

THE MODERATING ROLE OF TECHNOLOGY TRUST: EXAMINING HOW FINANCIAL LITERACY SHAPES MOBILE BANKING ADOPTION AND CONSUMER BEHAVIOR IN PAKISTAN

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Abstract

The aim of this study is to identify how financial literacy impact on mobile banking usage and consumer behavior in the banking sector of Pakistan, with trust in technology as a moderating variable. For data collection, only the users of ten most profitable banks of four cities of Pakistan like Lahore, Faisalabad, Rawalpindi, and Karachi were included in this study. Partial Least Square structural equation modelling (PLS-SEM) approach was used to analyze the data, using the Smart PLS 4.0 software. On the basis of study's findings, financial literacy is a significant indicator of mobile banking usage, which in turn positively impacts on consumer behavior. Furthermore, trust in technology acts as a moderator in this study to strengthen the impact of mobile banking usage on consumer behavior. Policy implications suggest the need for targeted financial literacy programs, enhanced digital security, and user-centric mobile banking services. The study also outlines key limitations, including its cross-sectional design and sample constraints, and offers recommendations for future research, such as exploring additional moderating variables and employing longitudinal methods to better understand evolving consumer patterns in digital finance.

Keywords:

Financial Literacy, Mobile Banking Usage, Trust in Technology, Consumer Behaviour, Quantitative Approach, SmartPLS.

1. Introduction

In this digital advancement era, the significant technological transformation in the financial sector has become crucial to boost up the customers interest regarding financial transactions (Abbas, & Khan, 2024). Currently, consumers are active users of financial services, including saving, investing, borrowing, and spending through digital technologies. These emerging technologies like block-chain, artificial intelligence, and mobile banking platforms have revolutionized the traditional banking system, offering speed, ease, and customization (Jhonson et al., 2023). Financial institutions, especially banks, are more focused on digital banking services, reshaping consumer’s interaction (Uribe-Linares et al., 2023). On the basis of the online banking services, the trust of tech-oriented age groups is increasing with the passage of time to manage their finances easily and comfortably (Kurniawan et al., 2025). In this case, financial literacy surfaces as a basic factor that authorizes the persons to utilize digital platforms positively. At the same time, trust in technology plays a vital role in determining the consumer behavior.

Financial literacy is a pressing essential skill to understand financial markets functions as a consumer’s point of view. It enables individuals to make informed decisions, which ultimately leads to a better financial behavior. People with stronger financial skills are better able to take financial decisions for the future by using digital technologies confidently (Munawar, 2023). They can easily communicate with suppliers of financial goods and services to reduce the risks related to their financial choices such as investments, loans, and retirement planning (Ingale, & Paluri, 2022).

Trust in technology plays a central role in determining whether individuals engage with new technologies, particularly when financial risk is involved. Similarly, financial literacy equips consumers with the skills to make informed decisions, evaluate digital financial products, and safeguard themselves against fraud. Therefore, investigating how these elements interact can provide valuable insights into fostering responsible and widespread fin-tech adoption in the banking sector.

The banking sector in Pakistan is experiencing a gradual transformation of digital technologies progressively, redefining financial delivery services. With the increasing adoption of mobile phones with internet access, mobile banking apps, AI financial tools, and block-chain technology based-solutions are becoming popular in this era (Elia et al., 2023). Unfortunately, the customers of Pakistan are still inconsistent for adopting of these technologies due to limited financial literacy and mistrust in digital systems (Abbas, & Khan, 2024). Furthermore, most of Pakistani population remains financially excluded due to lack of awareness and their behavior of adopting these emerging technologies is critical. Despite these financial services, the adoption of fin-tech within the banking sector is not same across different population segments of Pakistan. While prior researches have observed technology adoption in digital banking models such as the Technology Acceptance Model or the Unified Theory of Acceptance and Use of Technology, limited studies have widely investigated the joint influence of financial literacy and trust in technologies. Additionally, numerous existing studies are restricted by regional focus and cross-sectional designs that fail to capture evolving consumer behaviors.

The aim of this study is to identify how financial literacy impact on mobile banking usage and consumer behavior in the banking sector of Pakistan, with trust in technology as a moderating variable. By examining these relationships across diverse demographic and cultural backgrounds, the study address to create actionable acumens for banking sector, and policymakers aiming to encourage comprehensive and trustworthy digital financial services.

1.1 Study Objectives

Following objectives of this study are given below:

- To investigate the influence of financial literacy on mobile banking usage among banking consumers in banking sector of Pakistan.
- To examine the impact of mobile banking usage on consumer behaviour in banking sector of Pakistan.
- To explore the moderating role of trust in technology in the relationship between mobile banking usage and consumer behavior in banking sector of Pakistan.
- To highlight the effect of financial literacy on mobile banking usage to consumer behavior in banking sector of Pakistan.

This paper is organized as follows: The next section reviews earlier studies, section 3 outlines the data collection and methodology. In section 4, results and discussion will present and section 5 concludes the whole study with policy implications.

2. Literature Review

The earlier studies highlight the relationship between financial literacy, mobile banking usage and consumer behaviour in different workplaces. Additionally, the role of trust in technology provides the strength of the relationship between mobile banking usage and consumer behaviour. Therefore, we present several previous studies in this context to explore meaningful contributors of consumer behavior of any workplace.

The study of Sabila (2024) highlighted the relationship between financial literacy and mobile banking adoption in Jabodetabek. Through this research, she analyzed that mobile banking usage remained positive due to high financial literacy. From the last decade, mobile banking services have gained more popularity due to its speed, accessibility, and data security among the users (Johnson, 2020), whereas mobile applications adoption has been increased among various age groups (Carlin et al., 2017) despite of uneven internet access. Furthermore, it improves consumer capability in assessing financial technologies and encourages informed adoption (Kumar et al., 2023). In the light of the study of Liao & Chen (2020), a negative association was observed between financial literacy and mobile payment usage in US. They highlighted that financial literate individuals avoid to take perceived risks while using mobile banking for transactions.

Finally, the financial literacy enables the individuals to use digital financial services especially mobile banking on the basis of existing literature. Therefore, the financial literacy boosts up the usage of M-banking in financial sector and the current study explores the mentioned-below hypothesis.

H₁: Financial literacy has a significant positive impact on mobile banking usage.

The technological advancement in finance sector like M- banking has changed the parameters of financial payments after the COVID-19 pandemic. Business activities have been shifted from physical to online mood and the mind-set of the consumers also inclined towards digital services platforms. The study of Pattem & Srinivas (2025) focused on the consumer behavior which was developed by using M-banking during COVID-19 era. They revealed that consumers trust and satisfaction on online banking system remain the main features of mobile banking usage. The online banking reputation encourages the e-trust, e-loyalty and e-satisfaction of customers in banking system and e-reputation develops a powerful relationship between customers and M-banking system (Yahia & Berraies, 2025). On the basis of Nazri et al., (2025) research, financial organizations should prioritize the customer's desires including user-friendly design, identify security risks, and adopt innovative, customer-focused strategies. Furthermore, they suggested that innovation and entrepreneurship into banking procedures improve customer engagement and wider adoption of mobile banking in Malaysia. Finally, the hypothesis of M-banking usage and consumer behavior in the banking sector is as follows:

H2: Mobile banking usage has a significant positive effect on consumer behaviour in the banking sector.

Over the recent years, the development of mobile banking as a leading financial channel has converted how individuals interact with financial services, and financial literacy has become an essential enabler in this conversion. The existing studies highlight that users with strong financial knowledge are more feasible to use mobile banking services (Kaur et al., 2023; Shaikh et al., 2022). They also claimed that financially literate individuals are fully aware of the core benefits and major functions of M-banking system, including accessibility, Cost-effectiveness, and transaction tracking, which lessens hesitancy and perceived risk. This implementation impacts consumer behavior by improving financial management, refining budgeting practices, and enhancing financial decision-making power (Hassan et al., 2023).

The study of Kaur et al. (2023) examined that financial literacy indirectly influences consumer behavior by increasing the possibility of mobile banking usage. Also, Hassan et al. (2023) stressed that financial literacy may lead indirectly to behavioral change with the help of digital financial tools like mobile banking apps. Through these tools users attain practical expertise to apply their financial knowledge, including expenses monitoring, savings goals setting, and making timely payments to strengthen positive customers’ habits. Moreover, models such as TAM and UTAUT support technology usage as a mediator in converting financial knowledge into action. The research of Shaikh et al. (2022) explored that M-banking use acts as a mediator between financial literacy and behavioral outcomes, mainly in young and tech-savvy populations. In brief, the literature advises an appealing agreement that financial literacy is not always adequate to bring behavioral change. But it operates in-between mobile banking usage, which drives consumers to transform knowledge into financial behavior. This indirect path underscores the significance of improving both financial literacy and digital financial engagement to attain long-lasting behavioral outcomes.

H3: Financial literacy indirectly influences consumer behaviour through mobile banking usage.

The earlier studies have introduced several concepts of trust, Mayer et al. (1995) proposed a comprehensive definition as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party”. Sasongko et al. (2022) claimed that trust is the willingness of consumers to take risks initiated by the transactions of another party, believing in the expectation that the bank will proceed valuable action for the bank users. It reduces the users’ risk and inspires them for its initial usage, empowers customers to use M-banking services continually (Nguyen & Ha, 2022). The role of trust as a moderator has analysed in previous studies (Han et al., 2022 ; Lee & Kim, 2022) but few studies explored its moderating role in M-banking (Ashique & Subramanian, 2022). As such, based on previous studies, we propose the following:

H4: Trust in technology positively moderates the relationship between mobile banking usage and consumer behaviour—such that the relationship is stronger when trust in technology is high.

3. Data Collection & Methodology

3.1 Data Collection

In this study, we use primary data collection technique through well-structured questionnaire. This questionnaire has two parts: 1st part covers demographic Information and 2nd part consists of certain study constructs. Each construct of this questionnaire was measured through Likert Scale from “strongly disagree” to “strongly agree” having 1 to 5 points respectively (Agha & Sohail, 2025). For data collection, only the respondents of four cities of Pakistan like Lahore, Faisalabad, Rawalpindi, and Karachi were

included in this study (Abbas, & Khan, 2024) and ten most profitable banks were selected to access the consumer behaviour by using mobile banking apps of the selected banks. The participants were fully informed about the objectives of the study, and guided every one about the questionnaire. For filling this questionnaire, Google form was shared through email to 400 respondents and the data were received of 297 respondents for analysis via spreadsheet. For further data analysis, the data cleaning process was more effective for the accuracy, reliability and validity of received data. Only 224 responses were valid out of 297 for estimation process, whereas 73 responses were not favourable due to incomplete information.

3.2 Description of Variables

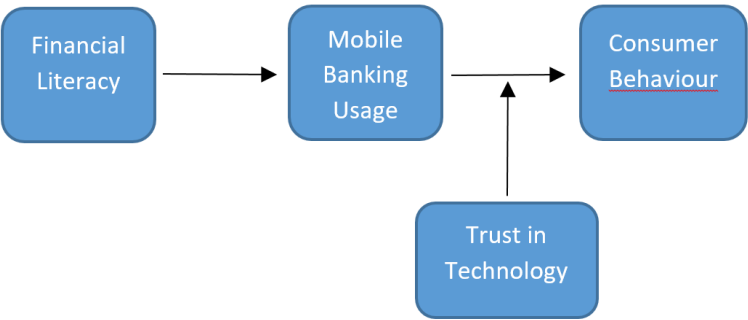
In this study, financial literacy was measured through indicators FL₁ to FL₃ as an independent variable influences M- banking usage, which is represented by MBU₁ to MBU₃. Moreover, trust in technology acts as a moderator, captured by indicators TT₁ to TT₃. Whereas, the consumer behavior is treated as a dependent variable, represented by components CB₁ to CB₃. The complete details of all these study variables are given in table 1.

Table: 1 Comprehensive Variable Description

Variables	Symbol	Items	Source
Consumer Behaviour	CB1	I intend to continue using mobile banking in the future.	Manuere et al., 2022
	CB2	I recommend mobile banking to friends/family.	
	CB3	I would switch banks for a more trustworthy mobile banking app.	
Financial literacy	FL1	I understand basic financial concepts (e.g., interest rates, inflation).	Lusardi & Mitchell, 2014
	FL2	I regularly budget and track my expenses.	
	FL3	I feel confident making financial decisions independently.	
Mobile Banking Usage	MBU1	I use mobile banking apps frequently for transactions.	(Venkatesh et al., 2012)
	MBU2	Mobile banking saves me time compared to visiting physical banks.	
	MBU3	Interacting with the system does not require lots of mental effort.	
Trust in Mobile Banking	TMB1	I trust mobile banking apps to keep my financial data secure.	Gefen et al., 2003
	TMB2	I worry about fraud or hacking when using mobile banking.	
	TMB3	Banks promptly resolve issues if I face problems in mobile banking.	

3.3 Theoretical Framework

The theoretical framework was established in figure 1, representing the structural relationships among Financial Literacy (FL), Mobile Banking Usage (MBU), Trust in Technology (TT) and Consumer Behaviour (CB). In this framework, financial literacy served as independent variable, M-banking usage as the mediator, trust in technology as the moderator and consumer behavior as dependent variable.



3.4 Methodology

Firstly, we applied reliability and validity tests to ensure the consistency and accuracy in the measurement of the constructs. For this, Cronbach’s alpha and composite reliability tests were employed to check reliability and Fornell- Larker Criteria were used to divergent validity. A Partial Least Square structural equation modelling (PLS-SEM) approach was used to analyze the data, using the SmartPLS 4.0 software. In this approach, direct, indirect and moderation estimation paths were examined.

4. Results

In this section, structural equation modelling technique was used through smart PLS 4.0 to check the accuracy and reliability of the model with moderating variable (Babar, 2020).

4.1 Reliability Analysis

To ensure the consistency and accuracy in the measurement of the constructs, we check the reliability through Cronbach’s alpha and composite reliability tests. To assess the reliability, the values of Cronbach’s alpha and CR should be greater than 0.7 as a rule of thumb (Hair et al., 2019). From table 2, we examined that the values of Cronbach’s alpha and CR of all latent variables were greater than 0.7 which indicates that the model is valid for further proceeding. For the sake of convergent validity, we used the values of average variance extracted (AVE) which should be more than 0.5 as a benchmark for validity (Hair et al., 2019). Moreover, AVE values of all the latent variables were greater than 0.5, mentioning in table 3 that was the confirmation of validity for further estimation.

Table: 2 Summary of Reliability Test

Construct	Cronbach’s Alpha	CR	AVE
Financial Literacy	0.738	0.812	0.516
Mobile Banking Usage	0.701	0.823	0.545
Trust in Technology	0.798	0.819	0.569
Consumer Behaviour	0.789	0.832	0.576

Source: Created by Author from smartPLS 4.0

4.2 Validity Analysis

Through Fornell- Larker Criteria, we accessed to confirm that a construct being measured was actually different from other unrelated constructs. For divergent validity, the square root of AVE values is more than the correlation between constructs which were given in table 3. The bold numbers indicate the square root of AVE values, whereas the number within ** were the correlations values of all the constructs

mentioned in table 3. On the basis of these findings, the data were the valid for the further estimation analysis.

Table: 3 Summary of Divergent Validity Test

Construct	FL	MBU	TT	CB
Financial Literacy	0.7183			
Mobile Banking Usage	0.618**	0.7382		
Trust in Technology	0.489**	0.599**	0.7543	
Consumer Behaviour	0.621**	0.609**	0.543**	0.7589

Source: Created by Author from smartPLS 4.0

4.3 Estimated Path Analysis

In this analysis, we identified the direct or indirect relationships of banking sector of Pakistan. In table 4, the relationship between Financial Literacy and Mobile Banking Usage was direct and significant. The impact of Financial Literacy on Mobile Banking Usage was positively significant (β : 0.1737, p-value: 0.0000) on the basis of H₁. It implies that a one unit increase in financial literacy leads to rise in 0.1737 unit of mobile banking usage. This positive relationship indicates that financial literacy is a crucial source to explore mobile banking usage. Similarly, mobile banking usage has a positive and significant impact on consumer behaviour (β : 0.4018, p-value: 0.0000) as per H₂. It means that one-unit rise in mobile banking usage, the consumer behavior increases 0.4018 unit approximately in the banking sector. This positive association promotes the financial inclusion by using the digital financial services regularly and consumers’ trust on these platforms boost up the consumer intention on these online financial sources.

In this table, the indirect effect was estimated from financial literacy to consumer behavior which was positive and significant (β : 0.1517, p-value: 0.0000) according to H₃. This relationship indicates that financial literate consumer were in a position to use more and more mobile banking apps for their daily financial transactions within any hesitation and discomfort. Additionally, we also revealed that trust in technology significantly moderates the relationship between mobile banking usage and consumer behaviour. Furthermore, trust in technology has a positive moderating effect on mobile banking usage and consumer behaviour (β : 0.1445, p-value: 0.0102) as per H₄.

Table: 4 Summary Path Estimation

Hypothesis	Path	β'	t-values	p-values	F-values	Remarks	Relationship
H ₁	FL → MBU	0.1737	3.23	0.0000	0.0998	Supported	Direct
H ₂	MBU → CB	0.4018	4.23	0.0000	0.0609	Supported	
H ₃	FL→ CB	0.1517	2.23	0.0000	0.0518	Supported	Indirect
H ₄	MBU x TT → CB	0.1445	2.03	0.0102	Supported		Moderating

Source: Developed by Author after calculating results from SmartPLS 4.0

The study’s findings reveal significant relationships among financial literacy (FL), mobile banking usage (MBU), customer behaviour (CB), and the moderating role of technology trust (TT). The positive and significant‘effect of FL on MBU aligns with prior research (Lusardi & Mitchell, 2014), confirming that financially literate individuals are more likely to adopt digital banking. This supports the notion that

financial knowledge empowers users to navigate mobile banking platforms effectively. Furthermore, MBU significantly enhances CB, consistent with studies demonstrating that digital banking improves convenience, cost savings, and accessibility (Shaikh & Karjaluoto, 2015). The indirect effect of FL on CB suggests that financial literacy not only drives adoption but also amplifies perceived benefits, reinforcing the mediating role of MBU. This finding echoes the resource-based view, where financial knowledge acts as an enabler for maximizing digital banking utility (Barney, 1991). A key contribution of this study is the moderating effect of TT, which strengthens the MBU-CB relationship. This result supports the Technology Acceptance Model (Davis, 1989), where trust in technology enhances perceived usefulness and satisfaction. Customers who trust mobile banking platforms derive greater benefits, emphasizing the need for secure and user-friendly interfaces to sustain engagement.'

Conclusion, Policy Implications & Recommendations

This study explored the interconnected relationships among financial literacy, mobile banking usage, consumer behavior, and trust in technology. 'The findings reveal three key insights: first, financial literacy has a direct and significantly positive impact on mobile banking usage; second, mobile banking usage itself significantly influences consumer behavior in a positive direction; and third, trust in technology serves as a moderately positive and significant moderator between mobile banking usage and consumer behavior. The positive relationship between financial literacy and mobile banking usage underscores the critical role that informed financial decision-making plays in technology adoption. Individuals who possess higher levels of financial knowledge are more confident in using mobile banking services, better understand digital financial products, and are more capable of evaluating potential risks and benefits. Consequently, these users are more likely to engage with mobile banking platforms for managing finances efficiently.

Furthermore, the direct impact of mobile banking usage on consumer behavior suggests that mobile platforms influence not just transactional activities but also broader financial attitudes and habits. Regular use of mobile banking may lead to increased financial awareness, improved budgeting, timely bill payments, and even greater savings. This behavioral transformation indicates that mobile banking is not merely a service but also a tool for shaping positive financial habits among users. The moderating role of trust in technology highlights the psychological dimension of digital adoption. Even when financial literacy and technological access are present, users' willingness to rely on mobile banking platforms depends significantly on their trust in the technology. This includes trust in the security of their personal and financial data, reliability of the platform, and perceived protection from fraud or malfunction. Trust enhances the strength of the link between mobile banking usage and changes in consumer behavior, making it a vital element for sustained user engagement.'

Policy Implications & Recommendations

The findings of this study have several important policy implications. 'First, the strong positive effect of financial literacy on mobile banking usage indicates a pressing need for policymakers and financial institutions to invest in targeted financial education initiatives. These programs should focus on enhancing individuals' understanding of digital financial services, especially in rural and underserved communities, to close the knowledge gap and increase confidence in using mobile platforms. Second, as mobile banking usage significantly influences consumer behavior, banks should design user-friendly, secure, and value-added mobile banking applications that cater to the needs and preferences of different customer segments. Third, the moderate but significant role of trust in technology suggests that improving cyber-security measures, ensuring transparent data usage policies, and maintaining consistent service reliability are crucial. Policymakers should enforce regulations that enhance consumer protection in digital banking and encourage banks to adopt best practices in digital trust-building. By integrating financial literacy, user

engagement strategies, and trust-enhancing mechanisms, stakeholders can promote broader adoption and meaningful use of mobile banking services.

Based on the study's findings and limitations, several directions for future research are recommended. First, future studies should consider using a larger and more diverse sample across different regions, age groups, and socio-economic backgrounds to improve the generalizability of the results. This would provide a more comprehensive understanding of mobile banking adoption across various demographic segments. Second, longitudinal studies are recommended to track changes in financial literacy, trust in technology, and consumer behavior over time, which would allow for stronger causal inferences. Third, future research should incorporate additional moderating and mediating variables, such as digital accessibility, mobile app usability, cultural attitudes, and income level, to enrich the current model. Fourth, qualitative approaches—such as interviews or focus groups—could provide deeper insights into users' personal experiences and perceptions regarding mobile banking and financial literacy. Finally, it is recommended that future research explore the role of emerging technologies (e.g., AI-based financial tools, biometric authentication) in shaping user trust and behavior, which could guide the next generation of digital banking strategies.

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