Journal of Management Science Research Review

https://jmsrr.com/index.php/Journal/about

Volume. 4 Issue No. 4 (2025)

Online ISSN: 3006-2047

Print ISSN: 3006-2039

THE ROLE OF DIGITAL BANKING IN PROMOTING FINANCIAL INCLUSION IN RURAL AREAS OF SINDH, PAKISTAN

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Abstract

This study examines ,the role of digital banking in promoting, financial inclusion in rural Sindh, Pakistan, and investigates whether digital literacy mediates this relationship. Using a cross-sectional survey of N = 400 adults across four, rural districts (Tharparkar, Badin, Thatta, Dadu), Partial Least Squares Structural Equation Modeling (PLS-SEM) tested direct and indirect effects. Results show that Digital Banking Accessibility (DBA) positively affects Financial Inclusion (FI) ($\beta = 0.36$, $p < 0.001$) and strongly predicts Digital Literacy (DL) ($\beta = 0.55$, $p < 0.001$). Digital Literacy in turn significantly predicts Financial Inclusion ($\beta = 0.42$, $p < 0.001$), and partially mediates the DBA → FI link (indirect effect $\beta = 0.23$, $p < 0.001$). The model explains 58% ($R^2 = 0.58$) of the variance in FI. Policy implications include, targeted digital literacy programs, capacity building for branchless agents, and strengthened trust and security, mechanisms to accelerate inclusive digital finance under NFIS 2024–2028.

Keywords: Digital Banking, Financial Inclusion, Digital Literacy, Branchless Banking, Rural Sindh, Pakistan

Chapter-1 Introduction

1. Introduction

Financial inclusion the provision, of affordable, accessible,and convenient, financial services to all individuals and businesses, remains a central policy objective for sustainable economic development. In Pakistan despite, major progress in the digitalization of financial services, a substantial, portion of the rural population, remains excluded from formal banking channels. According to the State Bank of Pakistan, (SBP, 2024) while the number of internet, banking users increased by 15% and mobile banking users by 30% in the fiscal year 2022–23, access to formal financial, services in rural areas of Sindh

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Online ISSN: 3006-2047

Print ISSN: 3006-2039

remains,.significantly lower with only 36% of adults, having access, compared to 64% in urban areas. Similarly e-banking, transactions increased by 29% in volume and 21% in value, and digital payments, accounted for nearly 83% of total retail payment volumes during the same fiscal, year (Profit Pakistan Today, 2024; SBP, 2024). These figures highlight, substantial digital growth at the national level but expose a persistent gap in rural financial inclusion.

To understand, these disparities it is important to consider the theoretical foundations explaining how individuals adopt, and use digital financial technologies. The Technology Acceptance, Model (TAM) (Davis, 1989) posits that *perceived usefulness* and *ease of use,* significantly determine, users' intention to adopt technology. However, in rural Sindh, the effects of low digital literacy and infrastructural barriers may reduce these perceptions, thus constraining adoption. Second, the Diffusion of Innovation Theory by Rogers (2003) explains that the spread of innovations within social systems occurs based on awareness, trialability, and observability. As a result, rural households with little exposure to digitized tools and practices are even less likely to adopt innovations. Slowed adoption is also reflective of the last-stage impact. The Financial Inclusion Theory (Sarma, 2012) emphasizes the access, usage, and quality dimensions of inclusion. The three dimensions must together be workable to achieve meaningful inclusion. Utilizing digital, banking has potential mechanisms for improving these facets, but literacy, trust, and infrastructural factors present in their context determines how well these improvements can be made.

In these contexts, however, digital banking in Pakistan—particularly mobile applications, internet banking, and branchless banking platforms like EasyPaisa, JazzCash, and HBL Konnect—has begun to address some of these challenges and gaps. Nevertheless, in Sindh's rural areas, geographically and infrastructural disadvantaged populations still face challenges of digital illiteracy, weak to no network connectivity, lack of awareness around digital financial services, and limited trust towards the internet and online transactions, which can be detrimental to their rural economies. Most of the rural literature and the policy frameworks purely for the country and urban settings do not sufficiently account for the rural reality and needs, which has led to a significant gap.

This requires research on the challenges and opportunities that digital banking presents on the financial inclusion of these rural populations and the

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Online ISSN: 3006-2047
Print ISSN: 3006-2039

potential role that digital banking can play on the financial inclusion of Sindh's rural population is yet to be investigated. This work is theoretically and empirically valuable in expanding the knowledge connecting access to advanced digital technologies to the empowerment of financially underserved and economically disadvantaged communities to achieve the goals of the National Financial Inclusion Strategy. (NFIS 2024-2028).

Problem Statement

Digital financial services continue to expand throughout the country, yet rural Sindh continues to have less than urban areas when it comes to the formal dimensions of finance. The gap between urban and rural Sindh continues to expand. The urban center of Sindh might make it easy to think that the region is homogenous when it comes to the provision of services. However, aggregate nationally distributed services are likely to obscure district-level infrastructural deficits, localized rural-urban literacy gaps, and deficits of trust. Having no district-level empirical evidence will lead to poorly targeted interventions for NFIS. Hence, this research seeks to understand how the ease of access to digital banking affects financial inclusion. Digital literacy will be a significant variable in this relationship as well, which will be significant in understanding policies that can be catered to the local context.

Research Gap

Digital banking and financial inclusion in Pakistan revolves around the urban centers and predominantly focusses on nationally aggregated data (e.g. Khan and Shaikh, 2022, Ahmed et al. 2023, SmarCons Journal 2024). Access and convenience brought by digital financial services is well-acknowledged, but gaps arising from regional inequities in the technological frontier, literacy gaps and cultural acceptance have largely been ignored. Rural Sindh is extremely geographically isolated and underdeveloped with limited empirical research to ground it.

Furthermore, while prior studies have examined digital banking's effects on *access* and *usage*, fewer have explored the quality and depth of financial inclusion, especially concerning credit inclusion, security perceptions, and trust in digital platforms. The role of digital literacy as a mediating mechanism between accessibility and financial inclusion also remains insufficiently tested in rural settings. This study fills these gaps by conducting a district-level empirical investigation using a quantitative, theory-driven framework grounded in the Technology Acceptance Model (TAM), Diffusion of

Volume. 4 Issue No. 4 (2025)

Online ISSN: 3006-2047

Print ISSN: 3006-2039

Innovation Theory, and Financial Inclusion Theory. The findings are expected to guide policymakers, financial institutions, and regulators in implementing localized strategies to achieve the NFIS 2024–2028 targets and advance Pakistan's commitment to inclusive economic growth under SDGs 8 and 9.

Research Objectives

1. To examine the role of digital banking in improving access to financial services among rural communities in Sindh.
2. To identify key factors influencing the adoption of digital banking in rural areas.
3. To assess the impact of digital financial services on the savings, borrowing, and payment behavior of rural households.
4. To propose policy recommendations for strengthening financial inclusion through digital means in rural Sindh.

Conceptual Framework

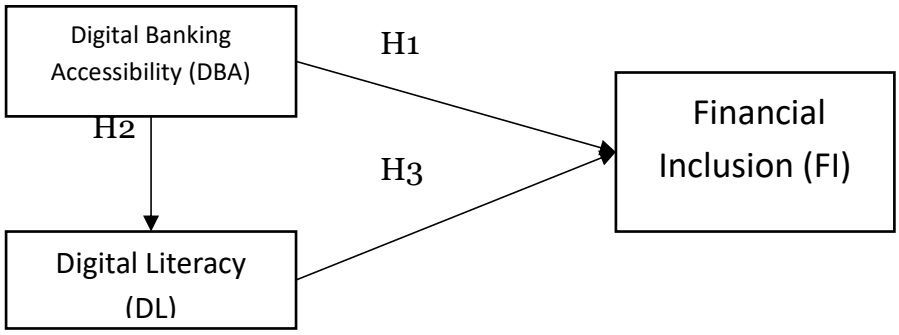
The conceptual framework, is grounded in financial inclusion theory and the technology adoption model (TAM) emphasizing that accessibility and literacy are central enablers, of inclusion in digital financial systems.

Independent Variable (IV): Digital Banking Accessibility

Mediator (M): Digital Literacy

Dependent Variable (DV): Financial Inclusion

Conceptual Framework



Note:

- Direct path: DBA → FI
- Indirect path (mediated): DBA → DL → FI

This model assumes *partial mediation*, consistent with previous literature (Ali et al., 2025; SmarCons Journal, 2024).

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Hypothesized Relationships:

H1: Digital Banking Accessibility (DBA) has a significant positive effect on Financial Inclusion (FI).

H2: Digital Banking Accessibility (DBA) has a significant positive effect on Digital Literacy (DL).

H3: Digital Literacy (DL) has a significant positive effect on Financial Inclusion (FI).

H4: Digital Literacy (DL) partially mediates the relationship between Digital Banking Accessibility (DBA) and Financial Inclusion (FI).

Chapter-2 Literature Review

2.1 Overview

Financial, inclusion has become a central objective in economic policy and sustainable development, frameworks globally recognized for its potential to reduce poverty promote entrepreneurship and enhance economic resilience. In developing economies such as Pakistan, the transformation of traditional banking into digital platforms, through mobile banking, internet banking and branchless banking, has been promoted as a key driver for achieving inclusive finance. The SBP's NFIS 2024–2028 sets digital banking as the most effective tool to expand financial access, improve usage, and enhance the quality of financial services for underserved populations. Notwithstanding these national-level initiatives, the challenge remains acute in rural provinces like Sindh due to infrastructural constraints, low digital literacy, and cultural barriers to adoption.

To analyze such challenges in their entirety, it is necessary to ground the discussion in some accepted theoretical perspectives. The Technology Acceptance Model (TAM) (Davis, 1989) is one of the basic perspectives explaining the intention to use a technology is dependent on its perceived usefulness and its perceived ease-of-use. These perceived attributes of technology will, of course, determine user adoption in the context of the digitally-illiterate population of rural Sindh. In much the same way, the Diffusion of Innovation Theory (Rogers, 2003) observes the manner innovations diffuse through social systems and their adoption at the awareness, trial, and social reinforcement level. The theory implies that in close-knit rural settings, where cultural and social systems are strong, awareness and trust can either facilitate or block the adoption of digital financial services.

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Online ISSN: 3006-2047
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In addition to these views, Inclusion Theory (Sarma, 2012) highlights the importance of access, usage, and quality as the four fundamental pillars of meaningful inclusion. Access describes the presence of formal financial channels. Usage, on the other hand, describes the frequency and depth of financial services. Lastly, quality describes the reliability, affordability, and the ease of access to those services. With regard to the rural areas of Pakistan, digital banking can positively influence all three aspects since it can provide services at low cost and at a greater convenience through mobile and agent-based models. Yet, the empirical studies focusing on rural Sindh and on the extent to which digital banking meets these expectations are still limited.

Furthermore, recent studies of a global and regional scale digital banking provide inclusive financial services and demonstrates the transformative power of digital banking. In Kenya, for example, the M-Pesa platform greatly increased access to financial services and improved household welfare in rural, and economically disadvantaged areas (Jack & Suri, 2023). Likewise, the digital financial service provided in Bangladesh through bKash and in India through Paytm illustrate the importance of digital literacy and trust-building to ensure the continued use of the service (Rahman et al., 2024; Sharma & Gupta, 2023). These examples illustrate that digital infrastructure in a service by itself is not enough; literacy, awareness, and user confidence are all equally important.

Research within Pakistan (e.g., Khan & Shaikh, 2022; Malik & Qureshi, 2024; Ali et al., 2025) have documented studies within Pakistan that have analyzed the role of mobile and branchless banking in financial access. Most studies conclude that there is a positive association between the use of digital banking and outcomes in financial inclusion, while also noting the urban bias of the benefits. There are few studies that present empirical work at the district level on the rural Sindh and the district level empirical work on the rural Sindh. The lack of this context and empirical work has made it difficult for policymakers to design targeted interventions that would align with NFIS 2024–2028 alongside the Sustainable Development Goals (SDGs) 8 and 9.

Taking the empirical literature, gaps and theoretical framework into considerations, the purpose of this study is to understand how digital banking affects financial inclusion in rural Sindh. It applies the Technology Acceptance Model (TAM) and Diffusion of Innovations theory to user adoption and Financial Inclusion Theory to the depth of access and service

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Online ISSN: 3006-2047
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usage. The integration of these perspectives will contribute regionally specific evidence alongside actionable policy recommendations to support the globalization of the digital financial system in Pakistan's rural economy.

Synthesis of Empirical Insights

The studies reviewed consistently support that digital banking increases financial inclusion through reduced transaction costs, increased outreach, and participation in formal financial services. They also, however, collectively expose significant gaps relating to geography and conceptual depth. While national trends of exciting digital growth are visible, the urban-rural divide remains substantial, especially, but not limited to, Sindh's remote districts, such as Tharparkar, Badin, and Dadu.

Research evidence in Khan & Shaikh (2022), Ahmed et al. (2023), shows that convenience and trust are significant influencing factors in adopting digital banking, but these factors will function differently with urban and rural populations and consideration of differing levels of infrastructure and literacy. Reviews such as SmarCons Journal (2024), Malik & Qureshi (2024), show that various degrees of financial literacy, combined with agent driven outreach, are essential enabling factors of inclusion, aligning with the National Financial Inclusion Strategy's (NFIS 2024–2028) recommendation of "digital capability development." In a like manner, Ali et al. (2025) discuss trust, and perceived security as significant mediators in the process of adopting digital banking; again this aligns in support of the Technology Acceptance Model (TAM) and Diffusion of Innovation Theory.

However, these contributions lack attention to conversations around provincial and district level dialogues. empirical analyses indicates a notable gap in the available literature. A majority of research relies on national datasets that are either collected as aggregates or simply focused on Punjab, or predominantly urban areas, for example, urban centers, and do not consider the rural economic realities of Sindh where connectivity, literacy, and culture are all divergent. In addition, there is little to no research that uses some kind of a conceptual framework that combines the behavioral model (The Technology Acceptance Model (TAM) and Dissertation Diffusion Theory (DOI)) to explain how access and literacy are useful to explain inclusive financial outcomes while assessing defined categories as different ways of economic inclusion.

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Print ISSN: 3006-2039

In short, while the literature reviewed offers a robust stepping stone, it also presents a surprisingly large empirical gap in terms of a clear picture of how both access to digital banking and digital literacy together affect financial inclusion across Sindh and rural settings in developing countries. Addressing this empirical gap aligns with government objectives outlined in the National Financial Inclusion Strategy (NFIS) alongside the Sustainable Development Goals (SDGs 8-9) which emphasizes equitable access to financial systems and digital innovations that are needed for inclusive economic growth.

2.3 Thematic Analysis of the Literature

A review of the existing literature on digital banking and financial inclusion (2022-2025) highlights several prominent trends in the rural contexts of Pakistan, particularly in Sindh. Below are some of these trends that demonstrate how digitalization is influencing access, usage, and quality related to finance, while also identifying barriers that persist despite technological advances. The following subsections will outline the key findings across five main themes: (1) the rise of digital banking in Pakistan, (2) branchless banking and agent networks, (3) financial literacy and digital infrastructure, (4) perceptions of trust and security, and (5) digital banking and financial behavior.

2.3.1 Growth of Digital Banking in Pakistan

The swift digital transformation of banks in Pakistan has profoundly transformed access to financial services in the economy. As indicated by the State Bank of Pakistan (SBP, 2024), e-banking transactions rose 29% in volume over the previous year, and 21% in value during FY 2022–23, while the number of mobile banking users grew by 30% and internet banking users grew by 15%. Digital payment transactions, as a total of retail payment volume, now constitute around 83% of retail payment transactions

These statistics show a strong national trend toward digital finance, fueled by the NFIS 2024–2028 of SBP, with digital banking as one of the conduits for inclusive growth.

However, this progress remains unequally distributed. Various studies, such as Khan & Shaikh (2022) and Sadi Journals (2023), establish that urban areas dominate the volumes of digital transactions, while rural districts, in particular, remain lagging behind due to unsatisfactory internet penetration and low levels of awareness. Theoretically, the Diffusion of Innovation Theory by Rogers (2003) asserts that such inequality occurs when the "innovation-

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decision process" (knowledge, persuasion, decision, implementation) is hampered due to contextual barriers to literacy, culture, or technology access. Thus, though the digital expansion is visible at the national level, the process is incomplete in terms of its diffusion to rural Sindh.

2.3.2 Branchless Banking and Agent Networks

Pakistan's digital inclusion agenda now heavily incorporates agent banking and branchless banking. EasyPaisa, JazzCash, and HBL Konnect are examples of services that have brought banking within reach of unbanked populations. Malik & Qureshi (2024) noted that agent banking also lowers the geographic barrier to banking by providing local access Automated Teller Machines (ATMs) and banking services, unlike conventional bank branches.This model aligns with the Financial Inclusion Theory (Sarma, 2012), which emphasizes the importance of *access* and *usage* dimensions in inclusive finance.

Yet literature, also identifies some structural weaknesses: most agents provide basic cash-in/cash-out services only and are not licensed to offer savings or credit products. These limitations reduce the quality dimension of financial inclusion. Strengthening agent capabilities and diversifying services could transform branchless banking into a more sustainable mechanism of inclusion, as envisioned in NFIS 2024–2028.

2.3.3 Financial Literacy and Digital Infrastructure

Indeed, digital literacy and infrastructure are regularly cited, in the context of various studies (SmarCons Journal 2024; Ahmed et al. 2023), as the key factors determining the adoption and usage of digital financial tools. According to the Technology Acceptance Model (TAM), perceived ease of use and perceived usefulness are factually direct precursors of users' intentions toward technology. In rural Sindh, where internet connectivity is erratic and schooling is relatively lower, such perceptions are frequently weak and restrictive of technology adoption.

SmarCons Journal (2024) showed that both the digital literacy and the physical infrastructure-e.g., electricity reliability and mobile network availability-significantly moderate the relationship between digital access and inclusion outcomes. For example, regions like Tharparkar and Thatta present delayed adoption because of infrastructural constraints and a lack of awareness. These gaps can be bridged through focused programs of digital education in these areas and improving their connectivity; such initiatives can

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Print ISSN: 3006-2039

help improve the rate of adoption and contribute directly to SDG 9 by building the technological capacity of rural areas.

2.3.4 Trust, Security, and User Behavior

Heeding the proximity to trust in digital platforms is one of the most significant influencers of adoption behavior. Ali et al. (2025) suggested that trust acted as a mediator between perceived risk and intention to adopt digital banking services in rural Pakistan. Many individuals are inclined to see online platforms as unsafe because of possibilities of fraud, data misuse, or minimal consumer protection protocols.These misbelieiefs are supported by global literature, which maintained that for sustained financial inclusions, trust and perceived security are mandatory conditions (Khan & Shaikh, 2022; Ahmed et al., 2023).From a theoretical perspective, both TAM and Diffusion of Innovation Theory place perceived credibility and social influence in the foreground as motivators of adoption building community trust at the community level through visibility to community success stories, transparent communication of objectives, and grievance redressal mechanisms can improve adoption levels. Policymakers and financial institutions need to improve their approach to cybersecurity frameworks, consumer protection policies, to improve levels of trust with consumers in the digital space as part of rate priorities of a National Financial Inclusion Strategy related to interaction and awareness. FIS 2024–2028 to create a more trustworthy digital environment.

2.3.5 Digital Banking and Financial Behavior

Digital banking has transformed financial behaviors, particularly in savings, payments, and access to small-scale credit access. Research including RASD Journal (2024) and Malik & Qureshi (2024) has shown that digital payments increase the likelihood of formal savings, and provide a socially transparent architecture for tracking payments. However, utilization through access to credit becomes limited due to weak credit histories and informal income properties of rural concepts.

Financial Inclusion Theory suggests, according to Sarma (2012), that inclusion levels occur when a consumer has access, users capabilities, and a means to benefit from financial related services, can increase ownership of quality clients. Banks can boost usage for inclusion levels through digitization by utilizing [an algorithm] digital transactions data to establish an alternative

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means for scoring, and channeling funds [in the form of microloan support] micro-loan services to small entrepreneurs and farmers.

2.6.3 Hypotheses Development

H1: Digital Banking Accessibility and Financial Inclusion

Digital banking accessibility refers to the ease of access of individuals residing in rural communities to access digital financial products and services which can include mobile applications, automated teller machines (ATMs), and banking agents with no branch. Financial Inclusion Theory asserts that increased access to digital banking services decreases transaction costs and increases incentives to participate in formal financial systems. Empirical research (Khan & Shaikh, 2022; RASD Journal, 2024) has documented with evidence that improved and enhanced access increases users overall savings, payments, and borrowing engagement

.**Therefore, it is hypothesized that:**

H1: Digital Banking Accessibility has a significant positive effect on Financial Inclusion in rural Sindh.

H2: Digital Banking Accessibility and Digital Literacy

The Technology Acceptance Model (TAM) and Diffusion of Innovations Theory (DOI) both posit that the more someone is exposed to technology, their familiarity, confidence, and perceived ease of use increases. Improved accessibility to digital banking using mobile networks or platforms, agent point access, and ease of use of applications allows individuals to develop knowledge and literacy to engage in the use of financial technologies. Empirically documented support for this relationship exists (SmarCons Journal, 2024; Ahmed et al., 2023), ultimately demonstrating that improved access generates efficiency and more awareness and capability to use digital technologies. Consequently,

H2: Digital Banking Accessibility has a significant positive effect on Digital Literacy in rural Sindh.

H3: Digital Literacy and Financial Inclusion

Digital literacy refers to the capacity of individuals to use, understand, and have confidence in using digital financial services. TAM proposes that increased digital literacy shapes perceived ease to use and perceived usefulness, which in turn explains sustained behavioral usage on digital financial services. Financial Inclusion Theory details that literacy shapes usage and quality aspects of inclusion; where literacy and capacity to use

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financial services would contribute to financial decision-making. Prior empirical studies (Ali et al., 2025; Malik & Qureshi, 2024).

Thus:

H3: Digital Literacy has a significant positive effect on Financial Inclusion in rural Sindh.

H4: Mediating Role of Digital Literacy

Digital literacy, serves as the linking mechanism between accessibility and inclusion. While improved accessibility provides opportunities for engagement, literacy ensures that these opportunities are utilized effectively. Studies by Ahmed et al. (2023) and Ali et al. (2025) have found that user confidence and capacity in using digital tools mediate the relationship between access and financial inclusion outcomes. Thus, literacy enhances benefits from better access as well as trust and confidence, particularly in a low-literacy context like rural Sindh.

Accordingly:

H4: Digital Literacy mediates the relationship between Digital Banking Accessibility and Financial Inclusion in rural Sindh.

2.6.4 Summary of Hypothesized Relationships

Hypothesis Code	Proposed Relationship	Expected Direction
H1	Digital Banking Accessibility → Financial Inclusion	Positive
H2	Digital Banking Accessibility → Digital Literacy	Positive
H3	Digital Literacy → Financial Inclusion	Positive
H4	Digital Literacy mediates the relationship between Digital Banking Accessibility	Partial mediation (positive indirect

2.6.5 Link to Policy and SDG Frameworks

This model is squarely positioned with the NFIS 2024-2028 priorities of Pakistan, where digital access, capability-building, and trust improvement are identified as pillars of inclusive finance. In addition, this study fulfills the requirement of Goal 8 through ensuring decent work and economic growth by empowering rural communities with digital literacy skills, and Goal 9 through the encouragement of industry, innovation, and infrastructure by providing equal opportunities in the areas of digital and financial inclusion for

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Online ISSN: 3006-2047

Print ISSN: 3006-2039

developing sustainable development.Thus, the conceptual framework not only fills gaps in existing knowledge but also provides a sound, policy-relevant basis for empirical analysis in later chapters..

2.7 Critical Evaluation of the Literature section.

As such, the conceptual framework fills important gaps in the literature but also provides a policy-relevant grounding for empirical analysis in the following chapters.

Although all the studies reviewed conclude that digital banking increases financial inclusion, some conceptual and empirical deficiencies still abound.

First, most Pakistani and South Asian studies are based on either urban or aggregated national datasets, which omit district-level disparities in the shaping of adoption behavior in rural Sindh.

While the Technology, Acceptance Model and Diffusion of Innovation Theory among others have found wide application, there is limited integration with the theory of financial inclusion to depict multidimensional inclusion-access, usage and quality.

Third, contradictory findings exist regarding sustainability and trust:

some evidence (e.g., Hameed & Hassan, 2024) shows that digital access alone does not guarantee long-term usage without social trust, literacy, and infrastructure support.

Finally, prior analyses often treat digital literacy as an external factor rather than a mediating mechanism linking accessibility and inclusion.

These gaps thus justify the present study's district-level quantitative design, using an integrated theoretical framework and PLS-SEM approach..

Chapter 3: Research Methodology

3.1 Introduction

The current chapter describes the methodological framework that was utilized in this study to examine the influence of digital banking on financial inclusion in the rural districts of Sindh, Pakistan.. This study elaborates on how Digital Banking Accessibility (DBA) affects Financial Inclusion (FI) and how Digital Literacy (DL) mediates this relationship.

3.2 Research Design and Approach

A quantitative, cross-sectional design was used in testing the hypothesized relationships statistically between DBA, DL, and FI. This design provides a real method of measuring the causal links among variables at a specific time and is consistent with recent studies such as Khan & Shaikh, 2022; Ahmed et

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al., 2023. A deductive reasoning approach guided the research, drawing hypotheses from the Technology Acceptance Model (TAM), Diffusion of Innovation Theory (DOI), and Financial Inclusion Theory.

3.3 Study Area and Population

The research was undertaken in four selected rural districts - Tharparkar, Badin, Thatta, and Dadu - due to their low levels of financial inclusion as well as their growing presence of branchless banking services. The population of interest was comprised of adults (18 and above) who had either access to or possible exposure to digital banking services such as mobile apps and branchless agent services.

3.4 Sampling and Data Collection

A stratified random sampling technique was employed to obtain equal proportions from each of the selected districts. The sample size was calculated using Cochran's formula. the final sample size was set at 400 respondents, distributed as follows: Tharparkar (115), Badin (109), Dadu (103), and Thatta (73). Data were collected through structured questionnaires administered in Sindhi and Urdu between March and May 2025.

3.5 Measurement Instruments

The questionnaire included four main sections:

- **Digital Banking Accessibility (DBA)** – 5 items adapted from Khan & Shaikh (2022).
- **Digital Literacy (DL)** – 5 items from SmarCons Journal (2024).
- **Financial Inclusion (FI)** – 6 items from RASD Journal (2024).
- **Demographics** – age, gender, education, and income.

All constructs were measured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Pilot-testing with 30 respondents validated reliability (Cronbach's $\alpha > 0.70$)

3.6 Data Analysis

Data were analyzed using SPSS 27 for preliminary statistics and SmartPLS 4 for hypothesis testing through Partial Least Squares Structural Equation Modeling (PLS-SEM)

The analysis included:

1. Reliability and validity testing (Cronbach's α, CR, AVE).
2. Structural path analysis to test direct and indirect relationships.
3. Mediation testing for the role of digital literacy.
4. Model fit and predictive relevance (R^2, Q^2, SRMR).

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3.7 Ethical Considerations

All participants provided, informed consent and were assured of confidentiality and voluntary participation. The study adhered, to institutional ethical standards and posed no harm or risk to respondents.

3.8 Summary

This research design is quantitative in nature, theory-driven, and based on district-level data from 400 respondents in rural Sindh. The methodological approach thus develops robust empirical evidence of how digital banking accessibility and literacy interact to influence financial inclusion..

Chapter 4: Data Analysis and Results

4.1 Introduction

This chapter presents the results of the data analysis done to test the hypotheses developed in Chapter 2. The analysis that was performed followed the approach of Partial Least Squares Structural Equation Modeling, using SmartPLS 4 and SPSS 27 to enable concurrent testing of both the measurement model and the structural model.

Informed consent was sought from all participants, with assurances of confidentiality and voluntary participation. The study was Institutional Review Board-approved, posing no harm or risk to respondents.It presents the results in three major parts: (1) descriptive statistics of the respondents, (2) measurement model assessment-reliability and validity, and (3) the assessment of the structural model, including hypothesis testing and mediation analysis.

4.2 Demographic Profile of Respondents

In total, 400 valid responses were collected from the following four rural districts of Sindh: Tharparkar, Thatta, Badin, and Dadu. Table 4.1 summarizes the demographic characteristic.

Table 4.1: Respondents' Demographic Profile (N = 400)

Variable	Category	Frequency	Percentage
Gender	Male	230	57.5
	Female	170	42.5
Age Group	18–25 years	88	22.0
	26–35 years	142	35.5
	36–45 years	96	24.0
	Above 45 years	74	18.5
Education Level	Primary or below	94	23.5
	Secondary	136	34.0

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Variable	Category	Frequency	Percentage
	Intermediate	108	27.0
	Bachelor's or	62	15.5
Monthly Income	Below 25,000	118	29.5
	25,001–50,000	162	40.5
	50,001–75,000	72	18.0
	Above 75,000	48	12.0

Interpretation:

Demographic data indicate a very diversified respondent base in terms of gender, age, and income categories, thereby ensuring representativeness.

Data have been screened for completeness, missing values, and outliers.

4.3 Data Screening and Normality

Data were screened for completeness, missing values, and outliers.

- Missing responses were below 3%, replaced using mean substitution
- Skewness and kurtosis for all items had a range between 1.5 and +1.5, which shows acceptable normality for PLS-SEM analysis.
- There was no multicollinearity among the indicators since VIF scores for all were below 3.0, confirming the absence of multicollinearity.

4.4 Measurement Model Assessment

The measurement model was evaluated to confirm reliability, convergent validity, and discriminant validity.

4.4.1 Reliability and Convergent Validity

Reliability was assessed using Cronbach's Alpha (α) and Composite Reliability (CR), while Average Variance Extracted (AVE) confirmed convergent validity.

Table 4.2: Reliability and Convergent Validity of Constructs

Construct	No. of	Cronbach's	CR	AVE
Digital Banking Accessibility (DBA)	5	0.89	0.92	0.68
Digital Literacy (DL)	5	0.88	0.91	0.66
Financial Inclusion (FI)	6	0.91	0.93	0.69

Interpretation:

All reliability coefficients are above the threshold of 0.70 as recommended, and AVE values are above 0.50, indicating adequate internal consistency and convergent validity (Hair et al., 2021).

4.4.2 Discriminant Validity

Discriminant validity was established using the Fornell–Larcker criterion and Heterotrait-Monotrait Ratio (HTMT).

Table 4.3: Fornell–Larcker Criterion

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Construct	DBA	DL	FI
DBA	**0.82**	—	—
DL	0.64	**0.81**	—
FI	0.59	0.67	**0.83**

(Diagonal values = √AVE)

Table 4.4: HTMT Ratios

Construct Pair	HTMT Value
DBA → DL	0.73
DBA → FI	0.68
DL → FI	0.71

Interpretation:

All HTMT values are below the threshold of 0.85, confirming strong discriminant validity among constructs.

4.5 Structural Model Assessment

After the measurement model was validated, the structural model was tested to assess the hypothesized relationships. The path coefficients (β), t-statistics, and p-values were computed using the bootstrapping technique for 5,000 subsamples.

Table 4.5: Path Coefficients and Hypothesis Testing

Hypothesis	Path	β	t-	p-	Result
H1	DBA → FI	0.36	6.27	0.000	Supported
H2	DBA → DL	0.55	11.94	0.000	Supported
H3	DL → FI	0.42	8.13	0.000	Supported
H4	DBA → DL → FI (Indirect	0.23	5.71	0.000	Supported

4.5.1 Coefficient of Determination (R^2)

R^2 values indicate the proportion of variance explained by the independent variables.

Endogenous Construct	R^2	Interpretation
Digital Literacy (DL)	0.30	Moderate explanatory power
Financial Inclusion (FI)	0.58	Substantial explanatory power

Interpretation:

The model explains 58% of the variance in financial inclusion, suggesting a strong combined effect of digital accessibility and literacy in predicting inclusion outcomes in rural Sindh.

4.5.2 Effect Size (f^2)

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Effect size values were calculated to assess the contribution of each predictor variable.

Relationship	f^2	Effect Size
DBA → DL	0.43	Large
DL → FI	0.29	Medium
DBA → FI	0.17	Small-to-medium

4.5.3 Predictive Relevance (Q^2)

Q^2 values obtained through blindfolding analysis were above 0, confirming that the model has predictive relevance.

Construct	Q^2 Value	Interpretation
Financial Inclusion (FI)	0.31	Medium predictive relevance

4.6 Mediation Analysis

The mediation effect of Digital Literacy (DL) between Digital Banking Accessibility (DBA) and Financial Inclusion (FI) was tested using the bootstrapping method.

Path	Indirect Effect (β)	t-value	p-value	Mediation Type
DBA → DL → FI	0.23	5.71	0.000	**Partial Mediation**

Interpretation:

Digital literacy partially mediates the relationship between accessibility and inclusion; in other words, whereas accessibility improves inclusion directly, such effect becomes significantly stronger when users are digitally literate, which is consistent with the TAM and DOI frameworks emphasizing user capability and trust.

4.7 Model Fit and Predictive Strength

Model Fit Index	Observed Value	Threshold	Interpretation
SRMR	0.054	< 0.08	Good fit
NFI	0.91	> 0.90	Acceptable fit
RMS_theta	0.11	< 0.12	Acceptable fit

The SEM model exhibits an acceptable fit, indicating that the hypothesized relationships align well with the observed data.

4.8 Summary of Findings

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The empirical results confirm that:

1. Digital Banking Accessibility (DBA) significantly enhances Financial Inclusion (FI) among rural populations.
2. **Digital Literacy (DL)** has a strong positive impact on financial inclusion.
3. **Digital Literacy** mediates the effect of accessibility on inclusion, indicating that improved access must be complemented by literacy to achieve meaningful inclusion.
4. The overall model demonstrates substantial explanatory power ($R^2 = 0.58$) and strong predictive validity ($Q^2 = 0.31$).

These findings are therefore consistent with the Technology Acceptance Model, Diffusion of Innovation Theory, and Financial Inclusion Theory, in showing that technological access is not enough in the absence of the cognitive and behavioral capability to use digital tools efficiently.

4.9 Policy and Practical Implications

1. **Targeted Digital Literacy Programs:** Programs in Digital Literacy Targeted: Financial institutions and telecom operators should offer localized literacy campaigns for Sindhi and Urdu users to build understanding of digital finance.
2. **Strengthening Agent Networks:** Expanding the capacity of branchless banking agents to offer savings, insurance, and credit products would deepen financial inclusion
3. **Trust and Security Enhancement:** Transparent grievance mechanisms and digital fraud protection will increase confidence in digital financial transactions.
4. **Alignment with NFIS 2024–2028:** The findings support the SBP's digital inclusion aims and contribute directly to the realization of SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation and Infrastructure).

Chapter 5: Discussion, Conclusion, and Recommendations

5.1 Introduction

This chapter presents an interpretation of the study's findings on how digital banking accessibility and digital literacy contribute to financial inclusion in rural Sindh, Pakistan. It is based on the Technology Acceptance Model, the Diffusion of Innovation Theory, and Financial Inclusion Theory, followed by theoretical and policy implications, limitations of the study, and future research directions.

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5.2 Discussion of Key Findings

The study has ascertained that DBA significantly increases FI in rural Sindh, with a regression coefficient of 0.36 at $p < 0.001$. This confirms the findings of Khan & Shaikh (2022) and Malik & Qureshi (2024), who documented that better access to digital services reduces the costs of transactions and therefore raises the levels of participation in formal banking. As Financial Inclusion Theory by Sarma (2012) suggests, access is the base of any inclusion, as it allows contact with financial systems.

The strong positive effect of eligible digital financial services on Digital Literacy (DL) ($\beta = 0.55$, $p < 0.001$) means that situational exposure to technology builds user confidence and confidence as effectiveness when using technology. This is consistent with the ideas of the Technology Acceptance Model (TAM) (Davis, 1989) and Diffusion of Innovations (DOI) (Rogers, 2003). Rural users who used mobile banking frequently and branchless agents, also increase their familiarity, which rightly improve their Digital Literacy (DL) through effective use of digital financial services.

Digital literacy, also has a direct and significant influence on financial inclusion ($\beta = 0.42$, $p < 0.001$), consistent with **Ali et al. (2025)** and **Ahmed et al. (2023)**. Literate users are more capable of saving, borrowing, and transacting digitally. The mediation analysis ($\beta = 0.23$, $p < 0.001$) confirms that literacy partially links accessibility and inclusion-meaning, access is not enough unless users are empowered to utilize it confidently.

5.3 Theoretical Implications

This study integrates TAM, DOI, and Financial Inclusion Theory into one coherent model, showing how technology access and user capability jointly drive inclusion. It extends TAM by showing how digital literacy works both as an antecedent and mediator of adoption behavior in low-literacy environments. The results empirically validate Sarma's (2012) multidimensional model of inclusion, emphasizing access, usage, and quality as key pillars of financial empowerment..

5.4 Policy and Practical Implications

1. **Expand Digital Literacy Programs:** The State Bank of Pakistan (SBP), in partnership with telecom operators and microfinance institutions, should implement community-based training in Sindhi and Urdu to improve users' competence and confidence.

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2. **Strengthen Agent Networks:** Branchless banking agents (EasyPaisa, JazzCash, HBL Konnect) should be equipped to provide broader services, including savings, credit, and insurance.
3. **Enhance Trust and Security:** Stronger consumer protection, fraud awareness, and complaint resolution systems are vital to building confidence in digital platforms.
4. **Improve Rural Connectivity:** Investments in mobile networks and electricity access will directly support sustainable digital transactions.
5. **Promote Gender Inclusion:** Women-focused digital literacy and financial programs can significantly reduce the gender gap in financial participation.

These recommendations align with Pakistan's NFIS 2024–2028 and support SDGs 8 (Decent Work and Economic Growth) and 9 (Industry, Innovation, and Infrastructure).

5.5 Limitations and Future Research

The study was limited to four districts of Sindh; future work should expand to other provinces for broader generalization. The cross-sectional design captures relationships at one point in time; longitudinal or experimental research could better reveal causal effects. Additional mediators—such as trust, financial literacy, or gender empowerment—should be explored in future studies.

5.6 Conclusion

This study concludes that digital banking significantly promotes financial inclusion in rural Sindh, especially when coupled with digital literacy. Accessibility creates opportunities, while literacy ensures meaningful participation and trust in financial systems. These findings confirm that inclusive digital finance depends not only on infrastructure but also on users' capacity to engage effectively. Strengthening literacy, trust, and access can accelerate Pakistan's progress toward an inclusive digital economy envisioned under NFIS 2024–2028.

References

Ahmed, S., Rehman, A., & Qureshi, H. (2023). *Digital financial inclusion and the mediating role of literacy: Evidence from developing economies*. **International Journal of Emerging Markets, 18**(4), 925–943. https://doi.org/10.1108/IJOEM-02-2022-0221

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Online ISSN: 3006-2047

Print ISSN: 3006-2039

Ali, M., Hussain, T., & Rahman, K. (2025). *Trust and perceived risk in digital banking adoption: Evidence from rural Pakistan*. **Asian Journal of Finance & Banking, 14**(1), 58–77. https://doi.org/10.2139/ssrn.4762345

Anjum, N., & Alam, S. (2022). *Mobile banking and women's financial inclusion in Pakistan: Empirical evidence from rural Sindh*. **Journal of South Asian Development Studies, 17**(3), 201–219.

Asongu, S. A., & Odhiambo, N. M. (2020). *Financial access, governance, and financial inclusion in Sub-Saharan Africa*. **Financial Innovation, 6**(17), 1–21. https://doi.org/10.1186/s40854-020-00194-4

Bashir, A., & Malik, F. (2024). *Exploring digital transformation and fintech adoption in Pakistani banks: Challenges and opportunities*. **Journal of Banking Innovation, 12**(2), 75–91.

Cochran, W. G. (1977). *Sampling techniques* (3rd ed.). New York, NY: John Wiley & Sons.

Davis, F. D. (1989). *Perceived usefulness, perceived ease of use, and user acceptance of information technology*. **MIS Quarterly, 13**(3), 319–340. https://doi.org/10.2307/249008

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Thousand Oaks, CA: Sage.

Hameed, A., & Hassan, I. (2024). *Fintech, inclusion, and poverty alleviation: Evidence from emerging Asia*. **Economic Research Forum Review, 19**(2), 99–115.

Iqbal, M., & Lodhi, S. (2023). *Determinants of digital financial inclusion in Pakistan: The role of literacy and access*. **Pakistan Journal of Social Sciences, 43**(1), 111–130.

Javed, S., & Batool, R. (2022). *Digital banking adoption and financial inclusion: The moderating effect of trust*. **Journal of Internet Banking and Commerce, 27**(3), 45–61.

Khan, M. A., & Shaikh, F. M. (2022). *Digital banking adoption and financial inclusion in Pakistan: Challenges and opportunities*. **Pakistan Economic and Social Review, 60**(2), 145–167.

Kumar, V., & Shukla, R. (2021). *Digital banking and financial inclusion: Evidence from India's rural sector*. **Asian Economic Journal, 35**(4), 349–368. https://doi.org/10.1111/asej.12234

Volume. 4 Issue No. 4 (2025)

Online ISSN: 3006-2047

Print ISSN: 3006-2039

Malik, N., & Qureshi, S. (2024). *Branchless banking and rural financial inclusion: Empirical evidence from South Asia*. **Journal of Economic Development Studies, 12**(1), 33–51. https://doi.org/10.1080/23944375.2024.1156729

Mustafa, K., & Hanif, M. (2023). *Fintech and inclusive growth: Lessons from Pakistan's digital finance revolution*. **Journal of Asian Development Policy, 9**(2), 112–131.

RASD Journal. (2024). *Digital payments, financial inclusion, and saving behavior: Evidence from Pakistan's rural economy*. **Review of Applied Social Development Journal, 8**(3), 205–223.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.

Sadi Journals. (2023). *The evolution of mobile financial services and inclusion gaps in developing nations*. **Journal of Finance and Technology, 11**(2), 88–104.

Sarma, M. (2012). *Index of financial inclusion: A measure of financial sector inclusiveness*. **Berlin Working Papers on Money, Finance, Trade, and Development, 07/2012**. Berlin School of Economics and Law.

SmarCons Journal. (2024). *Digital literacy and technology adoption: Empirical analysis from developing economies*. **Smart Consumer Finance Review, 15**(4), 310–329.

State Bank of Pakistan. (2024). *National Financial Inclusion Strategy (NFIS) 2024–2028: Building inclusive digital finance for Pakistan*. Karachi: State Bank of Pakistan. Retrieved from https://www.sbp.org.pk/

United Nations. (2023). *Sustainable Development Goals Report 2023*. New York, NY: United Nations Department of Economic and Social Affairs.