn, contributes to financial inclusion among rural users. The findings are expected to yield valuable insights for policymakers, financial institutions, and FinTech service providers seeking to leverage digital financial technologies to advance inclusive financial development in underserved rural communities.

2. Literature Review

2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), originally formulated by (Davis & Davis, 1989), continues to be regarded as one of the most widely applied theoretical frameworks used to explain the adoption and use of information technology systems. The model posits that two core perceptual beliefs perceived usefulness and perceived ease of use are the primary determinants of individuals' intentions to adopt a new technology, which subsequently translates into actual use behaviour. Perceived usefulness reflects the degree to which an individual trusts that using a particular system would enhance their task performance, while perceived ease of use captures the extent to which an individual believes the system to be free of cognitive effort (Davis & Davis, 1989).

Over the decades, TAM has been substantially extended to accommodate the complexities of emerging digital environments. Venkatesh & Bala, 2008) introduced TAM3, incorporating determinants of both perceived usefulness and perceived ease of use, while (Venkatesh et al., 2003) developed the Unified Theory of Acceptance and Use of Technology (UTAUT), integrating TAM with complementary theoretical lenses such as the Theory of Reasoned Action and the Theory of Planned Behaviour. In the FinTech context, awareness and trust are widely recognized as antecedents that strengthen perceived usefulness and ease of use, whereas perceived risk functions as a significant barrier that diminishes adoption intentions (Gefen et al., 2003); (Lim et al., 2019). The TAM framework thus provides a robust conceptual anchor for investigating the behavioural determinants of digital financial service adoption among rural users in Gujarat.

2.2 Diffusion of Innovation (DOI) Theory

(Rogers, 2003) Diffusion of Innovation (DOI) Theory offers a complementary theoretical lens for understanding the process through which new technologies are communicated and adopted within social systems over time. Five attributes of an innovation that determine the pace and extent of its diffusion are identified by the theory: relative advantage, compatibility, complexity, trialability, and observability. Among these, relative advantage the degree to which an innovation is perceived as superior to the idea it supersedes has been consistently identified as the most influential determinant of adoption (Rogers, 2003); (Oliveira et al., 2014).

In the context of digital financial services, DOI theory is particularly germane for understanding adoption patterns in rural communities where interpersonal communication networks and social influence exert considerable sway over individual behaviour. Awareness of FinTech services, propagated through communication channels including social networks, community leaders, and mass media, shapes individuals' perceptions of relative advantage and, consequently, their adoption decisions (Lwoga & Lwoga,

2017); (Tobbin, 2012). The DOI framework thus complements TAM by situating individual-level adoption decisions within the broader social and structural context of rural Gujarat.

2.3 FinTech and Financial Inclusion

FinTech has emerged as a transformative driver of financial inclusion by dismantling the structural barriers that have historically precluded low-income and rural populations from accessing formal financial services. By substantially reducing transaction costs, eliminating geographical constraints, and leveraging ubiquitous mobile connectivity, digital financial technologies enable individuals to access a broad spectrum of financial products including payments, savings, credit, insurance, and investment without dependence on physical banking infrastructure (Gabor & Brooks, 2017); (Philippon, 2019).

Empirical evidence corroborates the positive relationship between FinTech adoption and financial inclusion across diverse developing-country contexts. (P. K. Ozili, 2018) It was demonstrated that access to formal financial services was significantly expanded by the diffusion of digital finance instruments, particularly among previously unbanked segments. Similarly, (Demirguc-Kunt et al., 2018) documented that the proliferation of mobile money accounts and digital payment platforms was among the strongest predictors of improved financial inclusion outcomes in Sub-Saharan Africa and South Asia between 2011 and 2017. More recently, (Kass-Hanna et al., 2022) found that digital literacy, mediated through FinTech adoption, substantially enhanced financial resilience among underserved populations in emerging markets. Collectively, these findings highlight the pivotal role of FinTech as a substance for inclusive financial development.

2.4 Awareness and FinTech Adoption

In the context of technology adoption, awareness refers to users' knowledge of the availability, functionality, features, and potential benefits of a given technological innovation. It represents a prerequisite cognitive stage in the adoption process, wherein potential users first become acquainted with a technology before they can form attitudes and intentions towards its use (Rogers, 2003). In the FinTech domain, awareness encompasses consumers' familiarity with digital financial platforms, their understanding of operational procedures, and their cognizance of the security measures and consumer protection mechanisms in place (Hasan et al., 2021)

A growing body of empirical literature documents a significant and positive association between awareness and FinTech adoption intentions. (Singh et al., 2020) found that consumer awareness of UPI-based digital payment services was a robust predictor of adoption behaviour among Indian users, highlighting the role of awareness campaigns and digital literacy interventions in accelerating FinTech uptake. Similarly, (Lwoga & Lwoga, 2017) reported that awareness of mobile payment functionalities was a critical determinant of adoption among low-income users in developing economies. (Koomson et al., 2020) further established that financial awareness mediated the relationship between financial education and formal financial participation, reinforcing the pathway through which awareness translates into inclusive financial outcomes. In rural settings, where informational asymmetries are particularly pronounced, awareness-building interventions are therefore essential for scaling FinTech adoption.

2.5 Trust and FinTech Adoption

Trust is conceptualized as an individual's belief in the consistency, integrity, and competence of a technology provider or platform, and constitutes one of the most consistently influential antecedents of digital technology adoption in the extant literature (Gefen et al., 2003); (Featherman & Pavlou, 2003). In the

financial services domain, trust assumes heightened significance because financial transactions inherently involve the transmission of sensitive personal and monetary information, thereby exposing users to potential vulnerability. Users' willingness to engage with digital financial platforms is therefore contingent on their confidence that transactions will be executed accurately, securely, and in accordance with their interests (Kim et al., 2009).

Empirical research consistently affirms that trust is a significant positive predictor of FinTech adoption behaviour. (Gefen et al., 2003) demonstrated, within the TAM framework, that consumer trust directly enhanced both the perceived usefulness of and attitudes towards online transactional systems. (Chawla & Joshi, 2019) found that trust in mobile banking platforms significantly influenced adoption intentions among Indian consumers, with institutional trust anchored in regulatory credibility and platform security emerging as the dominant trust dimension. More recently, (Lim et al., 2019) established that perceived security and trust jointly determined continued usage intentions for mobile FinTech payment services, underlining the dynamic and reinforcing relationship between security architecture and user confidence. In rural Gujarat, where formal financial institutions have historically commanded limited trust, fostering institutional trust through transparent governance, regulatory oversight, and user-centric security design is critical to driving FinTech adoption.

2.6 Perceived Risk and FinTech Adoption

Perceived risk is defined as the subjective expectation of loss associated with the use of a technology or service, and it is understood to encompass financial risk, privacy risk, performance risk, psychological risk, and social risk. (Featherman & Pavlou, 2003). In the digital financial services context, perceived risk is prominently manifested as concerns over unauthorized transactions, data breaches, identity theft, and cyber security vulnerabilities apprehensions that are particularly salient among first-time and low-income users who may lack the digital skills to navigate security incidents (Yang et al., 2012); (Ryu, 2018).

Extant empirical literature consistently establishes perceived risk as a significant negative predictor of FinTech adoption intentions. (Featherman & Pavlou, 2003) demonstrated, within an e-services adoption framework, that perceived risk substantially reduced adoption intentions by eroding perceptions of usefulness and amplifying performance uncertainty. (Ryu, 2018) confirmed this negative relationship in the specific context of FinTech services, finding that privacy and security risk perceptions were the most influential deterrents to adoption across multiple FinTech categories including payments, investment management, and insurance. (Luo et al., 2010) further established that multi-faceted risk perceptions particularly social and financial risk were critical inhibitors of mobile banking adoption among early adopters. In rural communities characterized by limited digital literacy and nascent cyber security awareness, addressing perceived risk through user education, robust fraud protection mechanisms, and credible regulatory communication is imperative for sustaining FinTech adoption momentum.

2.7 FinTech Adoption and Financial Inclusion

FinTech adoption serves as a critical channel through which digital financial innovations are translated into physical financial inclusion outcomes. By enabling previously excluded individuals to access formal savings, credit, insurance, and payment products through low-cost digital channels, FinTech adoption directly expands the scope and depth of financial participation (P. K. Ozili, 2018); (Thakor, 2019). In developing economies characterized by sparse banking infrastructure and large unbanked populations, the relationship between FinTech adoption and financial inclusion is particularly pronounced.

Empirical studies provide robust evidence for this relationship across multiple geographic and demographic contexts. (P. Ozili, 2020) conducted a comprehensive review of global financial inclusion research and identified FinTech-mediated digital access as a primary mechanism through which low-income populations are integrated into the formal financial system. (Khera et al., 2022) constructed a digital financial inclusion index for developing market and developing economies, demonstrating that higher levels of FinTech adoption were positively and significantly associated with improvements in financial inclusion displays including account ownership, savings penetration, and credit access.

2.8 Research Gap

The preceding review of the literature reveals several important insights as well as notable lacunae that the present study seeks to address. First, while the individual effects of awareness (Singh et al., 2020); (Koomson et al., 2020), trust (Gefen et al., 2003); (Chawla & Joshi, 2019), and perceived risk (Featherman & Pavlou, 2003); (Ryu, 2018) on FinTech adoption are well-documented, the majority of extant studies examine these constructs in isolation rather than within an integrated framework that simultaneously captures their joint and interactive effects on adoption behaviour and, subsequently, on financial inclusion outcomes (Lim et al., 2019); (P. Ozili, 2020).

Second, the bulk of empirical evidence on FinTech adoption and financial inclusion is drawn from urban or nationally representative samples, with rural populations in developing economies remaining substantially underrepresented in the literature (Kass-Hanna et al., 2022); (Morgan & Long, 2020). Rural settings present distinct adoption challenges including limited digital infrastructure, lower financial literacy, stronger risk aversion, and greater reliance on informal financial mechanisms that may not be adequately captured by findings from urban contexts.

Third, region-specific evidence from rural Gujarat is conspicuously absent from the extant literature, notwithstanding the state's significant strides in digital infrastructure development and the increasing diffusion of FinTech platforms such as UPI and mobile wallets among its rural populace. The absence of such localized evidence constrains the ability of policymakers, financial institutions, and FinTech service providers to design contextually appropriate intermediations.

To address these gaps, the present study proposes and empirically tests a unified conceptual model that links awareness, trust, and perceived risk as antecedents of FinTech adoption, and FinTech adoption as a mediating pathway to financial inclusion, within the specific context of rural Gujarat. In doing so, contributions are made by the study to both the theoretical literature on digital technology adoption and the applied literature on FinTech-driven financial inclusion in emerging markets.

3. Research Objectives

The study is showed by the following specific research objectives, which collectively seek to advance understanding of FinTech adoption dynamics and their financial inclusion implications in the rural context of Gujarat:

1. To examine the level of FinTech adoption among rural users in Gujarat.
2. To assess the influence of awareness on FinTech adoption behaviour.
3. To assess the impact of trust on FinTech adoption behaviour.
4. To examine the effect of perceived risk on FinTech adoption behaviour.

5. To investigate the impact of FinTech adoption on financial inclusion outcomes.
6. To analyze the mediating role of FinTech adoption in the relationship between behavioural determinants (awareness, trust, and perceived risk) and financial inclusion.

4. Research Hypotheses

Drawing upon the theoretical foundations of the Technology Acceptance Model (Davis & Davis, 1989); (Venkatesh et al., 2003) and the Diffusion of Innovation Theory (Rogers, 2003), and informed by the empirical literature reviewed in the preceding section, the following hypotheses are proposed to examine the structural relationships among the key constructs of the study:

H1: Awareness has a significant and positive influence on FinTech adoption.

H2: Trust has a significant and positive influence on FinTech adoption.

H3: Perceived risk has a significant and negative influence on FinTech adoption.

H4: FinTech adoption has a significant and positive influence on financial inclusion.

In addition to the direct hypotheses above, the study proposes the following mediation hypotheses to examine the indirect pathways through which behavioural factors influence financial inclusion:

H5a: FinTech adoption mediates the relationship between awareness and financial inclusion.

H5b: FinTech adoption mediates the relationship between trust and financial inclusion.

H5c: FinTech adoption mediates the relationship between perceived risk and financial inclusion.

5. Research Methodology

5.1 Research Design

A quantitative research approach underpinned by a positivist epistemological paradigm was adopted by the study, a paradigm in which it is assumed that social phenomena can be measured objectively and that causal relationships can be established through empirical testing (Creswell et al., 2018). A cross-sectional survey design was employed to collect primary data at a single point in time, a design widely adopted in FinTech adoption research for its efficiency in capturing attitudinal and behavioural data from large samples (J. Hair et al., 2022); (Saunders et al., 2019). The research is together descriptive and explanatory in nature: descriptive insofar as it characterizes the current levels of FinTech adoption and financial inclusion among rural users in Gujarat, and explanatory insofar as it examines the causal mechanisms through which awareness, trust, and perceived risk influence adoption behaviour and, subsequently, financial inclusion outcomes.

5.2 Study Area and Target Population

The study was conducted in rural areas of Gujarat, one of India's most economically significant states, which has witnessed substantial improvements in digital infrastructure over the past decade alongside the nationwide rollout of the Pradhan Mantri Jan Dhan Yojana (PMJDY), Aadhaar-enabled payment systems,

and the Unified Payments Interface (UPI). The target population comprised adult rural residents of Gujarat who possessed awareness of, or had prior exposure to, digital financial services, including mobile banking applications, UPI-based payment platforms, internet banking, and digital wallet services. This purposive delineation of the population ensures that respondents possessed the minimum contextual awareness required to meaningfully evaluate the constructs of interest (Bougie & Sekaran, 2025).

5.3 Sampling Technique and Sample Size

Study participants were recruited from rural communities across India using a convenience sampling technique. While convenience sampling may limit the generalizability of findings, it is considered appropriate and pragmatic for exploratory quantitative research in geographically dispersed and hard-to-reach rural populations, where systematic probability sampling would impose prohibitive logistical and resource constraints (Saunders et al., 2019).

A total of 240 questionnaires were administered, of which 210 responses were deemed valid following data screening for completeness and response consistency, yielding a usable response rate of 87.5%. The adequacy of this sample size was evaluated against the minimum requirements stipulated for the chosen analytical method. (J. Hair et al., 2022) It is recommended that, for Partial Least Squares Structural Equation Modeling (PLS-SEM), the minimum sample size be set at ten times the maximum number of structural paths directed at any single construct in the model; this requirement is met by the present sample. Furthermore, the sample of 210 exceeds the threshold of 200 observations recommended for stable PLS-SEM parameter estimation (Ringle et al., 2015).

5.4 Measurement Instrument Development

Primary data were collected using a structured, self-administered questionnaire developed in accordance with established scale development guidelines (Churchill, 1979); (DeVellis, 2016). The questionnaire comprised two sections: Section A solicited demographic and socio-economic information (gender, age, education, occupation, and monthly income), and Section B contained the measurement items for the five latent constructs under investigation.

The five latent constructs Awareness (AW), Trust (TR), Perceived Risk (PR), FinTech Adoption (FA), and Financial Inclusion (FI) were each operationalized using five reflective measurement items, yielding a total of 25 items in Section B. All items were measured on a five-point Likert scale anchored at 1 (Strongly Disagree) and 5 (Strongly Agree), a response format widely adopted in FinTech adoption studies for its balance of simplicity, discriminatory power, and respondent ease (Chawla & Joshi, 2019); (Lim et al., 2019). Measurement items were adapted from validated scales in the extant literature to ensure content validity and theoretical alignment, as detailed in Table 1.

Table 1

Latent Constructs and Their Measurement Sources: A Summary

Construct	Code	No. of Items / Scale	Source(s)
Awareness	AW	5 items; 5-point Likert scale	(Hasan et al., 2021); (Koomson et al., 2020)
Trust	TR	5 items; 5-point Likert scale	(Gefen et al., 2003); (Chawla & Joshi, 2019)

Construct	Code	No. of Items / Scale	Source(s)
Perceived Risk	PR	5 items; 5-point Likert scale	(Featherman & Pavlou, 2003); (Ryu, 2018)
FinTech Adoption	FA	5 items; 5-point Likert scale	(Singh et al., 2020); (Lim et al., 2019)
Financial Inclusion	FI	5 items; 5-point Likert scale	(P. Ozili, 2020); (Khera et al., 2022)

Note. All constructs are measured as reflective constructs.

Content validity of the instrument was established through a review conducted by a panel of three academic experts in the domains of financial technology, rural finance, and survey methodology. Minor revisions to item wording were incorporated based on expert feedback to ensure linguistic clarity and contextual appropriateness for a rural Gujarat audience. A pilot study was subsequently conducted with 30 respondents drawn from the target population to assess item comprehensibility, scale reliability, and preliminary construct validity prior to the main data collection phase (Bougie & Sekaran, 2025).

5.5 Data Analysis Technique

The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with the aid of SmartPLS 4 software (J. F. Hair et al., 2021). PLS-SEM was selected over covariance-based SEM (CB-SEM) on account of several methodological considerations: first, the study's model is predictive and explanatory in orientation; second, the sample size, while adequate, is modest relative to the requirements of CB-SEM with maximum likelihood estimation; and third, PLS-SEM is particularly well-suited for research involving reflective-reflective hierarchical constructs and non-normal data distributions, both of which characterize the present study (J. F. Hair et al., 2022).

The analytical procedure followed a two-stage approach recommended by (Anderson & Gerbing, 1988); (J. F. Hair et al., 2022). In the first stage, indicator reliability, internal consistency reliability (Cronbach's alpha and composite reliability), convergent validity (average variance extracted, AVE), and discriminant validity (Heterotrait–Monotrait ratio, HTMT) were assessed through evaluation of the measurement model. In the second stage, the structural model was assessed to examine the significance and magnitude of path coefficients, the coefficient of determination (R^2), predictive relevance (Q^2), and effect sizes (f^2). Mediation hypotheses (H5a–H5c) Bias-corrected confidence intervals for indirect effects were generated using the bootstrapping procedure with 5,000 resamples (Preacher & Hayes, 2008).

6. Data Analysis

6.1 Measurement Model Assessment

The measurement model was calculated following the two-stage approach recommended by (Anderson & Gerbing, 1988); (J. F. Hair et al., 2022). assessing indicator reliability, internal consistency, convergent validity, and discriminant validity prior to structural model estimation.

Table 1
Reliability and Convergent Validity Assessed

Construct	Cronbach's α	CR	AVE
Awareness	0.84	0.89	0.62
Trust	0.86	0.90	0.65
Perceived Risk	0.81	0.87	0.58
FinTech Adoption	0.88	0.91	0.67
Financial Inclusion	0.85	0.89	0.63

Note. CR = Composite Reliability; AVE = Average Variance Extracted. Recommended thresholds: Cronbach's $\alpha > 0.70$; CR > 0.70 ; AVE > 0.50 (Hair et al., 2022).

As reported in Table 1, Cronbach's alpha ranged from 0.81 to 0.88 and composite reliability from 0.87 to 0.91, both exceeding the threshold of 0.70, confirming internal consistency (Hair et al., 2022). AVE values ranged from 0.58 to 0.67 (> 0.50), establishing convergent validity (Fornell & Larcker, 1981). All indicator loadings exceeded 0.70 (range: 0.77–0.85), satisfying the criterion for indicator reliability; no item was eliminated.

6.2 Discriminant Validity

Table 2
Fornell–Larcker Criterion (Square Root of AVE on Diagonal)

Construct	AW	TR	PR	FA	FI
Awareness	0.787				
Trust	0.520	0.806			
Perceived Risk	−0.310	−0.280	0.762		
FinTech Adoption	0.610	0.580	−0.350	0.819	
Financial Inclusion	0.540	0.510	−0.270	0.670	0.794

Note. Bold diagonal values are square roots of AVE. Off-diagonal values are inter-construct correlations. AW = Awareness; TR = Trust; PR = Perceived Risk; FA = FinTech Adoption; FI = Financial Inclusion.

Table 3
Heterotrait–Monotrait (HTMT) Ratio

Construct	AW	TR	PR	FA	FI
Awareness	—				
Trust	0.63	—			
Perceived Risk	0.34	0.29	—		
FinTech Adoption	0.71	0.69	0.41	—	
Financial Inclusion	0.64	0.61	0.33	0.76	—

Note. All HTMT values < 0.85 , confirming discriminant validity (Henseler et al., 2015).

The Fornell–Larcker criterion was satisfied: the square root of AVE for each construct exceeded all corresponding inter-construct correlations (Table 2). HTMT ratios ranged from 0.29 to 0.76, remaining well below the 0.85 threshold (Henseler et al., 2015), thereby confirming that all constructs are empirically distinct.

6.3 Structural Model and Hypothesis Testing

The structural model was assessed using path coefficients, bootstrapping with 5,000 resamples for significance testing (Preacher & Hayes, 2008), and R^2 for explanatory power.

Table 4

Hypothesis Testing Results

H	Path	β	SE	t	p	95% CI	Result
H1	Awareness $\rightarrow$ FA	0.34	0.058	5.82	< .001	[0.22, 0.45]	Supported
H2	Trust $\rightarrow$ FA	0.29	0.058	4.97	< .001	[0.17, 0.40]	Supported
H3	Perceived Risk $\rightarrow$ FA	−0.18	0.062	2.91	.004	[−0.30, −0.06]	Supported
H4	FA $\rightarrow$ Financial Inclusion	0.62	0.059	10.43	< .001	[0.50, 0.73]	Supported

Note. β = standardized path coefficient; SE = standard error; CI = bias-corrected bootstrap confidence interval (5,000 resamples). FA = FinTech Adoption.

Table 5

Coefficient of Determination (R^2) and Predictive Relevance (Q^2)

Endogenous Construct	R^2	Q^2
FinTech Adoption	0.53	0.34
Financial Inclusion	0.38	0.23

Note. R^2 = coefficient of determination; Q^2 = Stone–Geisser predictive relevance (blindfolding). Values > 0 indicate predictive relevance (J. F. Hair et al., 2022).

All four hypotheses were supported (Table 4). Awareness was the strongest predictor of FinTech adoption ($\beta = 0.34$, $t = 5.82$, $p < .001$), followed by trust ($\beta = 0.29$, $t = 4.97$, $p < .001$). Perceived risk exerted a significant negative effect ($\beta = -0.18$, $t = 2.91$, $p = .004$). FinTech adoption was the strongest path in the model, exerting a substantial positive effect on financial inclusion ($\beta = 0.62$, $t = 10.43$, $p < .001$). The predictors jointly explained 53% of the variance in FinTech adoption ($R^2 = 0.53$) and 38% in financial inclusion ($R^2 = 0.38$), reflecting moderate-to-substantial explanatory power (Hair et al., 2022). Q^2 values above zero confirm adequate predictive relevance.

6.4 Mediation Analysis

Table 6

Indirect Effects (Mediation via FinTech Adoption)

Path	Indirect β	SE	t	p	95% CI
Awareness $\rightarrow$ FA $\rightarrow$ FI	0.21	0.046	4.56	< .001	[0.12, 0.30]
Trust $\rightarrow$ FA $\rightarrow$ FI	0.18	0.045	3.98	< .001	[0.09, 0.27]
Perceived Risk $\rightarrow$ FA $\rightarrow$ FI	-0.11	0.045	2.44	.015	[-0.20, -0.02]

Note. Bootstrap CI based on 5,000 resamples. FA = FinTech Adoption; FI = Financial Inclusion. Confidence intervals excluding zero confirm mediation (Preacher & Hayes, 2008).

FinTech adoption significantly mediated the effects of all three antecedents on financial inclusion. Awareness (indirect $\beta = 0.21$, 95% CI [0.12, 0.30]) and trust (indirect $\beta = 0.18$, 95% CI [0.09, 0.27]) exerted positive indirect effects, while perceived risk exerted a negative indirect effect (indirect $\beta = -0.11$, 95% CI [-0.20, -0.02]). As all confidence intervals excluded zero, H5a, H5b, and H5c were supported, confirming partial mediation.

6.5 Model Fit

Table 7

Model Fit Indices

Index	Value	Threshold	Verdict
SRMR	0.061	< 0.08	Acceptable
NFI	0.912	> 0.90	Acceptable
RMS Theta	0.104	< 0.12	Acceptable
d_ULS / d_G	0.742 / 0.418	—	Acceptable

Note. SRMR = Standardised Root Mean Square Residual; NFI = Normed Fit Index. (J. F. Hair et al., 2022).

Model fit indices confirmed adequate model-data correspondence. SRMR = 0.061 (< 0.08), NFI = 0.912 (> 0.90), and RMS Theta = 0.104 (< 0.12), collectively supporting the validity of the proposed structural model (Henseler et al., 2015); (J. F. Hair et al., 2022).

7. Discussion

This study studied the influence of awareness, trust, and perceived risk on FinTech adoption and the subsequent effect of adoption on financial inclusion among rural users in Gujarat. The findings provide robust empirical support for all four direct hypotheses and three mediation hypotheses, with important implications for theory and practice.

Awareness emerged as the most influential antecedent of FinTech adoption ($\beta = 0.34$), consistent with (Rogers, 2003) DOI Theory, which identifies knowledge as a prerequisite for innovation adoption. This finding aligns with (Singh et al., 2020) and (Koomson et al., 2020), who similarly established that

informational exposure is a critical determinant of digital financial service uptake. In rural Gujarat, where digital literacy remains nascent, targeted awareness campaigns delivered through community channels and regional language media represent a key lever for accelerating FinTech penetration.

Trust exerted a significant positive effect on adoption ($\beta = 0.29$), corroborating the TAM-based argument that users engage with digital systems only when they perceive them as credible and secure (Gefen et al., 2003); (Davis & Davis, 1989). Consistent with (Chawla & Joshi, 2019), institutional trust anchored in regulatory credibility and platform security was central to rural users' adoption decisions. Strengthening regulatory frameworks and communicating consumer protection mechanisms transparently are therefore critical for building the trust necessary to sustain FinTech adoption in underserved markets.

Perceived risk negatively influenced adoption ($\beta = -0.18$), consistent with (Featherman & Pavlou, 2003) and (Ryu, 2018), who established that concerns over financial loss, privacy breaches, and cyber fraud are significant adoption barriers. The comparatively smaller magnitude of the perceived risk coefficient relative to awareness and trust suggests that positive motivations outweigh risk aversion in the present sample, though the effect remains statistically meaningful. Simplified onboarding processes, visible fraud redress mechanisms, and cyber security literacy programmers could mitigate these concerns effectively.

Crucially, FinTech adoption demonstrated the strongest effect in the model ($\beta = 0.62$), exerting a substantial positive influence on financial inclusion. This finding corroborates (P. K. Ozili, 2018), (Khera et al., 2022), who established that digital financial service adoption is a primary pathway through which unbanked and underbanked populations access formal financial systems. The R^2 of 0.38 for financial inclusion indicates that FinTech adoption explains a meaningful share of the variance in rural financial participation, affirming its role as a transformative driver of inclusive development.

The mediation analysis additionally revealed that FinTech adoption transmits the effects of all three behavioural antecedents onto financial inclusion, with awareness and trust operating through positive indirect pathways and perceived risk through a negative one. These findings are theoretically significant: they establish FinTech adoption not merely as a dependent outcome but as a mechanism, a mediating conduit through which pre-adoption perceptions ultimately determine financial inclusion outcomes. This integrated perspective advances beyond prior studies that examined antecedents and outcomes in isolation (Lim et al., 2019); (P. Ozili, 2020).

8. Implications

8.1 Theoretical Implications

This study makes several contributions to the digital financial services literature. First, it extends the Technology Acceptance Model (Davis & Davis, 1989) and Diffusion of Innovation Theory (Rogers, 2003) to the underexplored context of rural FinTech adoption in an emerging economy, demonstrating that both frameworks retain explanatory power when applied conjointly to financially excluded populations. Second, by integrating awareness, trust, and perceived risk within a unified PLS-SEM framework, the study advances beyond prior work that examined these antecedents in isolation (Lim et al., 2019); (P. Ozili, 2020), providing a more complete account of the cognitive and attitudinal determinants of FinTech uptake. Third, the confirmation of FinTech adoption as a significant mediator between behavioural antecedents and financial inclusion outcomes enriches the financial inclusion literature by establishing a theory-grounded mechanism linking pre-adoption perceptions to formal financial participation (Gefen et al., 2003); (Khera et al., 2022). Collectively, these contributions extend prior theoretical frameworks to a rural emerging-market context for which empirical evidence remains scarce.

8.2 Practical Implications

The findings carry actionable implications for policymakers, regulators, financial institutions, and FinTech service providers. Given that awareness emerged as the strongest adoption predictor ($\beta = 0.34$), targeted digital literacy programmes delivered through community-based channels, regional language media, and rural self-help groups are a high-priority intervention for expanding FinTech reach. Government schemes such as PMJDY and Digital India should incorporate structured awareness modules that communicate not only the availability but also the practical utility and safety of digital financial platforms (Hasan et al., 2021); (Singh et al., 2020).

The significant role of trust ($\beta = 0.29$) underscores the importance of credible institutional frameworks. Regulators, particularly the Reserve Bank of India, should strengthen consumer protection mandates and ensure that grievance redressal mechanisms are visible, accessible, and effective in rural markets. FinTech providers should invest in transparent security communication, two-factor authentication, and localized customer support to cultivate platform trust among first-time rural users (Chawla & Joshi, 2019); (Kim et al., 2009).

To mitigate perceived risk ($\beta = -0.18$), service providers should simplify onboarding processes; offer demo or low-stakes trial interfaces, and deploy cyber security awareness campaigns addressing common rural fraud typologies. Insurance-backed transaction guarantees and real-time fraud alert systems would further reduce the psychological cost of adoption among risk-averse rural populations (Featherman & Pavlou, 2003); (Ryu, 2018).

Finally, the strong positive effect of FinTech adoption on financial inclusion ($\beta = 0.62$) affirms that investments in scaling digital financial infrastructure in rural Gujarat including network connectivity, interoperable payment systems, and agent banking networks carry significant social returns. Public-private partnerships that co-develop low-cost, vernacular-language FinTech platforms tailored to rural income profiles represent a particularly promising avenue for policy action

9. Conclusion

This study investigated the behavioural determinants of FinTech adoption and their downstream implications for financial inclusion among rural users in Gujarat. Using PLS-SEM on a sample of 210 respondents, the study found that awareness ($\beta = 0.34$) and trust ($\beta = 0.29$) positively and significantly predicted FinTech adoption, while perceived risk exerted a significant negative effect ($\beta = -0.18$). FinTech adoption, in turn, was the most powerful predictor of financial inclusion in the model ($\beta = 0.62$), and fully mediated the influence of all three antecedents on financial inclusion outcomes.

These findings underscore that expanding digital financial access in rural India requires simultaneous attention to informational, relational, and risk dimensions of the adoption decision. Promoting awareness without addressing trust and perceived risk will yield suboptimal inclusion outcomes; conversely, secure and credible platforms will fail to achieve scale without complementary awareness-building investments. A coordinated, multi-dimensional policy approach integrating digital literacy, regulatory trust, and risk mitigation—is therefore essential for leveraging FinTech as an engine of inclusive financial development in rural emerging markets.

10. Limitations and Future Research

Several limitations of the present study should be acknowledged. First, the generalizability of findings beyond the study sample is restricted by the use of convenience sampling; probability-based sampling frames should be employed by future research to enhance external validity. Second, causal inference regarding the temporal dynamics of FinTech adoption and financial inclusion is precluded by the cross-sectional design; adoption trajectories and their evolving relationship with financial participation over time would be more rigorously captured through longitudinal designs. Third, the study is geographically confined to rural Gujarat, a scope which, while theoretically motivated, limits transferability to other Indian states or developing-country contexts with distinct institutional, cultural, and infrastructural profiles.

Future research may productively address these limitations in several directions. Comparative studies contrasting rural and urban adoption dynamics would illuminate whether the behavioural mechanisms identified here operate differentially across the urban-rural digital divide. The inclusion of additional constructs such as digital self-efficacy (Venkatesh et al., 2003), social influence (Venkatesh et al., 2012), facilitating conditions, and perceived usefulness would further enrich the explanatory power of the proposed framework. Scholars may also examine moderating roles of demographic variables, including age, gender, and income, in shaping the awareness-adoption and trust-adoption relationships, as these boundary conditions remain underexplored in the rural FinTech literature (Lwoga & Lwoga, 2017). Finally, extending the model to other underserved contexts such as rural sub-Saharan Africa or Southeast Asia would advance the global generalizability of these findings.

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