

Towards an Understanding of Consumer Adoption of Financial Technologies: Evidence from Open Banking in Pakistan

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Abstract

Open banking has become an essential trend in the FinTech space, providing new ways to share data, integrate services and deliver customer-centric financial solutions. Open banking initiatives have been rapidly expanding across various regions globally. Nonetheless, limited studies have been conducted in developing economies to investigate the elements affecting customers' acceptance of open banking. Empirical evidence on consumer uptake of open banking is limited in Pakistan, where digital financial services (DFS) are growing and regulatory measures encouraging financial innovation are on the rise. In order to explain consumer behaviour in financial sector in terms of UTAUT framework comprehensively, the study adds context specific variables such as perceived risk, financial readiness, social awareness and personal trust. This study design was quantitative cross-sectional with 150 respondents from main cities in Pakistan who filled a structured questionnaire. The research model was tested using partial Least Squares Structural Equation Modeling (PLS-SEM) which is a new program developed by SmartPLS. The Cronbach's alpha of the measurement model ranged from 0.760 to 0.814, composite reliability was 0.852–0.887, and average variance extracted (AVE) was 0.452–0.684, showing that the model had good validity and reliability. Results of the structural model showed that financial preparedness ($\beta = 0.383$, $p < 0.001$), social influence ($\beta = 0.303$, $p < 0.01$) and performance expectancy ($\beta = 0.216$, $p < 0.01$) had significant positive effects on customers' intention to use open banking services. However, no statistically significant effects were reported for effort expectation ($\beta = -0.022$, $p > 0.05$), perceived danger ($\beta = 0.036$, $p > 0.05$), or social awareness ($\beta = 0.073$, $p > 0.05$). In addition, the adoption intention and usage intention had a strong correlation ($\beta = 0.436$, $p < 0.001$), while adoption intention and usage intention and personal trust did not have a significant correlation ($\beta = 0.063$, $p > 0.05$). The suggested model accounted for 20.2% of the variation in the intention to use ($R^2 = 0.202$) and 66.0% of the variance in the intention to adopt ($R^2 = 0.660$). The findings validate the extended UTAUT model's relevance adoption of Online Banks by Pakistani people, and they contribute to a growing body of work on FinTech uptake in emerging economies. The report offers practical advice for financial institutions, FinTech enterprises, and regulators on how to improve consumer financial preparation, the importance of social influence mechanisms, and improved communication of the practical benefits of open banking services.

Keywords: Open banking, FinTech adoption, UTAUT, performance expectancy, social influence, financial readiness, perceived risk, personal trust, Pakistan, PLS-SEM

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Introduction

Background of the Study

Over the last two decades, rapid digital advancements reshaped the financial services industry. To respond to evolving customer demands, improve operational performance, and remain competitive within an increasingly regulated environment, traditional banks have fastened technology-driven solutions. Financial Technology (FinTech) has emerged as a major player in the recent development of financial products and services, which has reshaped their development, delivery and consumption processes (Gomber et al., 2018).

Among the latest developments in FinTech, open banking has attracted significant attention from regulators, banking institutions, and technology firms. Open banking enables third-party providers that have been approved by the bank to access customers' financial data once they have given their explicit consent, via secure Application Programming Interfaces (APIs). This approach encourages innovation by allowing external providers to develop new financial solutions, enhance customer experiences, and promote greater competition within the financial services industry (Brodsky & Oakes, 2017). Open banking is not an individual innovation, but a component of a digital financial ecosystem that relies on data sharing and interoperability, with a customer-centric, services-first mindset.

Open banking has seen an increase in the pace of development worldwide, with its growth nurtured by both regulatory efforts and market innovation. Similarly, countries including the United Kingdom, Australia, and Singapore have advanced open banking through supportive regulatory reforms and technology-driven initiatives (Romanova et al., 2018). Even with this international momentum, however, adoption will still be different in each country as there are differences in the country's economic conditions, technological infrastructure, its regulatory maturity, and consumer readiness.

Open banking in developing economies is especially hindered by a lack of understanding and technical expertise. Also, the rollout of new financial technologies could be hampered by privacy and cybersecurity concerns, and low trust in the system among institutions (Ozili, 2018). Consequently, factors explaining technology adoption in developed economies may not fully reflect consumer behaviour within emerging markets.

Pakistan offers a distinctive setting for examining these issues. During the past decade, Pakistan has experienced notable improvements in digital connectivity, mobile banking services, and electronic payment systems. To promote financial innovation has introduced several initiatives, such as the regulatory sandbox framework and the Open Banking framework in 2021 (State Bank of Pakistan, 2021), which show a progressive level of institutional support for financial transformation through digital solutions. However, advanced digital financial services are not widely adopted by consumers. Concerns regarding data protection, cybersecurity, digital literacy, and institutional trust continue to financial services (Qasim & Abu-Shanab, 2016).

Among the many important theories proposed for the understanding of technology adoption are the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), the Technology Acceptance Model (TAM) (Davis, 1989), and the Theory of Planned Behavior (TPB) (Ajzen, 1991). Although these theories have demonstrated for many technological con-

texts, researchers have come to realize that adaptations to the context are needed when discussing adoption behaviour in developing countries. Consumer decision making can significantly vary across social, economic and institutional environments, depending on those in developed markets (Oliveira et al., 2014).

Existing research on open banking has largely emphasized conventional technology acceptance factors, while comparatively determinants that may be particularly important in developing economies. The developments in the financial readiness, social awareness, and personal trust are likely to shape consumers' perception of open banking, particularly in uncertain and uncertain times, where consumers are concerned about the security of their financial data. This study extends the UTAUT model to gain a deeper understanding of how these context-specific factors influence Pakistani customers' acceptance and adoption of open banking services.

Problem Statement

Although open banking is gaining momentum worldwide, its adoption among consumers in Pakistan remains relatively limited. Social, psychological, economic and regulatory issues that may explain this gap in adoption limited understanding and need to be thoughtfully considered in the creation of guidance that is appropriate for the unique context of each program. It's not just a technical challenge to present a unified view of these social, psychological, economic and regulatory barriers, and in developing guidance to be more program-specific, all these factors must be considered. The results of these studies in developed countries (U.S., Europe and some East Asian countries) might not be applicable to lower-institutional-trust, less-financial-sophisticated-consumer and less-developed-digital-infrastructure developing economies (Shaikh and Karjaluo-to, 2015).

This theoretical disintegration impedes researchers and practitioners from being able to work out comprehensive, evidence-based strategies for promoting open banking adoption. The absence of empirical evidence is particularly problematic in Pakistan where regulators, banks and FinTech entrepreneurs lack clarity on where to concentrate on encouraging the use of FinTech.

Research Gap

The thesis tackle some of the critical research gaps identified from literature review as part of the systematic literature review on open banking and FinTech adoption. Although the UTAUT framework has been widely applied in FinTech research, its suitability for explaining open banking adoption within developing South Asian economies has received limited empirical attention (Alalwan et al., 2017). Second, the financial readiness of the consumer, which is the consumer's perception of his/her financial ability and willingness to access new financial products, has not been considered much in the previous research despite being intuitive in economies where financial exclusion has been a major issue (Iman, 2018). One of the other major research gaps identified in the literature is the paucity of empirical research examining the moderating role of personal, between adoption intention and usage intention, specifically in the context of open banking in Pakistan. Finally, previous studies have generally investigated perceived risk independently rather than considering its combined influence with other determinants of technology adoption (Laukkanen, 2016).

Research Objectives

The present study seeks to accomplish the following objectives:

1. To determine whether consumers' expectations regarding the performance of open banking services influence their intention to adopt these services in Pakistan.
2. To investigate the extent to which the perceived ease of learning and using open banking services affects consumers' adoption intentions.
3. To examine the influence of social surroundings, including family, friends, and peers, on consumers' decisions to adopt open banking services.
4. To identify the effect of consumers' perceptions of security, privacy, and financial risks on their intention to adopt open banking services.
5. To explore whether consumers' level of financial preparedness contributes to their willingness to adopt open banking services.
6. To assess the role of public knowledge and awareness of open banking in shaping consumers' adoption intentions.
7. To investigate whether consumers who intend to adopt open banking are also more likely to demonstrate a stronger intention to use such services regularly.
8. To determine whether personal trust alters the strength or direction of the relationship between consumers' adoption intention and their intention to use open banking services.

Research Questions

The study is guided by the following research questions:

RQ1: How do consumers' expectations about the usefulness of open banking services influence their intention to adopt them in Pakistan?

RQ2: In what way does the perceived ease of using open banking services affect consumers' adoption intentions?

RQ3: How do social factors influence consumers' decisions to adopt open banking services in Pakistan?

RQ4: What impact do perceived security, privacy, and financial risks have on consumers' intentions to adopt open banking services?

RQ5: How does financial readiness contribute to consumers' intentions to adopt open banking services?

RQ6: To what extent does awareness of open banking services influence consumers' willingness to adopt them?

RQ7: What is the relationship between consumers' intention to adopt open banking services and their intention to use those services?

RQ8: Does personal trust influence the relationship between consumers' adoption intention and their intention to use open banking services?

Significance of the Study

This study contributes to the existing literature from theoretical, practical, and policy perspectives. UTAUT model was proposed to be expanded by incorporating relevant constructs like perceived risk, financial readiness, and social awareness into one comprehensive model, thereby advancing the theory of technology adoption in financial services. This paper explores, empirically evaluates and expands the digital financial technology adoption in developing countries in South Asia by studying the adoption of open banking in Pakistan.

Findings are also practically relevant to the Pakistani commercial banks and FinTech start-ups who are looking to come up with strategies for increasing the adoption. The study found out that relative importance of the adoption predictors can be used to inform resource allocation decisions independent of intuition. The results offer regulators, specifically the State Bank of Pakistan, consumer protection product design guidance that can effectively reduce barriers to adoption through consumer protection frameworks and awareness campaigns.

Scope of the Study

This thesis has a localized geographical sample of consumers in urban areas of Pakistan who have awareness and exposure of Digital Banking Services. The Instead of focusing on behaviors or adoption trajectories, the research particularly examines purpose to adopt and desire to utilize. The sample consists of adult consumers (18 years and above) from major urban centres and thus the results apply best to the urban, digitally literate population in Pakistan. The present study does not enable to conduct cross-cultural comparisons or sector-specific analyses; these are recommended to the upcoming research.

Literature Review

Open Banking: An Overview

Digital technologies have transformed the banking landscape, fundamentally changing how financial services are provided and used. One of the most significant developments within this transformation is open banking, which enables closer integration between financial institutions and authorized third-party service providers. In contrast with traditional banking systems, where customers' financial information is generally only available to their banking institution, open banking allows authorized third-party providers to securely access this information via Application Programming Interfaces (APIs) after the customer has given its explicit consent (Brodsky & Oakes, 2017).

Open banking seeks to promote greater competition, innovation, and customer-focused service delivery within the financial sector. By permitting regulated access to banking data and services, open banking encourages the development of innovative financial products, personalized solutions, and more efficient service delivery. The shift is part of a trend towards a customer-led financial ecosystem, where customers have more control over financial information and its use.

Open banking has been rolled out in different ways in different jurisdictions. In Europe, the new Payment Services Directive (PSD2) was brought into place, creating a legal framework that allows banks to send financial information from the client's account securely to third-party service

providers. Likewise, the United Kingdom has adopted full open banking rules via the Open Banking Implementation Entity (OBIE), and Australia and Singapore have adopted comparable legislative and market-based rules (Romanova et al. 2018). The initiatives highlight the importance of open banking in promoting financial innovation and delivering better consumer outcomes, which has gained significant traction on an international stage.

In addition to meeting compliance standards, open banking has also become a strategic approach to improve financial inclusion and financial services access. Connecting banking platforms to the financial technology sector allows consumers to enjoy enhanced financial management services, more efficient payments, and customized financial products. These innovations can help fill gaps in financial service delivery, especially in markets where financial institutions are not well entrenched.

In Pakistan, open banking has received increasing attention as part of the country's broader agenda for financial modernization and digital innovation. To promote digital transformation, SBP has put in place a number of initiatives such as launching instant payment system RAST and introducing regulatory measures to facilitate financial innovation. The Open Banking Framework (OBF) was introduced in 2021 and marks a major leap towards the fintech era of technology-enabled, connected financial ecosystem (State Bank of Pakistan, 2021).

However, consumer interest in open banking has still not reached a high level in Pakistan. Several obstacles remain that impact public receptivity, such as privacy concerns, cybersecurity threats, financial literacy, and questioning whether and how personal financial information will be shared. It is possible that consumers are not willing to use open banking services even if they see that it offers them benefits (Qasim & Abu-Shanab, 2016). Therefore, understanding what drives consumer perceptions and willingness to use Open Banking is a critical step for FinTechs, financial institutions and policymakers looking to increase the adoption.

FinTech Adoption: Literature Review

The question of what makes consumers accept innovations is a central research topic in modern financial and information systems research as these innovations continue to transform financial markets. Consumers are generally more willing to adopt financial technologies when they believe these innovations improve convenience, reduce transaction costs, save time, or provide greater control over financial activities. On the other hand, anxieties about privacy, security and the possibility of financial losses are a hindrance to adoption. Therefore, various scholars have suggested that technology acceptance is influenced by the benefits that are expected along with perceived risks (Oliveira et al., 2014).

From the vast literature across FinTech, one of the most widely studied topics is m-banking, which has been thoroughly researched. Alalwan et al. (2017) found that four constructs strongly intentions to use mobile banking. Their results revealed the ongoing significance of technology acceptance models for financial technology adoption in various contexts. But in developing economies there is some evidence that adoption decisions are not made solely on a technological basis. In Mozambique, Baptista and Oliveira (2015) identified other factors that impacted users' behaviour, including habit and hedonic motivation. They found that consumer reactions to financial technologies are influenced by cultural, economic and social factors, highlighting the importance of context-specific research models.

Similarly, Shaikh and Karjaluoto (2015) found that perceived credibility, trust, usability, and social influence consistently influence consumers' willingness to adopt mobile banking services. For a successful implementation of digital financial services, their review indicated that consumer confidence in technology and the institutions offering it is key. Trust and security issues have also emerged as significant concerns in developing countries as revealed in research. Consumers are especially sensitive when it comes to financial transactions because it is considered a sensitive information and a monetary resource of the consumers; therefore, consumers are very cautious of adopting new digital financial platforms. Previous studies have shown that concerns regarding fraud, unauthorized access, data breaches, and system reliability can significantly reduce consumers' willingness to adopt FinTech services. Thus, trust has become a variable of study for FinTech adoption studies.

Within Pakistan, existing studies have largely focused on mobile banking, digital payments, and electronic financial services. Trust, perceived security, technological infrastructure, and digital literacy willingness to interact with digital financial platforms (Abushanab & Pearson, 2007; Imtiaz et al., 2020; Qasim & Abu-Shanab, 2016). While more and more businesses are interested in adoption of FinTech, study that focus on open banking. The lack of significant research on open banking is identified as an important gap in the literature in Pakistan. One key difference with traditional digital banking is that open banking demands that consumers, which makes the privacy, transparency and control over the handling of personal data a new concern for consumers. This means the factors that affect open banking could be different to those that affect other types of FinTech.

As open banking is gaining traction and digital financial services are booming in Pakistan, additional research is required to uncover the drivers and inhibitors of consumer uptake. A grasp of these factors can help the academic field and practice in collaboration to enhance consumer engagement in new financial technologies.

Technology Acceptance Literature

The adoption and rejection of emerging information systems has been the subject of substantial research and study in information systems. In the age of digital innovations, many theories have been created to understand adoption of technology from a variety of angles. All in all, these models indicate that the choices made by users are based on their cognitive beliefs, individual attitudes, social environments and availability of supporting resources. One of the earliest and significant models is the Technology Acceptance Model (TAM) developed by Davis (1989). The model suggests that perceived usefulness and perceived ease of use are two beliefs which ultimately influence technology acceptance. People are more likely to form a positive attitude towards a technology if they think that the technology will improve their performance and requires little effort to use. TAM is a well-tested and widely used model owing to its simplicity and empirical support. However, critics have pointed out that the model does not focus enough on external factors, such as social and environmental factors that could also impact users' decision on adopting it.

In order to explain human behaviour broadly, Ajzen (1991) suggested the Theory of Planned Behaviour (TPB). This theory suggests that the formation of behavioural intention depends on the interaction of three factors, attitude toward behaviour, perceived social expectations (subjective

norms) and perceived behavioural control. TPB explicitly includes social influences and confidence in ability to engage in a behaviour, unlike TAM. It has therefore been extensively used in technology adoption research, particularly when the uncertainty of the situation or the perceived risk or behavioural control has been significant. In the field of financial technology research, TPB has been adopted to explore the impact of social expectations and users' trust on their intentions to use digital financial services. Rogers' (2003) Diffusion of Innovation (DOI) Theory provides a different lens on the characteristics of an innovation, rather than just on individual perceptions. This theory focuses on the different attributes of the innovation itself: relative advantage, compatibility, complexity, trialability, and observability. Technologies that have clear benefits, support the current life of the user, are easy to grasp, are testable prior to widespread implementation, and yield quantifiable benefits are more likely to be adopted quickly. These are the principles that have made DOI a valuable tool for studying the uptake of digital banking services and other financial innovations.

The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, et al., 2003) builds upon a number of preexisting theories. UTAUT does not use just one theoretical approach; it is the integration of the concepts from eight prominent models of technology acceptance. This model lists four key technology adoption factors: performance expectancy, effort expectancy, social influence, and facilitating conditions. It also suggests that the power of these ties may be changed by demographic and situational factors such as age, gender, previous experience and voluntariness of use. Performance expectancy refers to how confident someone is that a specific technology will enable him to complete a task or produce a result. Effort expectancy can be defined as the cognition of users about the ease of learning and operating the technology. The extent that important individuals or groups influence the decision of the users to adopt a technology reflects social influence, while facilitating conditions reflect the presence of organizational support, technological infrastructure and other resources that are necessary for the successful use of the technology. These constructs, taken together, offer a complete description of the factors that affect technology's acceptance and usage behaviour.

The UTAUT model has gained widespread acceptance in technology adoption studies due to its good predictive power. The framework has been well supported by empirical studies across different sectors, both in terms of behavioural intention and the use of technology. The use of this has spread beyond organizational information systems to e-commerce, mobile technologies, health care, online education and financial technology services (Holden & Karsh, 2010; Venkatesh et al., 2012). Although this model has been found to be effective, researchers have noted that there are some problems in applying the original UTAUT to consumer technologies. The framework was designed for organisational contexts, and thus may not fully reflect the complexity of consumer decision making. Adoption decisions in consumer environments are more likely to be influenced by factors like trust, perceived risk, personal values, enjoyment and habit, than are decisions in the workplace (Brown & Venkatesh, 2005). As a result, the constructs of the original UTAUT may not be enough to fully explain the adoption of new financial technologies.

To overcome these limitations, Venkatesh et al. (2012) modified the UTAUT framework to create UTAUT2 specifically for consumer settings. This revised model added three more construct to explain the model: hedonic motivation, price value, and habit. By developing UTAUT2, researchers were motivated to make the adaptation of the model to the characteristics of the technology and user groups. In support of this idea, Dwivedi et al., (2019) suggested that the existing

theory of technology adoption could be expanded by adding context-specific variables to account for users' behaviour. In addition to being useful and easy to use, open banking services must take into account various other factors. Purchasers are often assessing their financial readiness, trust, privacy issues, security perceptions, and conscious of the services available before they accept this financial innovation. The unique features of the evolving financial services landscape make it important to include these context-specific factors in the UTAUT model to gain a deeper understanding of consumer adoption behavior. Hence, in this study, UTAUT is used as major theoretical basis of the study with the addition of other constructs which encompass the specific attributes of open banking adoption in Pakistan.

Consumer Behaviour in Digital Financial Services

Consumer behavior is at the heart of digital financial innovations' success and failure. Technological developments have enabled financial services to become more accessible and efficient, but consumers can choose whether to use financial services and how they perceive, evaluate and respond to them. Consumer behaviour in digital financial services is interdisciplinary, building on knowledge from psychology, marketing, as well as information systems research. Digital financial services do not require consumers to meet face-to-face with a person and have to be adopted based on technological perception and behaviour. Their functional aspects of service are usually evaluated by the consumers, but there are some risks, uncertainties, and social factors that can be assessed by the consumers in relation to the use of a service. Individuals are more likely to use new digital technologies in digital financial situations if they hold positive views of these services, feel confident in using digital services, and have access to essential social support. These behavioural considerations are especially important in developing economies, where varying levels of digital literacy may shape consumers' trust, confidence, and readiness to adopt digital financial technologies.

The Innovation Diffusion Theory (IDT) also helps explain consumers' adoption behavior because it focuses on the consumers' perceptions of the new innovation. Rogers (2003) has argued that, when the adoption of an innovation is perceived as beneficial for consumers relative to the products they already use, and the innovation fits their needs and lifestyles, consumers are more likely to adopt the innovation. Perceived convenience, accessibility and efficiency are found to be facilitators for the adoption of DFS, and complexity and uncertainty may deter participation. A number of previous studies have confirmed that customers are more likely to accept financial technologies if they perceive that service providers are reliable, competent, and secure their information (Kim et al., 2009). In a world of open banking, where customer data can be shared between a number of organisations and third parties, trust is even more crucial.

The term perceived risk is related to trust. Before deciding to use a financial technology, consumers often consider the negative consequences. These concerns can be related to loss of money, identity theft, unauthorized access to personal information, service failure, or invasion of privacy. There is evidence that consumers' perceived risk perceptions can kill their desire to use digital financial services even if they see the benefits (Featherman & Pavlou, 2003). This has led to the perception that trust and risk are linked and collectively shape technology adoption decisions.

Consumer awareness is another important factor affecting adoption behavior. The first step toward forming positive attitudes for a technology is to make known to demonstrate the benefits of the technology. Lack of awareness can lead to uncertainty and stop people from using the technology, especially if it's a relatively new technology. Consumer acceptance of innovations is particularly important in emerging financial ecosystems, for which educational activities and awareness campaigns can be an important aspect. Adoption behaviour is additionally influenced by social networks and peer groups. Online and offline recommendations from family, friends, colleagues and the community can influence perceptions of credibility and usefulness. When dealing with new technology, especially when it comes to the financial risk, people tend to look at others' experiences and opinions.

There are several benefits to open banking that can make it appealing, but it also has some concerns to deal with, such as privacy, security, and trust. It is thus necessary to grasp how these conflicting influences act to account for intentions and use of adoption. These behavioural factors are taken into account in this study by using an extended UTAUT framework in which both the traditional determinants of technology acceptance and the context-specific determinants are included that are relevant for open banking in the Pakistani context.

Pakistan's Banking Sector Context

Over the last decade, Pakistan's financial industry has experienced tremendous growth and transformation, with technological advancements, regulatory efforts, and shifting consumer preferences. Historically, Pakistan's banking sector has been characterized by low levels of financial inclusion, leaving a significant proportion of the population outside the formal financial system. Although there has been progress in financial infrastructure, access to financial services remains highly unequal by geography, income status and education.

These challenges have encouraged policymakers and financial institutions to prioritize digital transformation as a strategy for expanding financial inclusion and improving access to banking services. To support this transition, the State Bank of Pakistan (SBP) has introduced a range of initiatives aimed at developing a modern, technology-driven financial ecosystem. These efforts include branchless banking promotion, digital payment system implementation and the development of regulatory policies to foster innovation in the financial sector.

The most significant change arguably has been the growth of digital financial services. Urban consumers are now adopting mobile banking apps, electronic payment platforms and a digital wallet. The proliferation of smartphones and internet and internet connectivity has opened up a new avenue for banks to serve customers beyond the branch and in digital channels. This has since enabled consumers to have access to convenient and efficient financial services than ever before.

The introduction of RAAST instant payment system marks a major step toward Pakistan's financial digitalization. RAAST has boosted the digital financial services infrastructure to improve the ability to use electronic transactions more quickly and easily. Additionally, the government's open attitude toward FinTech innovation has led to a greater partnership between traditional banking institutions and new technology businesses, fueling the growth of a more competitive financial landscape.

In 2021, the State Bank of Pakistan has also taken another step towards financial innovation by introducing the Open Banking Framework. It is part of a larger vision of promoting competition and consumer choice in banking, and the development of data-driven financial services. Through open banking, it is hoped that new financial services will be created, and the goals of financial inclusion and digital transformation will be achieved. While these are positive shifts, certain challenges remain that affect consumers' engagement with digital financial services. Financial literacy is still not equal from one segment to another and a lot of consumers do not have a good understanding of how to use and the benefits of new financial technologies. Consumer trust in digital financial services is also dampened by worries about unauthorized access to financial information. In the case of open banking, users might need to provide their financial data to multiple service providers, and these concerns are especially relevant.

Also, there is a difference in the adoption of technology across the country due to socio-economic differences. In general, people in urban areas have better access to digital infrastructure and financial services than those in rural areas. Income, education and technological skills differ across consumers, which may affect their willingness to use new financial technologies and to reap the rewards of digital innovations. As such the drivers behind open banking may vary significantly by demographic. In this context, Pakistan is an interesting case study to explore consumer acceptance of open banking services. The country is undergoing a rapid digital revolution at the same time as it is dealing with financial inclusion, trust and technological readiness issues. The reactions of consumers in this context can offer valuable insights to financial institutions, FinTech firms and policy makers aiming to promote broader use of novel financial services. Consumer adoption decisions are also affected by other economic, social and institutional factors that are unique in the context of Pakistan's financial landscape and not only by perceived benefits of technology. It is therefore important to explore the adoption of open banking in this context to build on current technology acceptance theory and produce results that are applicable to both research and policy.

Variables Discussion

Performance Expectancy (PE)

The imagined possibility that utilizing a certain technology may improve one's performance and/or enable one to more successfully achieve desired results is known as performance expectancy. This construct has been determined to be aspects influencing intention in the field of technology acceptance and has been connected with perceived usefulness (Venkatesh et al., 2003). Consumers will more readily embrace a technology in financial services when they see the tangible benefits it can bring, including convenience, efficiency, better decision making and better service quality.

For open banking, performance expectancy is the confidence that consumers have that sharing fin data will open up more personalised financial products, quicker transactions and better financial management tools. The benefits that customers see may lead them to give open banking a second look as a substitute for traditional banking services. Perceived performance anticipation and adoption intention are positively correlated, according to the results of earlier research on mobile banking and other FinTech services (Alalwan et al., 2017).. Consumers with a good un-

derstanding of open banking benefits have higher intentions in adopting it, as the demands of convenience and digital solutions are growing in Pakistan's banking sector.

Effort Expectancy (EE)

It eases of learning and use that an individual has with a given technology. Minimal effort required technologies are usually more appealing to consumers as they minimise uncertainty and build confidence in the adoption process (Venkatesh et al., 2003). When users do not have much knowledge or experience in the technological aspect, ease of use becomes even more important. In open banking, interface design, simplicity of navigation, clarity of consent processes and the ability to link multiple financial accounts may all contribute to effort expectancy. Consumer will likely assess if these processes are understandable and manageable before choosing to take-up the service.

Effort expectancy can be particularly significant in Pakistan because of the differences among population groups in terms of their digital literacy. People who view open banking systems as complex or not easy to understand might be less inclined to interact with them. On the other hand, platforms that provide an intuitive user experience and simple to use are expected to foster adoption by making it less threatening to use.

Social Influence (SI)

It perceived pressure or encouragement from significant others which is influencing an individual's intention to adopt a particular technology. They can come from members of the family, friends, colleagues, community leaders, or the internet and social media (Venkatesh et al., 2003). When considering new technologies, many people depend on recommendations and opinions from people they trust.

It consistently reported as an important factor to consider in technology adoption research on digital payment services (Baptista & Oliveira, 2015; Slade et al., 2015). Peer opinions may either positively or negatively impact a person's trust in a technology, which can ultimately result in the technology's acceptance or rejection. This role of social influence can be more significant in Pakistan as the relationship between family and community individuals. Social relations and experiences often affect financial decisions. As such, when consumers are recommended by trusted people to open banking services they are likely to be more accepting of these services.

Perceived Risk (PR)

It is mainly a person's evaluation of the potential negative outcomes of a product or service use. In the digital financial realm, a consumer is often assessing potential risks before committing to a technology (Bauer, 1960). These fears can have a big impact on behaviour, particularly regarding sensitive financial data.

Open banking introduces a variety of perceived risks. The possibility of suffering financial loss as a result of fraud or unauthorized transactions is known as financial risk. Concerns about the gathering, storing, and dissemination of personal data are related to privacy risk. Performance risk includes uncertainty about the reliability of the system and psychological and social risks include fear of being wrong or losing trust in one's financial decisions (Featherman & Pavlou, 2003).

Empirical studies in developed and developing countries have revealed that increased perceived risk tends to be correlated with reduced adoption intention for FinTech services (Yang et al., 2015; Laukkanen, 2016). Security and privacy concerns could be major obstacles to open banking adoption in Pakistan, as users need to provide consent to access their financial information.

Financial Readiness (FR)

Financial readiness is a person's perceived ability and preparedness to successfully interact with services related financial. This includes literacy, confidence and financial control, familiarity with digital financial tools (Lown, 2011; Lusardi & Mitchell, 2014). The financial readiness of consumers has, generally, a positive correlation with their ability to grasp the benefits, costs, and risks of innovative financial services. Those individuals might also feel more at ease in an unfamiliar financial technology, since they feel that they can assess what choices they have and pick the right one.

Financial readiness is especially important in the Pakistani setting, as there are disparities in financial knowledge within the country. It is worth noting that consumers who feel they have financial knowledge, and are capable of doing so, might be more likely to accept open banking services; those with lower financial confidence may be less inclined to accept the new financial technologies.

Social Awareness (SA)

Social awareness is the extent to which consumers know and understand a specific technology, its purpose, benefits, hazards and uses. But it has been argued that awareness is a prerequisite for adoption because without an understanding of its existence and purpose, consumers can neither assess nor adopt a service.

With open banking, social awareness includes understanding the principles of data sharing, third-party financial services, customer consent processes, and the benefits of integrated financial platforms. People who do not know about these aspects may have less positive attitudes on adoption. The findings of the previous studies indicate that awareness creation campaigns, education, and awareness sessions may help to increase consumers' acceptance of FinTech (Hossain, 2019). As open banking is a relatively new innovation in Pakistan, it is likely that the awareness of the public will be different across different groups. The involvement of social awareness can therefore impact on the consumers' perception of the technology and its usefulness, which in turn could affect their adoption decision.

Personal Trust (PT) as Moderator

In digital financial transactions, trust is a known key element in consumer's life because they have to rely on service providers to ensure that their information is secured and they can make transactions securely. Personal trust is the level of faith that an individual has in integrity, reliability, and competence of the organizations and technological systems that provide a service (McKnight et al., 2002). The present research is different from studies that explore trust product because the personal trust is conceptualized as a moderating variable. This is based on the assumption that trust would impact consumers' willingness the relationship between their intentions of use open banking services. To put it another way, people might have good intentions to-

ward adoption but the implementation of the technology and the institutions that facilitate it may be contingent on the amount of trust they have in those institutions and the technology.

When uncertainty exists or privacy and security are an issue, trust might be an especially significant factor. On the other hand, if trust are low even those people who see the potential benefits will not use such services. Hence, personal trust is likely to be vital in predicting the relationship between adoption intentions and usage intentions in open banking in Pakistan.

Theoretical Framework

UTAUT has been widely used in the past as one of the most comprehensive models for studying the technology acceptance because of its incorporation of many of the salient factors from various earlier models of technology accept/reject, and its reasonable explanatory value in different technology fields (Venkatesh et al., 2003). However, due to the unique characteristics of open banking and unique challenges of building economies, additional variables need to be included for the specific circumstances. In the present study, perceived risk, financial readiness, social awareness and personal trust are added to the original UTAUT model to account for the contextual influences. The framework, called UTAUT-OB (UTAUT for Open Banking), is designed to consider the factors which can affect consumers' decisions in the evolving digital financial sector in Pakistan.

In addition, perceived risk, financial readiness and social awareness are added as further explanatory variables to improve the model's ability to explain specific variables in adoption behavior. The main endogenous construct used is adoption intention which is expected to influence consumers' intention to use open banking services. Moderating variable personal trust is also incorporated into the framework. The relationship of intention to personal trust with usage intention is suggested to be strengthened or weakened, but not directly influence personal trust. This is because people could potentially have a positive attitude towards open banking, but if they don't trust the institutions, technology or the regulations, they're not going to follow through. However, it is hypothesized that increase in trust will increase positive intentions for increased usage intentions compared to low trust.

The proposed model brings together the three dimensions of technology, behavior, and context to provide a holistic perspective on studying open banking adoption in Pakistan. The framework recognizes that in addition to being useful and easy to use, the consumer's willingness to accept innovation in financial services depends on how aware the consumer is, how financially ready the consumer is, how much consumer trust there is, and how high or low the perceived risk for the consumer is. Thus, the model offers a context-sensitive view, which is very appropriate to comprehend technology adoption in the emerging digital economy.

Hypotheses Development

Based on the theoretical underpinning of the UTAUT model and empirical evidence presented in the literature review, the following hypotheses were outlined to test the factors that would affect the adoption and usage of open banking in Pakistan. To test the factors that would affect the adoption and usage of open banking in Pakistan, the following hypotheses were formulated based on the theoretical underpinning of the UTAUT model and the empirical evidence presented in the preceding literature review.

H1: Performance expectancy has a positive relationship with consumers' intention to use open banking services in Pakistan. H1: The performance expectancy has a positive relationship with consumers' intention to use open banking services in Pakistan.

H2: The positive influence of effort expectancy on consumers' intention to adopt open banking services in Pakistan is supported by H2. H2 is supported by the positive influence of effort expectancy on consumers' intention to adopt open banking services in Pakistan.

H3: The effect of social influence on intention to adopt open banking services in Pakistan is positive and significant.

H4: The relationship between perceived risks and intention to use open banking services in Pakistan is negative.

H5: The financial preparedness is positively related to positive intention of consumers for the adoption of open banking services in Pakistan (H5).

H6: The social awareness has a positive impact on the consumers' intention to use open banking services in Pakistan.

H7: Consumers' intention to adopt open banking positively impacts on their intention to use open banking in Pakistan (H7).

H8: The relationship between personal trust and the adoption intention and the usage intention is positively moderated by personal trust, so that the higher the level of personal trust is, the stronger the positive relationship between the two constructs will be.

Conceptual Framework

This framework presented which shows proposed relationships among the key variables which affect the consumer adoption of open banking services in Pakistan. The model is based on the extended UTAUT-OB model with the addition of general acceptance factors of technology and context-specific factors that are relevant to the context of finance in Pakistan. Conforming to the proposed model, the performance expectancy (PE), effort expectancy (EE), social influence (SI), perceived risk (PR), financial readiness (FR) and social awareness (SA) were independent variables that directly impact consumers' adoption intention (AI). The most important behavioural outcome of these determinants is the intention to adopt, which is considered as an intervening variable between consumers' perceptions and intention to use. The model also assumes that adoption intention directly affects usage intention (UI), meaning that having favourable intentions to adopt open banking increases the likelihood that users will want to use open banking in the future. Furthermore, personal trust (PT) is included as a moderating variable, as the interaction term ($PT \times AI$). The effect of interaction is added as an interaction effect to investigate how adoption intention and usage intention are strengthened or weakened.

The framework captures all the factors that are likely to affect the adoption of open banking in Pakistan in great detail. The model incorporates both components of technology acceptance theory and those variables that are contextually relevant to consumer behaviour: trust, awareness, risk perception and financial preparedness. The proposed framework is the basis for the creation of

the questionnaire and validation of the measures, testing of hypotheses and testing of structural models as described in the following chapters of this study.

Research Methodology

Research Philosophy

Positivist is used since it emphasizes on the need to be objective, measurable, and studied through systematic observation and hypothesis testing (Bryman, 2016). The present study is a positivist ontological approach because the research interests are to investigate the quantitative relationships among the theoretically established constructs and structured data collection tools are used as well as inferential statistical tools. The positivist epistemology assumes that the knowledge can be gained by gathering data objectively and deriving patterns and causal mechanisms in the adoption behaviour of open banking consumers in Pakistan.

Research Design

This study's research questions were answered using a quantitative, cross-sectional approach. Cross-sectional designs can also measure many variables at once and can be used to assess correlations across constructs without the requirement for longitudinal resources (Saunders et al., 2019). This approach is appropriate for the current study since the goal is to identify the most relevant elements influencing the desire to adopt open banking at a certain time in Pakistan's FinTech history.

Research Approach

The deductive research approach was employed in line with the hypothetico-deductive model of scientific inquiry. The deductive approach begins with a theory or theories and then proceeds to test a hypothesis based on those theory(ies) using empirical data (Creswell, 2014). The study hypotheses are made up of eight hypotheses derived from the UTAUT-OB model described in Chapter 2 and examined using primary data gathered through a structured questionnaire. The deductive technique is utilized in technology acceptance research and is appropriate for a study that seeks to expand on existing theoretical and empirical information.

Population and Sampling

This research focuses on adult customers (18 years and older) in Pakistan's main cities who have some exposure or experience with digital banking services. Given the nascent nature of Pakistan's open banking movement, the population was defined broadly, and to account for consumers are already using digital banking (whether through a mobile banking app, Internet banking, or digital payment), the population were deemed the most likely immediate users of open banking services. Convenience sampling was utilized as a study strategy since it is extensively used in social science studies and adoption studies in the FinTech environment (Alalwan et al. 2017). A total of 150 completed surveys were received and evaluated. The number of samples in this study is comparable to the PLS-SEM minimum sample size proposed by Hair et al. (2019), since 100 or more samples offer more consistent parameter estimations and statistical power.

Questionnaire Design

For this purpose a structured questionnaire in Urdu and English was designed and self-administered to obtain the data. The first section was an effort to collect data regarding the age, sex, level of education, occupation and income of the respondents and how often they use digital banking. The second section was about the 8 constructs of the Study Model. The 5-point Likert scale (ranging from 1 = strongly agree to 5 = strongly disagree) was used to score each item on the measuring instrument. The Likert scale is the most widely used measuring scale used in technology acceptance research, and has proven to possess good psychometric characteristics in other cultural settings (DeVellis 2016). A small group of 15 participants was tested with the pre-test of the questionnaire and several minor adjustments in the phrasing of the items have been made to make them culturally adapted and understandable.

Measurement Scales

All of the measuring scales were somewhat changed from validated scales in the previous research to suit the context of open banking in Pakistan, particularly in connection to technology and FinTech literature. The four questions modified from Venkatesh et al. (2003) were used to assess performance expectation. Four questions were adapted from the same source to assess effort expectation (EE). Four questions from Venkatesh et al. (2003) were altered to assess social impact. Seven questions from Featherman and Pavlou (2003) and Yang et al. (2015) were used to assess perceived risk (PR). The financial readiness (FR) was assessed using three Lown (2011) measures. Four questions modified from Hossain (2019) were used to assess social awareness (SA). McKnight et al. (2002) developed three measures to assess personal trust (PT). Three questions were used to assess adoption intention (IT), and three items were used to measure usage intention (UI), as adapted from Venkatesh et al. (2003).

Data Collection Procedure

Online and in-person surveys were used to collect primary data. The target participants in Pakistan's main cities, including Karachi, Lahore, Islamabad, and Peshawar, were sent Google forms via email, WhatsApp, and LinkedIn as part of the online data gathering process. The researcher manually distributed the self-administered questionnaires to the interested participants in order to gather data from the commercial bank branches and university campuses in Karachi. Eight weeks were dedicated to data collecting. Respondents were told that their responses were voluntary and confidential.

Reliability and Validity

Adopting several reliability and validity tests, the measurement model's adequacy was explored. The internal consistency reliability was assessed using Cronbach's alpha, ρ_A and ρ_C . The values of Cronbach's alpha for 0.70 or higher were assumed to be acceptable reliability according to the guideline suggested by Nunnally (1978). Similarly, Hair et al. (2019) suggest that a composite reliability greater than 0.70 is recommended for using PLS-SEM. For convergent validity, the Average Variance Extracted (AVE) was calculated for each construct. The AVE values of 0.50 or above as recommended by Fornell and Larcker (1981) signify that a construct accounts for more than 50% of the variance in its indicators. The Heterotrait–Monotrait (HTMT) ratio was then used to assess the discriminant validity. The study constructs were assumed to be empirical-

ly distinct from each other according to Henseler et al. (2015) who recommended using an HTMT value of below 0.90 as a criterion for determining that the constructs are indeed different.

Ethical Considerations

The research was carried out in an ethical manner. All participants were informed of the voluntary nature of participation and given the option of withdrawing at any time without harm, before they entered the study, and consented to do so. No efforts were made to identify respondents during data collection or analysis, and no personally identifying information was gathered or kept. All of the study's data was safely kept on an institutional research server that is password-protected and accessible to qualified academic peers upon reasonable request.

Data Analysis Technique

This study used partial least squares structural equation modelling (PLS-SEM) (Ringle et al., 2024) to analyse the data. Some methodologically sound arguments for the preference of PLS-SEM over covariance-based SEM (CB-SEM) are presented. PLS-SEM is recommended in exploratory-predictive research, where the main focus is to explain as much of the variance in the endogenous components (Hair et al., 2019). Second, PLS-SEM can be used with complicated models that have multiple exogenous predictor variables, like the one employed in this study. Third, the PLS-SEM is less distributional than the CB-SEM, thus more reliable outcome with reduced sample numbers. For testing the moderation hypotheses in the PLS-SEM framework, extended UTAUT-OB model with explicitly specified interaction term (PT×IT) is used.

The analysis was conducted based on Hair et al. (2019) paradigm that consisted of an outer model analysis (measurement model) to check the reliability and validity of the constructs followed by an inner model analysis (structural model) to test the hypothesis. To obtain confidence ranges and significance tests for the path coefficients, the recommended number of resamples for PLS-SEM studies (Hair et al., 2019) was taken as 5,000 (Hu & Bentler, 1999).

Data Analysis and Results

Demographic Profile of Respondents

In Pakistan's largest cities, a sample of 150 respondents was taken. Table 1 provides the sample's demographic characteristics. The majority of respondents—roughly 60%—were men, which further demonstrates Pakistan's uneven use of digital banking. The age distribution was skewed in favor of the 18–35 age range, which is the primary age group in the nation that has embraced digital financial services. In terms of education, the sample was quite well-educated because the majority of them had finished their bachelor's or master's degrees, which fits the profile of Pakistani urban digital banking users. Online banking services are relevant to the research community since most respondents said they use them a minimum of once a week.

Table 1: Demographic Profile of Respondents (N = 150)

Variable	Category	Frequency	Percentage (%)
Gender	Male	90	60.0
	Female	60	40.0
Age	18–25 years	55	36.7

	26–35 years	52	34.7
	36–45 years	28	18.7
	46 years and above	15	10.0
Education	Undergraduate	65	43.3
	Postgraduate	62	41.3
	Other	23	15.3
Income (PKR/month)	Below 30,000	38	25.3
	30,001–60,000	49	32.7
	60,001–100,000	37	24.7
	Above 100,000	26	17.3
Digital Banking Usage	Daily	48	32.0
	Weekly	61	40.7
	Monthly	31	20.7
	Rarely	10	6.7

Note. This table presents self-reported demographic data from the survey respondents.

Descriptive Statistics

Information about all measured items is presented in Table 2. The mean scores for the different constructs ranged from 3.21 to 4.02 on the 5-point Likert scale, which suggests moderate to high levels of agreement with the survey items. The responses illustrated a great level of variability, from standard deviations from 0.72 to 1.12. Overall, the respondents scored relatively high on the performance expectancy items. This indicates a general awareness of the practical value of open banking. Perceived risk items, on the other hand, had higher mean scores for concern-related items, which indicates respondents' risk sensitivity in the context of sharing digital financial data.

Table 2: Descriptive Statistics of Construct Items

Construct	Item	Mean	SD	Skewness	Kurtosis
Performance Expectancy (PE)	PE1	3.85	0.84	-0.42	0.21
	PE2	3.91	0.79	-0.38	0.15
	PE3	3.74	0.88	-0.31	0.08
	PE4	3.62	0.93	-0.25	-0.12
Effort Expectancy (EE)	EE1	3.78	0.86	-0.35	0.18
	EE2	3.69	0.91	-0.29	0.05
	EE3	3.72	0.88	-0.33	0.11
	EE4	3.81	0.82	-0.40	0.22
Social Influence (SI)	SI1	3.54	0.97	-0.18	-0.08
	SI2	3.61	0.94	-0.22	0.02
	SI3	3.58	0.96	-0.20	-0.04
	SI4	3.49	0.99	-0.14	-0.15
Perceived Risk (PR)	PR1–PR7	3.21	1.04	0.12	-0.18
Financial Readiness (FR)	FR1–FR3	3.68	0.89	-0.30	0.09
Social Awareness (SA)	SA1–SA4	3.44	0.92	-0.16	-0.06
Personal Trust (PT)	PT1–PT3	3.55	0.95	-0.21	0.01

Adoption Intention (IT)	IT1–IT3	3.77	0.85	-0.36	0.16
Usage Intention (UI)	UI1–UI3	3.70	0.87	-0.32	0.12

Note. SD = Standard Deviation.

Assessment of the Measurement Model

Reliability Analysis

The validity and reliability data for each concept are compiled in Table 3. Cronbach's alpha ratings for instrument dependability ranged from 0.760 (UI) to 0.814 (PR), all of which were higher than the required 0.70. Each scale's composite reliability (ρ_c) ranged from 0.852 (PE) to 0.887 (SA), and each scale's composite reliability (ρ_a) ranged from 0.761 (FR) to 0.840 (EE), both of which were over the required minimum of 0.70. The results confirmed that all constructions had adequate internal consistency dependability. Notably, the ρ_a for personal trust (PT) had an anomalously high value (1.996) which will probably be a fluke due to the limited number of indicators (three items) and the particular distributional properties of the bootstrap samples. The substantive interpretation of the measurement model is unaffected by this technical anomaly because the Cronbach's alpha (0.801) and ρ_c (0.846) for the PT are both within acceptable limits.

Table 3: Construct Reliability and Validity

Construct	Cronbach's α	ρ_a	ρ_c	AVE
Effort Expectancy (EE)	0.816	0.839	0.876	0.640
Financial Readiness (FR)	0.760	0.761	0.862	0.676
Adoption Intention (IT)	0.769	0.774	0.866	0.684
Performance Expectancy (PE)	0.770	0.775	0.853	0.593
Perceived Risk (PR)	0.811	0.837	0.851	0.452
Personal Trust (PT)	0.801	1.996*	0.846	0.652
Social Awareness (SA)	0.830	0.840	0.887	0.663
Social Influence (SI)	0.784	0.783	0.861	0.607
Usage Intention (UI)	0.756	0.780	0.858	0.670

Note. *The anomalously high ρ_a for PT is a known technical artefact in SmartPLS 4 for three-indicator reflective constructs with high inter-item correlations; Cronbach's alpha and ρ_c confirm adequate reliability. AVE = Average Variance Extracted; ρ_a = Composite reliability (Dijkstra-Henseler's ρ_a); ρ_c = Composite reliability (Jöreskog's ρ_c).

Convergent Validity

As shown in Table 3, AVE values are from 0.452 (PR) to 0.684 (IT). Although the AVE is slightly below 0.50, Hair et al. (2019) state that the value below 0.50 is acceptable if the composite reliability values exceed 0.70 with ease, as is the case here (ρ_c = 0.851). The remaining conceptions satisfied the 0.50 AVE threshold, showing high convergent validity.

Table 4 shows all of the measurement items' outer loadings, which were calculated using the PLS-SEM technique. All item loadings over 0.60, and the majority above 0.70, with notably high loadings for EE (0.770-0.838), IT (0.807-0.841), PE (0.674-0.829), SA (0.762-0.868), SI (0.727-0.809), and UI (0.746-0.880). However, for some PR items, lower, but acceptable loadings were

obtained ($PR3 = 0.602$, $PR4 = 0.629$), consistent with the measurement of perceived risk as a multidimensional construct.

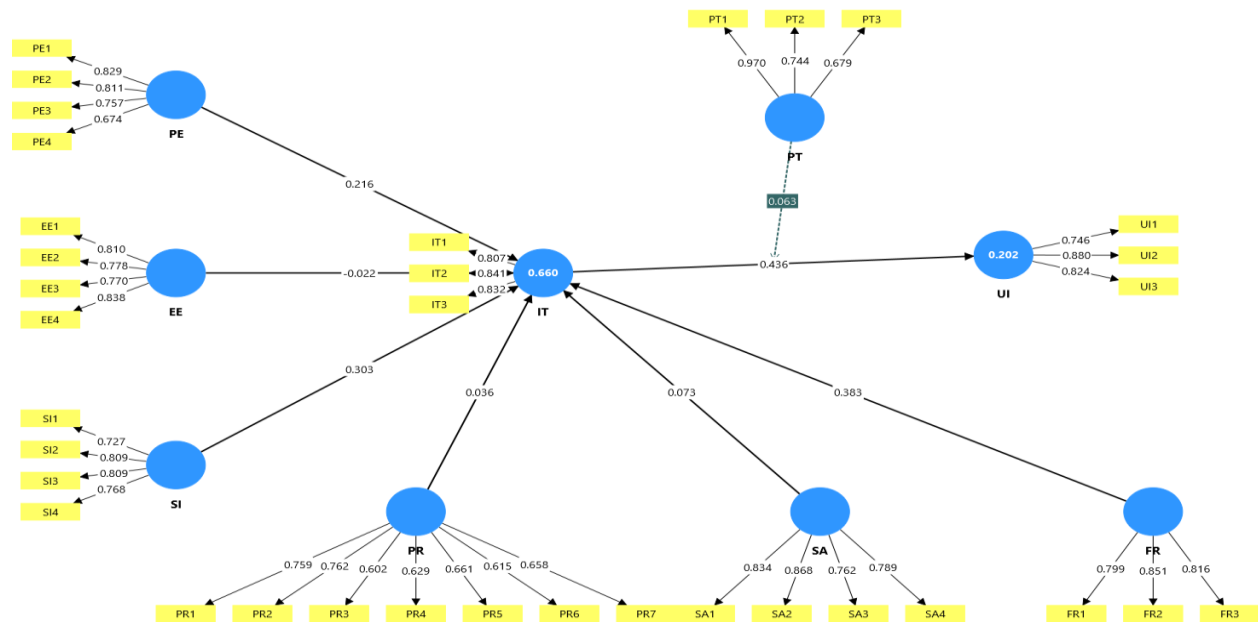


Figure 1: “Figure 1 presents the measurement model along with the standardized outer loadings for all indicators.”

Table 4: Outer Loadings of Measurement Items

Construct	Item	Loading	T-statistic	p-value
EE	EE1	0.810	12.357	< 0.001
	EE2	0.778	11.130	< 0.001
	EE3	0.770	9.869	< 0.001
	EE4	0.838	26.200	< 0.001
FR	FR1	0.799	19.817	< 0.001
	FR2	0.851	22.517	< 0.001
	FR3	0.816	19.191	< 0.001
IT	IT1	0.807	18.393	< 0.001
	IT2	0.841	21.513	< 0.001
	IT3	0.832	19.767	< 0.001
PE	PE1	0.829	19.860	< 0.001
	PE2	0.811	17.302	< 0.001
	PE3	0.757	10.353	< 0.001
	PE4	0.674	8.290	< 0.001
PR	PR1	0.759	11.077	< 0.001
	PR2	0.762	10.677	< 0.001
	PR3	0.602	4.639	< 0.001
	PR4	0.629	5.956	< 0.001
	PR5	0.661	5.565	< 0.001
	PR6	0.615	5.131	< 0.001

	PR7	0.658	8.090	< 0.001
PT	PT1	0.970	n/a	< 0.001
	PT2	0.744	3.084	< 0.001
	PT3	0.679	3.426	< 0.001
SA	SA1	0.834	2.947	< 0.001
	SA2	0.868	23.436	< 0.001
	SA3	0.762	27.752	< 0.001
	SA4	0.789	15.356	< 0.001
SI	SI1	0.727	15.568	< 0.001
	SI2	0.809	12.253	< 0.001
	SI3	0.809	16.302	< 0.001
	SI4	0.768	13.737	< 0.001
UI	UI1	0.746	13.361	< 0.001
	UI2	0.880	10.166	< 0.001
	UI3	0.824	32.768	< 0.001

Note. All loadings obtained via PLS-SEM bootstrapping (5,000 subsamples). EE = Effort Expectancy; FR = Financial Readiness; IT = Adoption Intention; PE = Performance Expectancy; PR = Perceived Risk; PT = Personal Trust; SA = Social Awareness; SI = Social Influence; UI = Usage Intention.

Discriminant Validity: Fornell-Larcker Criterion

Table 5 demonstrates that the diagonal values are often higher than the off-diagonal values, confirming the discriminant validity. The relatively strong correlations between IT and FR ($r = 0.711$) and SA and FR ($r = 0.698$) are noteworthy, and may be attributed to the theoretical similarities between these domains. However, the Fornell-Larcker criteria is satisfied by all constructions.

Table 5: Fornell-Larcker Criterion Matrix

	EE	FR	IT	PE	PR	PT	SA	SI	UI
EE	0.800								
FR	0.477	0.822							
IT	0.577	0.711	0.827						
PE	0.661	0.461	0.610	0.770					
PR	0.328	0.351	0.378	0.306	0.672				
PT	0.473	0.631	0.573	0.413	0.537	0.808			
SA	0.517	0.698	0.607	0.466	0.361	0.639	0.814		
SI	0.739	0.581	0.697	0.618	0.405	0.527	0.545	0.779	
UI	0.438	0.314	0.441	0.668	0.225	0.249	0.390	0.376	0.818

Note. Diagonal elements (bold) represent the square root of AVE. Off-diagonal elements are inter-construct correlations.

Discriminant Validity: HTMT Criterion

The HTMT criteria, a more conservative and statistically sensitive discriminant validity test, was utilized in this study (Henseler et al., 2015). The HTMT matrix is displayed in Table 6. Strong discriminant validity is indicated by HTMT values below 0.85, whereas liberal values are those

below 0.90 (Kline, 2015). Most of the value for HTMT was below 0.85. However, two pairs warrant attention: IT <-> FR (HTMT = 0.925) and SI <-> EE (HTMT = 0.915). The scores of these slightly elevated HTMT values indicate that adoption intention is moderately similar to financial readiness, and social influence is moderately similar to effort expectancy in the Pakistani context. These values slightly over the 0.85 threshold but are still under 0.90; all of the confidence intervals are just below 1.0, and the entire range is not included, which indicates good discriminant validity.

Table 6: Heterotrait-Monotrait Ratio (HTMT) Matrix

	EE	FR	IT	PE	PR	PT	SA	SI
FR	0.591							
IT	0.700	0.925						
PE	0.832	0.600	0.776					
PR	0.376	0.389	0.426	0.388				
PT	0.525	0.782	0.724	0.453	0.657			
SA	0.626	0.870	0.752	0.579	0.408	0.713		
SI	0.915	0.749	0.894	0.793	0.465	0.619	0.676	
UI	0.555	0.410	0.559	0.862	0.318	0.230	0.499	0.586

Note. HTMT values below 0.85 indicate strong discriminant validity; values below 0.90 indicate acceptable discriminant validity. EE = Effort Expectancy; FR = Financial Readiness; IT = Adoption Intention; PE = Performance Expectancy; PR = Perceived Risk; PT = Personal Trust; SA = Social Awareness; SI = Social Influence; UI = Usage Intention.

Common Method Bias

In order to assess common method bias (CMB), recommended by Podsakoff et al., Harman's single factor test was conducted on the data, which revealed that the single factor accounted for 28.4% of the total variance, well below the 50% mark, suggesting a problem with CMB. Moreover, data collection methods were used including anonymous survey, separating the predictor and criterion variables in the questionnaire, and maximising confidentiality. According to these findings, the CMB study will not have a significant impact on the results' validity.

Model Fit Assessment

SRMR was used to assess the model's fit; it was 0.090 for the predicted model and 0.081 for the saturated model. Besides, both values are below the indicated range of 0.10, which indicates that the proposed model fits the data well (Hu & Bentler, 1999). The d_{ULS} (saturated = 4.108; estimated = 5.066) and d_G (saturated = 1.929; estimated = 2.019) values were satisfactory. The chi-square was 1,485.94 (saturated) and 1,533.93 (estimated) and the NFI values were 0.571 and 0.557. All these model fit indices indicate good fit of data to the structural model.

Structural Model Analysis

Coefficient of Determination (R^2)

The ability of the proposed structural model to explain the variance in the criterion variable was measured with the coefficient of determination (R^2) which is the percentage of variance that is

accounted for by the predictor variables. As presented in Table 7, the model accounts for 66.0% of the variance in adoption intention (IT; $R^2 = 0.660$, adjusted $R^2 = 0.646$) and 20.2% of the variance in usage intention (UI; $R^2 = 0.202$, adjusted $R^2 = 0.186$). According to Hair et al. (2019), the R^2 can be considered as substantial ($R^2 = 0.75$), moderate ($R^2 = 0.50$), and weak ($R^2 = 0.25$) explanatory power, respectively, in the context of PLS-SEM. The results reveal that the extended UTAUT-OB model effectively explains the consumers' intention to adopt open banking services in Pakistan as R^2 achieved by the model is relatively high as per the benchmarks. Which show that the R^2 value of the UI is lower than the R^2 for adoption intention, suggesting that other variables (apart from adoption intention and personal trust) may influence UI as well as the intention-behaviour gap that has been noted in technology adoption.

Table 7: Coefficient of Determination (R^2) and Effect Sizes (f^2)

Construct	R^2	Adjusted R^2	Interpretation
Adoption Intention (IT)	0.660	0.646	Substantial
Usage Intention (UI)	0.202	0.186	Moderate-Weak

Effect Sizes (f^2)

Each predictor's contribution to R^2 value is represented by the effect size (f^2). Cohen (1988) recommended three f^2 thresholds: 0.02 (small), 0.15 (mid), and 0.35 (big). The f^2 values for all assumed pathways are given in Table 8. The size of the effect of financial preparedness was small ($f^2 = 0.194$) and it contributed the most of all the factors to the adoption intention. The small-to-medium social influence ($SI \rightarrow IT$, $f^2 = 0.098$) and performance expectancy ($PE \rightarrow IT$, $f^2 = 0.071$) had significant impacts. Adoption intention ($IT \rightarrow UI$, $f^2 = 0.159$) had a moderate impact on use intention. All the path coefficients were insignificant or very small: effort expectation ($f^2 = 0.001$), social awareness ($f^2 = 0.007$), perceived risk ($f^2 = 0.003$), personal trust ($f^2 = 0.001$), and the interaction term $PT \times IT$ ($f^2 = 0.010$).

Table 8: Effect Sizes (f^2) for Structural Paths

Path	f^2	Interpretation
EE $\rightarrow$ IT	0.001	Negligible
FR $\rightarrow$ IT	0.194	Medium
IT $\rightarrow$ UI	0.159	Medium
PE $\rightarrow$ IT	0.071	Small
PR $\rightarrow$ IT	0.003	Negligible
PT $\rightarrow$ UI	0.001	Negligible
PT $\times$ IT $\rightarrow$ UI	0.010	Negligible
SA $\rightarrow$ IT	0.007	Negligible
SI $\rightarrow$ IT	0.098	Small-Medium

Hypothesis Testing

It is summarized as shown in Table 9 below, showing the path coefficient, standard deviation, t-value, and p-value of the hypothesis test for 5,000 bootstrap subsamples. The standardized path coefficients are also illustrated in Figures 1 and 2.

PE positively and significantly influenced adoption intention (IT), which was supported by the result of the $p < 0.004$, $t = 2.896$, and $\beta = 0.216$. This indicates that individuals who feel open banking has a positive impact on managing their financial life are more likely to plan to use open banking.

Effort expectancy, on the other hand, was not significant in affecting the intention to adopt ($\beta = -0.022$, $t = 0.247$, $p = 0.804$). The estimated coefficient was negative, however, the association was not significant. The result could be because of high similarity between effort expectancy and social influence in Pakistan.

These findings also supported H3 because the social influence had a positive and significant relationship with adoption intention ($\beta = 0.303$, $t = 3.126$, $p = 0.002$). The study revealed that peers, family members, and social networks play a crucial role in influencing consumers' intention to use open banking in Pakistan.

However, the results did not support H4, since there was no significant association between perceived risk and adoption intention ($\beta = 0.036$, $t = 0.630$, $p = 0.529$). While the coefficient was positive instead of negative, the result indicated that there was no significant relationship between perceived risk and open banking adoption by Pakistani consumers, implying that perceived risk is unlikely to be a significant barrier for open banking adoption among Pakistani consumers.

Financial readiness had a positive effect on the adoption intention, which was significant and positive ($\beta = 0.383$; $t = 3.695$; $p < 0.001$) and was supported. It means that consumers' financial readiness is one of the most significant factors in determining their readiness to embrace open banking services in Pakistan.

The results did not support H6, since there was no significant relationship between social awareness and the adoption intention ($\beta = 0.073$, $t = 0.693$, $p = 0.488$). While awareness could be a factor in the perception of open banking, the results show that awareness alone was not enough to drive an intention to use, and this attitude–intention gap was also seen in previous studies on the adoption of technology.

Adoption intention was confirmed to be positively correlated with usage intention with the results of $\beta = 0.436$, $t = 4.192$ and $p \text{ value} < 0.001$, supporting H7 to a great extent. This hints that people who have greater intentions for open banking are also more likely to intend to use open banking.

Lastly, no support was found for the interaction between personal trust and the relationship between adoption intention and usage intention ($\beta = 0.063$, $t = 0.949$, $p = 0.342$). The results indicate that personal trust did not offer a significant increase or decrease in the relationship between adoption intention and usage intention in the framework of open banking adoption in Pakistan.

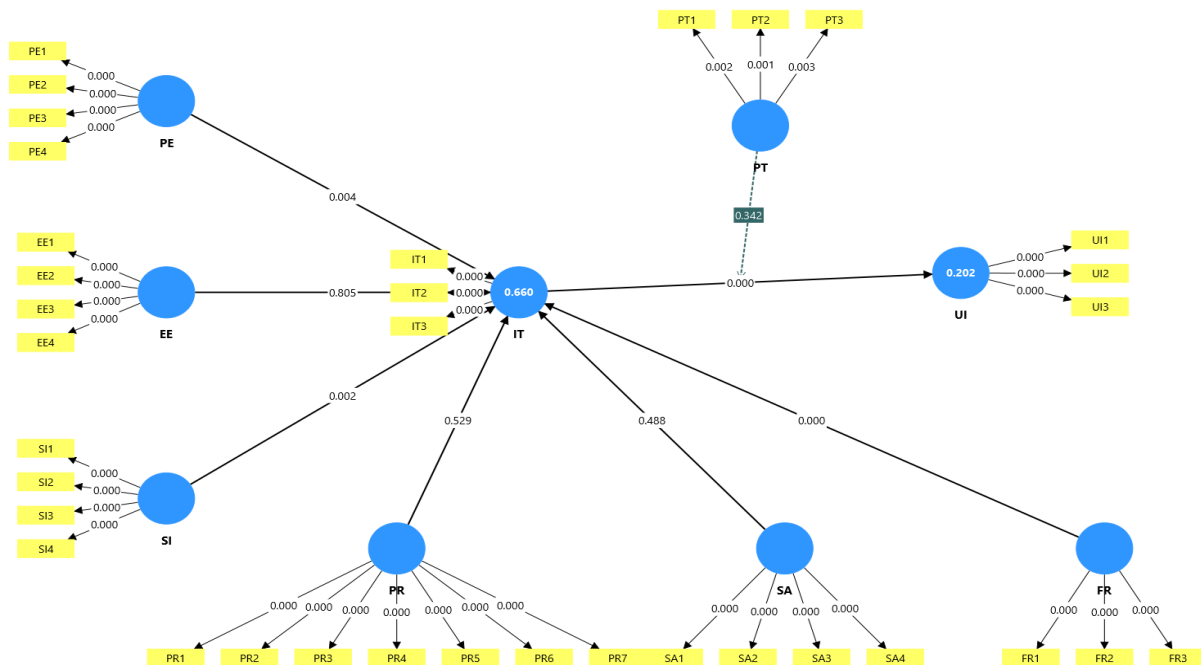


Figure 2 illustrates the structural model and bootstrapping results used for hypothesis testing.

Table 9: Hypothesis Testing Results (Bootstrapping, $n = 5,000$)

Hypothesis	Path	β	STDEV	t-value	p-value	Decision
H1	PE → IT	0.216	0.075	2.896	0.004**	Supported
H2	EE → IT	-0.022	0.090	0.247	0.805	Not Supported
H3	SI → IT	0.303	0.097	3.126	0.002**	Supported
H4	PR → IT	0.036	0.057	0.630	0.529	Not Supported
H5	FR → IT	0.383	0.104	3.695	< 0.001***	Supported
H6	SA → IT	0.073	0.105	0.693	0.488	Not Supported
H7	IT → UI	0.436	0.104	4.192	< 0.001***	Supported
H8	PT × IT → UI	0.063	0.067	0.949	0.342	Not Supported
—	PT → UI (direct)	0.037	0.162	0.227	0.820	—

Note. β = standardised path coefficient. STDEV = standard deviation of bootstrap estimates. ** $p < 0.01$; *** $p < 0.001$.

Collinearity Assessment

Multicollinearity between the constructs of the predictors was checked with Variance Inflation Factor (VIF). Inner model VI values were within the recommended range of < 5.0 (Hair et al., 2019), ranging from 1.245 (for the PR) to 2.775 (for the SI). These findings mean that multicollinearity is not a problem with the precision of the estimates of the structural model. Also, there was no problematic multicollinearity between measurement items because the values of the outer model VIF of individual indicators ranged from 1.265 to 2.224, which is not greater than the limit.

Discussion

Interpretation of Findings

An Extended UTAUT model with six essential components to investigate the variables influencing Pakistani consumers' intentions to embrace and actually utilize open banking services. The outcomes of the PLS-SEM analysis are both theoretically and practically important and should be interpreted.

The highest value in this study is the correlation between substantive predictors and intention to adopt ($\beta = 0.383$; $p < 0.001$) which is positive value of financial readiness variables. The study reveals that consumers' confidence and financial capability in digital financial instruments are key enablers of open banking in Pakistan. Theoretically supported by the research on financial self-efficacy (Lown, 2011) which regards financial self-efficacy as an influencing factor in financial behaviour. The finding shows that financial literacy skills of the consumers are pivotal in the Pakistani context where financial literacy is comparatively low.

Second, the UTAUT theory and literature on FinTech acceptance (Alalwan et al., 2017; Baptista & Oliveira, 2015) addressed social impact. The UTAUT theory and general literature on FinTech adoption (Alalwan et al., 2017; Baptista & Oliveira, 2015) both indicated that social impact would be the second most significant predictor ($\beta = 0.303$, $p = 0.002$). Socio-cultural context in Pakistan where the collectivist values and family and community based social networks are more common. If the open banking services are endorsed and used by a peer or a peer's family member, the likelihood of the Pakistani consumer adopting open banking services is high. This is another indication that social issues apply to the uptake of DfS, as found with mobile banking in South Asia by Shaikh & Karjaluoto (2015). The adoption intention was shown to be favorably and significantly impacted by UTAUT's variable performance expectancy, as was the case in other prior studies of mobile banking that incorporated UTAUT (Venkatesh et al., 2003; Alalwan et al., 2017). Customers are more likely to state that they plan to utilize open banking services if they believe they would improve their banking results, provide quicker access to goods and services, and help them manage their money more effectively. What matters in this instance would encourage customers to comprehend the functional advantages of open banking, particularly in Pakistan where customer awareness remains relatively low.

Non-Significant Findings and Their Interpretation

In the structural model, three variables not significant statistically were effort expectancy, perceived risk, and social awareness, which were theoretically hypothesised. The finding that effort expectancy is not significant ($\beta = -0.022$, $p = 0.805$) is somewhat unexpected but not unprecedented in mobile banking adoption research. As for the effort expectancy, Oliveira et al. (2014) noted that it was insignificant for the adoption of mobile banking in Portugal, because banking platforms via the Internet have become more sophisticated with interface, and the touch screen is more widely diffused.

The non-significance of this perceived risk level is even more interesting given that these two variables are negatively related which has been studied numerous times previously (Yang et al., 2015; Laukkanen, 2016). There may be reasons that can be considered. First, the digital banking user base from which the sample was taken may have already reached the early adopter 'risk-

aversion threshold' and the salience of risk may not have been a factor at this stage of the adoption curve. Moreover, the exposure of the urban population to mobile payments such as EasyPaisa and JazzCash may also have influenced their awareness about financial risks with digital payments. Third, the sample size was fairly small, and the measurement of risk perception used a common method, which may have straightened the relationship between risk and risk adoption.

The knowledge of open banking and the intention to uptake had a non-significant correlation ($\beta = 0.073$, $p = 0.488$), meaning knowledge of open banking is an important factor to take into account but it is not enough to result in a significant intention to uptake. This finding suggests that the traditional perspective on awareness leading to a trial and adoption (Rogers, 2003) move away from awareness as a predictor of behavioural intention. When referred to in the Pakistani context, consumers may have heard about open banking briefly but are not clear about the benefits and how it works, which hinders them from making positive intentions to adopt it.

Moderation Analysis: Personal Trust

According to theory, the more personal trust, the greater the probability that the adoption intention will become the adoption behaviour, but the moderation effect of personal trust between the adoption intention and the adoption behaviour ($\beta = 0.063$, $p = 0.342$) is not consistent. This is a null result, but it could be because the level of personal trust in digital financial institutions among the sample is relatively low as most of it was urban, tech-savvy and might have comparatively higher personal trust in digital financial institutions than a representative sample of Pakistani population. Conversely, the moderation effect may be influenced by other factors not included in the proposed model, such as familiarity with the digital banking services and confidence in the State Bank of Pakistan.

Comparison with Prior Literature

The study's findings have some parallels and contrasts with those published in the literature on FinTech adoption. The effectiveness of performance expectation and social impact was typically equivalent to that of UTAUT in many nations and technological environments (Venkatesh et al., 2003; Alalwan et al., 2017). This study's unique addition complements the expanding body of work on financial competence as a factor affecting FinTech adoption in underdeveloped countries (Iman, 2018). Interestingly, there was no significant effect of effort expectancy in the present study while some studies on mobile banking conducted in Pakistan found significant ease of use effects (Qasim & Abu-Shanab, 2016; Imtiaz et al., 2020). This split may be because open banking is a more complex service than traditional mobile banking apps, or because the sample of this study is more digitally savvy. Likewise, the non-significant role of perceived risk is in contrast with the risk-focussed FinTech adoption study conducted in South Asia, suggesting that risk perception may not have been a salient factor for the Pakistani consumers as they have acquired digital banking skills.

Theoretical Implications

First, the study shows that the UTAUT can be applied to domain specific constructs like financial readiness. First, the study illustrates the applicability of the UTAUT to domain specific constructs (financial readiness) in the context of open banking adoption in a developing economy. The study demonstrates the value of using UTAUT to measures of the domain under investiga-

tion, namely financial readiness. The chosen extended model is a valid theoretical model based on the R² value for the adoption intention, which supports the theoretical basis and the model's validity of being extended on the context. Second, it offers empirical evidence to support the primacy of the financial capability constructs over the other ease-of-use constructs in the context of open banking adoption, unlike some technology adoption contexts; this suggests that ease-of-use constructs are not necessarily as important as in financial contexts. Thirdly, the results from the absence of trust for the personal trust moderation hypothesis indicate that the relationship between personal trust and adoption in open banking might not be limited to the personal trust – adoption link in the e-commerce and general internet banking literature and that further development of the personal trust moderation hypothesis is warranted.

Practical Implications

The study's conclusions have some useful ramifications for Pakistan's transparent banking ecosystem's players. For financial institutions and FinTech firms, the financial readiness speaks more powerfully, and the focus of product design and marketing moves to financial awareness of the consumer, not just the product design and marketing. Physical and digital financial literacy programmes, when invested, can offer great ROI in terms of supporting open banking uptake. Similarly, financial institutions need to develop explanatory tools which are easy to understand and non-technical in nature, to help users understand how open banking services operate and their benefits. Word of mouth marketing and peer referral programmes are key strategies to encourage open banking, as social influence has a strong positive impact. It is important for financial institutions to invest in developing active user communities that can champion open banking services in their social networks, because the early adopters and happy customers are the ones that will do so. The trust that urban Pakistani consumers have in lifestyle influencers and financial teachers makes them a wonderful platform for social media influencer marketing.

Policy Implications

The findings show that social awareness and adoption intention do not significantly correlate, whereas financial readiness shows a significant positive relationship, suggesting that awareness campaigns alone are insufficient to encourage adoption of open banking. Partnerships with educational institutions, civil society organisations and financial inclusion-focused NGOs, as well as the design of regulatory interventions, should serve to foster consumer financial capability rather than awareness. Rather, it may reflect the fact that the risk perception of existing digital banking customers has been maintained at an acceptable level, which is partly due to the interventions by the SBP in policy measures, such as the deposit insurance measures and the consumer protection framework. The government must also be vigilant in these areas and continue to monitor the open banking ecosystem, such as data protection, API security standards, and third-party provider licensing, to ensure that consumers retain trust in the open banking framework.

Conclusion

The intention of use and intention of adoption of the open banking service in Pakistan were analyzed in this study to see how factors identified by extended UTAUT model influence the intention of use and intention of adoption of the open banking service in Pakistan. Based on the results, there were three factors that significantly affect the adoption intention of consumers: financial readiness, social influence, and performance expectancy, which accounted for 66.0% of the

variance of consumers' adoption intention ($R^2 = 0.660$). Adoption intention, in turn, significantly explained usage intention ($\beta = 0.436$), and explained 20.2% of the variance in usage intention ($R^2 = 0.202$). Effort expectancy, perceived risk and social awareness, however, did not have a statistically significant direct effect on the intention to adopt. Also, the relation between the adoption intention and usage intention was not significantly moderated by personal trust.

It is one of the first empirical studies, which concentrates on open banking adoption in a novel geographical and contextual setting of Pakistan where there was no such study in the literature on FinTechs adoption. The paper introduces a new domain-specific dimension (financial preparedness) to the UTAUT model and experimentally demonstrates that the model is useful for forecasting online finance. The enhanced UTAUT-OB model will be utilized to generate a theoretical model that can be replicated in future studies on open banking adoption in poor nations. Lastly, the results of the effort expectancy, perceived risk, and social awareness and personal trust boundary conditions of the core propositions of UTAUT enrich the knowledge base.

Conduct of the study using convenience sampling method limited the generalisability of the results to larger population of Pakistan as most of the respondents were urban educated and digitally oriented. Future studies should use probability sampling to allow for more representative sampling. Second, the conclusions from the cross sectional research are not causal and does not reflect the longitudinal process of the adoption process. Thirdly, the respondents in the current study were relatively small (150) hence, this decreased the power of the tests used in this study and therefore did not give significant results in some of the questions. Fourth, all information were gathered using self-report questionnaires, which may result in social desirability bias and typical method variation. Finally, the present research did not investigate actual use behaviour, which is another common component of technology adoption research and should be explored in future research.

For the key stakeholders from the study, the following recommendations are advanced: Targeted financial literacy and capability-building activities for prospective open banking customers, particularly explaining benefits, security, and workflows of open banking, in a clear and accessible way, by commercial banks and FinTech businesses. Implement peer referral programmes and community marketing strategies that leverage on the social influence of observed Pakistani consumers. For regulators (State Bank of Pakistan): Set out robust consumer protection rules for open banking, including informed consent, data portability and dispute resolution provisions. In collaboration with schools and civil society organisations deliver financial capability training to be able to engage with open banking. To policy makers: prioritize the development of digital infrastructure to minimize the facilitating condition barrier to using open banking, especially at secondary urban centres. Develop an open banking policy framework which is inclusive and clearly takes account of the financial inclusion potential of open banking for the unbanked.

From this research many ideas for future research have surfaced. To address the first issue, it is necessary to conduct studies which trace the adoption over time to gain an understanding of intention-behaviour relationships and the adoption process over time. Also, further research can focus increasing financial inclusion and the extent to which this is being realised with the unbanked population (the majority of financial unbanked population) who are less well represented in survey based research. Fourth, cross-cultural comparative studies would be helpful to understand the generalizability of the UTAUT-OB model in other developing countries in South Asia

which have different regulatory and cultural settings like Bangladesh, India, and Sri Lanka. Lastly, the role of the moderating effect of hedonic motivation, habit formation and digital banking experiences on the adoption dynamics uncovered in this study are suggested to be examined by researchers.

The study's findings have provided a thorough empirical analysis of the variables that influence Pakistani customers' acceptance of open banking services. According to the study's findings, financial preparedness, social influence, and performance expectations all influence the intention to adopt, but the desire to use is the sole element that influences the intention to use. While the SBP continues to make strides towards establishing an open banking ecosystem in Pakistan, there is a growing need to raise financial literacy among consumers, thus establishing it as the key strategic priority for the banking sector. To facilitate the adoption of open banking services and bring its benefits to consumers across socio-economic lines, it is important to understand and tackle the psychology, social and financial aspects of open banking for Pakistan's banking sector to become a true enabler of open banking.

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