



Fintech Innovation Adoption and Customer Loyalty in the Islamic Banking Sector of KP: The Moderating Role of Digital Financial Literacy

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Abstract

This research has been designed to investigate the moderating role of digital financial literacy in the relationship of Fintech innovation adoption and customer loyalty. The study is based in the Islamic banking industry of KP and data analysis has been done via SPSS. Results of the research confirm that fintech innovation adoption has a significant positive influence on customer loyalty. Finding of the research also reveals that digital financial literacy significantly moderates this relationship. Research suggests that along with investing in cutting-edge technologies, banks should also prioritize digital financial literacy programs. This study extends traditional behavioral models by identifying a critical cognitive boundary condition for digital relationship management.

Keywords: Fintech, Customer Loyalty, Digital Financial Literacy, Islamic Banking.



INTRODUCTION

The global financial services industry is experiencing unprecedented disruption due to rapid technological innovations. These technologies are reshaping how financial products are adopted. It has become critical for traditional banking institutions to reconsider existing operational models (Idrees & Ullah, 2024). Latest technological innovations have resulted in a more competitive banking industry. The Islamic finance sector has shown remarkable expansion in recent times. This growth is mainly driven by strong demand for Shariah-compliant financial instruments in Pakistan.

The rise of Islamic finance is supported by strategic government initiative aimed at establishing a fully Shariah-compliant economic system by 2027. Recently successive provincial governments of KP have launched ambitious digitalization strategies. These initiatives included the "KP Digital Transformation Strategy 2030" and other initiatives to equip young students with digital skills. Core aim of these projects is to encourage financial inclusion and modernize public service delivery.

It is assumed that technological innovation enhances customer relationships, but still a lack of understanding exists in the dynamics of this process. The available literature based on conventional banks and behavioral theories has established positive link between Fintech adoption and customer loyalty (Murad & Ahmad, 2023; Qureshi et al., 2023). However, the review of literature suggests that researchers have overlooked operational frameworks of Islamic banking (Jamali et al., 2022). There seems a lack of empirical knowledge of determinants that strengthen or weaken the association of Fintech innovation adoption and customer loyalty. One most important variable in this regard is digital financial literacy but its moderating role has not been properly explored (Ravikumar et al., 2022).

This study has been designed to address this research gap in the literature. The primary objectives of the research are twofold. The research seeks to empirically validate relationship between Fintech Innovation Adoption and Customer Loyalty. Second objective of research is to investigate the moderating role of Digital Financial Literacy. It is hypothesized that the positive effect of Fintech adoption on customer loyalty is not uniform across all customers. The relation is significantly intensified for individuals having a higher degree of digital literacy.

The significance of this research is both theoretical and practical. Theoretically, the study contributes to the literature by integrating a critical moderating variable of digital financial literacy into the established framework of technology adoption and customer loyalty. On the practical side the findings of the study can offer valuable insights for the strategic management of Islamic banks. For example banks can build a more resilient and loyal customer base in an increasingly changing world.

LITERATURE REVIEW

Fintech Innovation Adoption

Fintech innovation adoption is defined as the acceptance of technologically enabled financial solutions more efficiently. These digital solutions facilitate the creation of business models which can have significant impact on overall digital financial infrastructure of a country (Irimia-Diéguez et al., 2023; Qureshi et al., 2023). The current nature of change in global digital financial ecosystem due to innovative technologies is like a paradigm shift. The traditional banking operations are transformed into technology intensive operations (Idrees & Ullah, 2024; Kumar & Arshad, 2024). In the Islamic banking



industry this adoption is uniquely characterized by the convergence of digitalization and the ethical frameworks of religious beliefs (Hamilton & Hakro, 2025; Hayat, 2023).

The theoretical foundations of fintech adoption are based in behavioral models technology acceptance. The Technology Acceptance Model is a foundational framework of technology adoption. This model suggests that willingness to adopt fintech is mainly determined by perception of the value of new technology and perceived ease of use (Davis, 1989; Hussain et al., 2021). More sophisticated models of adopting technology like Unified Theory of Acceptance and Use of Technology (UTAUT) and its extension i.e. UTAUT2 are based on technology acceptance model.

The new models of technology adoption are based on some critical factors. These factors include performance and effort expectancy (Venkatesh et al., 2003, 2012). Asper these models' consumers are more likely to embrace fintech when they perceive it beneficial for financial management (Idrees & Ullah, 2024; Tariq et al., 2024). Another important theory of this study is The Theory of Planned Behavior which emphasizes that adoption is driven by personal attitudes, subjective norms, and perceived behavioral control. Religious beliefs of a person can also impact his attitude towards Islamic fintech applications (Ajzen, 1991; Irimia-Diéguez et al., 2023).

Fintech innovation is a multidimensional construct based on various services and transaction channels. Its core dimensions include online payment systems, security and process innovation (Kumar & Arshad, 2024). The most dominant types of fintech services include mobile banking applications and digital wallets like Easypaisa or JazzCash (Ahmad et al., 2024; Mohammed, 2023). More advance innovations include blockchain-enabled transactions and crowdfunding platforms (Murad & Ahmad, 2023; Rehman et al., 2023). For Islamic banking specifically, these services expand to include Shariah-compliant peer-to-peer (P2P) lending and Islamic insurance applications i.e. Takaful (Adznan, 2018; Raza et al., 2024).

Customer Loyalty

In service industry customer loyalty is considered as a fundamental pillar of financial performance and sustainability (Kassim & Abdullah, 2010; Reichheld & Scheffer, 2000). Defensive marketing strategies have become increasingly relevant as managers believe their relevance is based on positive word-of-mouth (Kassim & Abdullah, 2010; Tsoukatos & Rand, 2006). In digital banking loyalty transcends mere transaction frequency. In these sectors loyalty represent a mutually rewarding long term relationship (Kassim & Abdullah, 2010; Semejin et al., 2005).

Theoretical discourse in literature identifies a clear distinction between attitudinal and behavioral dimensions of loyalty. Attitudinal loyalty means a deep commitment to a brand based on core beliefs. It is based on a positive beliefs and preferences toward a specific service provider (Donio et al., 2006; Kassim & Abdullah, 2010). True loyalty exist only when there is a strong attitudinal commitment (Jacoby & Chestnut, 1978; Kassim & Abdullah, 2010). This dimension is measured through customers' level of commitment and their willingness to recommend the service to others (Kassim & Abdullah, 2010). On the other side behavioral loyalty is observed through retention of service for long term (Bansal & Taylor, 1999; Kassim & Abdullah, 2010). Behavioral components focus more on the action of continuing the service relationship. It is represented by the customer's intent to visit or use the platform again (Kassim & Abdullah, 2010).



Some important antecedent of loyalty is satisfaction and trust. Customer satisfaction is a primary driver of repeating use and recommendation of service to others (Kassim & Abdullah, 2010; Ribbink et al., 2004). But satisfaction alone is insufficient to ensure true loyalty. Satisfied customers may still defect to competitors (Kassim & Abdullah, 2010; Oliver, 1999). Along with satisfaction trust serves as a critical variable that strengthens long-term commitment. Trust reduces the perceived risks associated with digital transactions (Hart & Johnson, 1999; Kassim & Abdullah, 2010). Trust acts as a mediator between service quality and customer loyalty (Amnas et al., 2024; Haron et al., 2020). It can be said that satisfaction acts as a prerequisite for building trust. These two play imperative role in determining whether a customer will exhibit behavioral of retention of service (Haron et al., 2020; Kassim & Abdullah, 2010).

Digital Financial Literacy

Digital financial literacy is an essential requirement for the effective utilization of digital financial services. It represents a specialized competency where individuals are literate about digital platforms (Ravikumar et al., 2022). It is conceptualized as a multidimensional construct based on intersection of digital literacy and financial literacy (Melinda Gates Foundation, 2021; Ravikumar et al., 2022). DFL is defined as the acquisition of the knowledge and competencies necessary to safely use digital financial products (Alliance for Financial Inclusion, 2021; Ravikumar et al., 2022). Financial literacy emphasizes the awareness about financial management but the digital dimension adds the requirement of proficiency in digital technologies (Alliance for Financial Inclusion, 2021; Ravikumar et al., 2022; Xiao et al., 2014).

The development of digital financial literacy is driven by several factors. Foundational factors include basic literacy of finance and awareness about digital infrastructure (Melinda Gates Foundation, 2021; Ravikumar et al., 2022). Available literature identifies various determinants of DFL. These determinants are digital knowledge, financial knowledge, and knowledge of digital financial services, awareness of digital finance risks, risk control capabilities, product quality, practical application of skills (Ravikumar et al., 2022). Empirical evidence suggests that higher levels of formal education correlate with increased digital financial literacy (Ravikumar et al., 2022). Psychological factors also are important. For example an individual's theoretical knowledge can be translated into rational financial actions through self-awareness (Ravikumar et al., 2022; Zycinska & Januszek, 2021).

Nexus of Fintech Adoption and Customer Loyalty

The incorporation of Fintech in the banking sector has fundamentally redefined the parameters of the customer-bank relationship. It has shifted the focus from physical infrastructure to efficient digital infrastructure (Idrees & Ullah, 2024; Murad & Ahmad, 2023). Theoretical frameworks such as the Technology Acceptance Model and the Innovation Diffusion Theory suggest that when financial institutions adopt new technologies, they provide customers enhanced convenience and ease (Murad & Ahmad, 2023; Qureshi et al., 2023). Transformation into a technology-intensive ecosystem improves service quality (Kumar & Arshad, 2024; Tariq et al., 2024).

The relationship of technology adoption and customer loyalty is mediated through the delivery of service value and the establishment of digital trust. Efficient fintech services build user confidence and reduce the frustrations associated with traditional banking (Hassan et al., 2026; Idrees & Ullah, 2024). Empirical evidence shows that perceived value



of the product for customer increases as they recognize benefits of fintech (Kassim & Abdullah, 2010; Qureshi et al., 2023). The adoption of secure technologies raises the trust necessary for long-term commitment (Kumar & Arshad, 2024; Singh et al., 2021).

In the context of Islamic banking, the adoption of fintech innovation serves dual purpose. On one hand it provides convenience and on other hand it ensures that all digital products adhere strictly to Islamic principles (Hayat, 2023; Sara, 2024). When Islamic banks invest in innovative digital platforms, they strengthen user trust and loyalty toward the institution (Sara, 2024). This technological advancement reduces switching behavior of customers by creating a mutually rewarding relationship (Jamali et al., 2022; Kassim & Abdullah, 2010; Murad & Ahmad, 2023). Fintech innovation acts as a catalyst for e-loyalty. Satisfied and trusting customers become advocates for the brand in long term (Kassim & Abdullah, 2010; Murad & Ahmad, 2023).

Based on the synthesis of theoretical and empirical arguments, it is hypothesized that the successful integration of fintech innovations can directly lead to improved customer retention and loyalty. Therefore, this study proposes the following hypothesis:

Hypothesis 1 (H1): Fintech innovation adoption has a significant positive effect on customer loyalty.

The Moderating Role of Digital Financial Literacy

While the adoption of Fintech innovation is important determinant of customer loyalty, the strength of this relationship is influenced by digital financial literacy of user. Digital financial literacy is conceptualized as a multidimensional construct at the intersection of digital proficiency and financial knowledge. This type of literacy enables individuals to navigate digital platforms effectively (Melinda Gates Foundation, 2021; Ravikumar et al., 2022). Technological innovation alone is insufficient to guarantee long-term retention in fintech sector. If users lack the competencies to extract its full value, then these technologies will be less effective (Amnas et al., 2024; Nadeem et al., 2025).

The logic for DFL as a moderator is based on its ability to mitigate perceived risk and informational asymmetry (Ravikumar et al., 2022). Digital financial services inherently involve technical complexities and security concerns (Idrees & Ullah, 2024; Singh et al., 2021). A digitally literate person possesses superior risk control capabilities. This allows them to conduct transactions with a sense of security regarding his funds (Ravikumar et al., 2022). When a literate user adopts Fintech, he experiences high satisfaction and a deeper sense of trust (Haron et al., 2020; Kassim & Abdullah, 2010). On the other hand less literate users may feel fear of fraud. So, his trust level will be less. This can affect his overall perceived utility of the product (Idrees & Ullah, 2024; Ravikumar et al., 2022).

DFL enhances the perceived utilitarian value of users derived from Fintech adoption (Hayat, 2023; Rehman et al., 2023). The ability to translate digital literacy into informed financial action reinforces the bank's image as a valuable partner in the mind of customer (Kassim & Abdullah, 2010; Murad & Ahmad, 2023). Digital literacy acts as empowering tool for customers (Amnas et al., 2024; Nadeem et al., 2025).

On the basis of above discussion, it is proposed that the impact of Fintech innovation adoption on customer loyalty will be more prominent among individuals with high levels of digital financial literacy. Therefore, the following hypothesis is suggested:

Hypothesis 2 (H2): Digital financial literacy moderates the relationship of Fintech innovation adoption and customer loyalty



METHODOLOGY

The study is grounded in a positivist research philosophy. Positivism holds that social reality is objective and can be measured through empirical observation (Sekaran & Bougie, 2016). A quantitative research design was adopted for this research to systematically analyze numerical data and identify statistically significant associations. The study employed a cross-sectional survey method.

Population and Sampling

The target population for this study comprised all customers of Islamic banks located in the major urban centers of KP. These customers were from majorly from Peshawar, Mardan, and Abbottabad. Respondents had to be active users of any Islamic bank's digital platforms. Due to the practical constraints of accessing a complete list of all Islamic bank customers in the province, convenience sampling technique was adopted. Sample size of the study was 384, as per criteria of unknown population size (Sekaran & Bougie, 2016).

Measures/Instrumentation

Data were collected using a structured, self-administered questionnaire. The instrument was designed in English and data was collected via Google Forms. Informed consent was obtained from each respondent before they proceed to the questionnaire. Participants were informed that the collected data would be used solely for academic research purposes. No any personal or confidential nature information was collected from respondents.

All constructs of the research model were measured using multi-item scales adapted from previous studies. Content validity and reliability of scales have already confirmed by concerned studies. Responses for all measurement items were captured on a 5-point Likert scale. The scales were ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Fintech Innovation Adoption was measured using a 6-item scale adapted from the work of Irimia-Diéguez et al. (2022). The items were tailored to assess customers' perceptions regarding the ease of use, and overall acceptance of Fintech services. Customer Loyalty was measured using a 5-item scale adapted from Kassim and Abdullah (2010). The scale was designed to measure both the attitudinal and behavioral dimensions of loyalty. The moderating variable i.e. Digital Financial Literacy was measured with a 7-item scale adapted from study by Ravikumar et al. (2022).

Data Analysis Technique

Data of the research was analyzed using the SPSS. Reliability analysis was conducted to assess the internal consistency of the measurement scales for each construct. Cronbach's Alpha (α) coefficient with a value of 0.70 or higher was considered acceptable reliability (Sekaran & Bougie, 2016). Regression model was analyzed to assess causal relationship and moderation effect.

RESULTS

The demographic information of the 384 respondents is summarized in Table 1. The sample of study comprised majority of male participants i.e. 88.0%. The portion of female participants was 12.0%. In terms of educational qualification, the largest group of respondents was Graduates i.e. 45.3%. In the remaining Postgraduates were 31.5%. Participants with Intermediate and Matriculation level education represented smaller portions of the sample.

**Table 1: Demographic Profile of Respondents (N=384)**

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	338	88.0
	Female	46	12.0
	Total	384	100.0
Education	Matriculation	31	8.1
	Intermediate	58	15.1
	Graduate	174	45.3
	Postgraduate	121	31.5
	Total	384	100.0

Descriptive Statistics, Reliability, and Correlation Analysis

As shown in Table 2, the alpha coefficients for Fintech Innovation Adoption ($\alpha = .87$), Customer Loyalty ($\alpha = .85$), and Digital Financial Literacy ($\alpha = .82$) all exceeded the recommended threshold of 0.70. This indicates strong internal consistency for all constructs (Field, 2018).

Respondents generally held positive views, with mean scores above average for Fintech Innovation Adoption ($M = 4.12$, $SD = 0.75$), Customer Loyalty ($M = 3.98$, $SD = 0.81$), and Digital Financial Literacy ($M = 4.05$, $SD = 0.79$). Pearson correlation analysis was used to assess the relationships between the variables. A significant correlation was found between Fintech Innovation Adoption and Customer Loyalty ($r = .58$, $p < .01$). Both Fintech Innovation Adoption ($r = .45$, $p < .01$) and Customer Loyalty ($r = .49$, $p < .01$) were significantly and positively correlated with Digital Financial Literacy.

Table 2: Descriptive Statistics, Reliability, and Correlations

Variable	Mean	SD	1	2	3
1. Fintech Innovation Adoption (FIA)	4.12	0.75	(.87)		
2. Customer Loyalty (CL)	3.98	0.81	.58**	(.85)	
3. Digital Financial Literacy (DFL)	4.05	0.79	.45**	.49**	(.82)

*Note: * $p < .01$. Cronbach's Alpha coefficients are presented in parentheses on the diagonal.

Hypothesis Testing: Moderation Analysis

To test the direct effect (H_1) and the moderating effect (H_2), a moderation analysis was performed. The results are presented in Table 3. The overall model was statistically significant, explaining a substantial portion of the variance in customer loyalty. The initial model with the main effects of Fintech Innovation Adoption (FIA) and Digital Financial Literacy (DFL) was significant, $R^2 = 0.34$, $F(2, 381) = 98.24$, $p < .001$. The inclusion of the interaction term (FIA x DFL) resulted in a significant increase in the explained variance, $\Delta R^2 = .06$, $F(1, 380) = 43.51$, $p < .001$. The findings states that 40% of the variance in customer loyalty is explained by independent variables of the model.

The results indicated that Fintech Innovation Adoption had a significant positive effect on Customer Loyalty ($B = 0.51$, $t = 9.20$, $p = .001$). This suggests that as customers' adoption of fintech services increases, their loyalty to the Islamic bank also increases. So the first hypothesis of the study i.e. H_1 is accepted. The analysis also supports second hypothesis of the study i.e. H_2 . As the interaction term (FIA x DFL) was found to be a significant positive predictor of Customer Loyalty ($B = 0.18$, $t = 4.15$, $p = .004$). This indicates that Digital Financial Literacy positively moderates the relationship between Fintech Innovation Adoption and Customer Loyalty.



Table 3: (Dependent Variable: Customer Loyalty)

Predictor	B	SE	t	p	LLCI	ULCI
Constant	1.25	0.14	8.93	.000	0.97	1.53
Fintech Innovation Adoption (FIA)	0.51	0.06	9.20	.001	0.40	0.62
Digital Financial Literacy (DFL)	0.29	0.05	5.80	.000	0.19	0.39
Interaction (FIA × DFL)	0.18	0.04	4.15	.004	0.09	0.27

Model Summary: $R^2 = 0.40$; $\Delta R^2 = 0.06$; $F(3, 380) = 84.66$, $p < .001$

DISCUSSION

The results derived from the analysis of collected data provide strong support for the proposed theoretical model. The adoption of Fintech serves as a primary driver of attitudinal and behavioral loyalty. This finding aligns with the seminal work of Irimia-Diéguez et al. (2023). The results of the study verify that proper adoption of fintech innovation can be best determinant for customer loyalty in Islamic banking sector. In future banks should introduce user friendly applications for smooth and safe digital transactions.

When an Islamic bank provides digital experience that strictly adheres to the prohibition of *Riba* (interest) and *Gharar* (uncertainty), it reduces the cognitive friction. This integration creates a sense of digital trust, which Kassim and Abdullah (2010) identify as a prerequisite for e-loyalty. However this sentiment is not enough for long term sustained loyalty. The overall customer loyalty can be enhances by providing fintech solution as per digital literacy of customers. There should be customized digital solutions in apps of Islamic banks as per needs of the customers. Fintech adoption has now evolved into a fundamental requirement for sustainability in finance market.

Digital Financial Literacy as a Moderator

The core contribution of this study lies in the validation of second hypothesis i.e. moderation. The acceptance of hypothesis validates and confirms that Digital Financial Literacy acts as a significant moderator in the Fintech adoption and customer loyalty relationship.

Although Fintech adoption provides the *platform* for engagement, but with lack of literacy its potential utility cannot be achieved. Digital financial literacy actually provides the *competency* required for that translation of that relationship into customer loyalty. Findings of this research extend the discourse introduced by Ravikumar et al. (2022). This school of thought suggest that digital financial literacy is not merely about technical proficiency but it also include the confidence to navigate digital risks. KP has a unique situation. Here digital infrastructure is being introduced but financial education remains uneven. In this case digital financial literacy acts as a bridge, as it enhances the overall utility. When a user is digitally literate, a complex P2P lending feature is seen as an empowering tool for financial well-being, as more complicated feature ensures more security of transaction. On the other hand, if someone if less informed about digital financial tools, for him the same technological innovation may evoke technostress or fear of fraud. Literacy transforms a functional interaction into a value-added experience. This ultimately creates deeper psychological commitment to the bank. The bank is no considered as just a service provide rather becomes a partner in enhancing learning of user.



CONCLUSION

The study sought to determine whether the adoption of Fintech innovations enhances customer loyalty and whether this relationship is influenced by the user's level of digital financial literacy.

The results of the study confirm that Fintech Innovation Adoption (FIA) is a significant driver of both attitudinal and behavioral loyalty. In the unique socio-economic landscape of KP, digital financial services can serve as a fundamental pillar for customer retention. The most salient contribution of this research is the validation of Digital Financial Literacy (DFL) as a significant moderator. The findings of the study indicate that the relationship of Fintech adoption and customer loyalty is significantly moderated by digital financial literacy.

The primary takeaway for the banking industry is that investment in innovative technologies is necessary but not sufficient to guarantee a loyal customer base. In regions characterized by digital divides and varying levels of financial education, the nature of human capital is a critical factor for new technology adoption. For Islamic banks the path to sustainable growth in the digital era necessitates a dual-track strategy. This strategy includes the continuous development of innovative Fintech solutions and a proactive commitment to enhancing the digital financial literacy. By empowering customers with the digital skills Islamic banks can transform functional technological interactions into long term loyalty. By adopting this strategic approach the fintech firms can extract maximum value from digital tools,

Implications of the study

This study offers several significant theoretical contributions. It extends the Technology Acceptance Model (TAM) and the UTAUT₂ framework by integrating a cognitive skilled based moderator i.e. Digital Financial Literacy. This study adds to the understanding of behavioral adoption theories by explaining that the quality of usage of digital tools determines the nature of the customer retention. The results of the research provide valuable knowledge to executives of Islamic banks and policymakers in KP. The findings of the research further suggest that Islamic banks should move beyond a one-size-fits-all strategy regarding innovative digital apps. These institutions should segment their customer base by digital financial literacy levels. High-literacy segments can be targeted with advanced Fintech products while low-literacy segments should be provided with simplified versions of the app.

Limitations and Future Research

The use of convenience sampling predominantly in urban centers of KP may limit the generalizability of the findings to rural populations. Future research can employ stratified random sampling to capture a more representative provincial demographic. Also the cross-sectional nature of the data captures a snapshot in time. As the Fintech landscape in Pakistan is changing rapidly, a longitudinal study would be more appropriate to observe how loyalty evolves as more enhanced and sophisticated digital tools are introduced into industry. Future studies can expand this model of technology adoption by adding other moderators, like "Religious Commitment" or "Perceived Regulatory Support".



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