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"Impact of Fintech Innovation on Digital Financial Literacy in Pakistan Insight from the Banking Industry"

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Abstract

This study critically examines the impact of fintech innovations on digital financial literacy in Pakistan, utilizing a sample of 102 respondents. Through a quantitative research design, structured surveys were used to collect data and assess the relationship between fintech adoption and financial literacy levels. The analysis reveals that fintech innovations are a significant predictor of digital financial literacy, underscoring the critical role of technological advancements in enhancing financial knowledge and capabilities.

The research findings align with established theoretical frameworks, including the Technology Acceptance Model and the Theory of Planned Behaviour, which highlight the importance of perceived ease of use and usefulness in technology adoption. The results demonstrate that fintech innovations significantly contribute to improved financial literacy, facilitating greater financial inclusion and economic empowerment.

Policymakers are encouraged to develop regulatory frameworks that support fintech innovation while ensuring consumer protection and data security. Investment in digital infrastructure, particularly in rural areas, is vital to enable broader access to fintech services. Educators should integrate digital financial literacy into curricula at all educational levels, and industry practitioners should focus on developing user-friendly fintech applications and engaging in public-private partnerships.

Despite its valuable contributions, the study acknowledges limitations such as its cross-sectional design and reliance on self-reported data, suggesting the need for longitudinal and qualitative research to capture deeper insights and long-term trends. Overall, this research highlights the transformative potential of fintech in enhancing digital financial literacy and provides strategic recommendations for leveraging fintech to achieve broader economic development in Pakistan.

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Chapter 1

1. Introduction

1.1. Background of the Study

Financial technology (fintech) has transformed the financial industry. Technology-enabled financial services have made transactions faster, easier, and safer. Digital payment systems, online banking platforms, and blockchain technology have emerged from global fintech growth. These transformed traditional financial services (Lukonga, 2018). Pakistan's fintech industry has proliferated due to increased internet and smartphone access and supportive government policies (Butt & Khan, 2019). Today's financial world necessitates digital financial literacy or knowing how to use different digital financial services. It involves digital payments, online banking, and computer security (Setiawan et al., 2021). Digital financial literacy is essential; it lets people manage their finances, make intelligent choices, and avoid cyberattacks online. Pakistanis struggle with digital finances, challenging fintech solutions (Manzoor et al., 2021).

Pakistan's banking industry was one of the first to use fintech to improve customer service and experience. Banks have added mobile banking apps, internet banking platforms, and digital wallets to simplify financial services (Butt & Khan, 2019). Habib Bank Limited (HBL) and United Bank Limited (UBL) have launched complete digital banking solutions, making their services more accessible and practical. Despite these improvements, digital financial services are still unevenly distributed mainly because most people do not understand digital finances (Manzoor et al., 2021).

According to statistics, Pakistanis need to learn more about using technology to manage their finances. The Pakistan Telecommunication Authority (PTA) found that 21% of adults use digital financial services (PTA, 2020). This low adoption rate is partially due to individuals lacking or understanding these services. The State Bank of Pakistan (SBP) found that 62% of respondents were unaware of digital transaction security. This suggests knowledge gaps (SBP, 2021). Fintech could improve financial inclusion in Pakistan by providing digital solutions to non-bankers. Only if people understand and use these innovations will they work. Therefore, the banking sector is crucial in deploying fintech solutions and educating the public about their benefits and safe use (Supriadi et al., 2023). In summary, fintech innovations can improve Pakistan's financial system and make it more accessible, but digital financial literacy management beginners are a problem. The banking industry must launch targeted education and awareness campaigns to address this challenge. This dissertation analyses how fintech innovations have changed digital financial literacy in Pakistan by examining banking challenges facing the industry.

1.2. Problem Statement

Financial technology (fintech) in banks has been termed a game-changer worldwide, but little is known about how it affects Pakistanis' online finance management. Fintech solutions are becoming more popular, but little is known about how they affect Pakistani consumers' digital financial literacy (Butt & Khan, 2019). Fintech's effects on economic growth and financial inclusion have been studied extensively, but digital financial literacy has not (Lukonga, 2018). A major challenge in Pakistan is that different groups know different things about digital finances. In 2021, 21% of Pakistanis used digital financial services, according to the State Bank. This implies that many must learn and recognise them. Technology access, digital

platform concerns, and digital literacy education gaps lower adoption rates (Manzoor et al., 2021).

Digital KYC and other barriers make onboarding difficult, so Pakistani fintech is preferred. Rural, underdeveloped communities without internet or smartphones face infrastructure issues first (Butt & Khan, 2019). There is a lack of targeted educational programs to bridge the knowledge gap in the more complex ecosystem of digital financial services; second, university students are reluctant to switch to online banking due to cultural preference for traditional banks (Setiawan et al., 2021). Public awareness campaigns and training on financial institutions' fintech solutions are needed (Supriadi et al., 2023), while cybersecurity and regulations affect fintech adoption (Lukonga, 2018).

1.3. Research Objectives

Primary Objectives

I. To critically evaluate the impact of fintech innovations on digital financial literacy in Pakistan's banking sector.
II. To identify and analyse the specific fintech innovations that most significantly influence digital financial literacy in Pakistan.
III. To assess the barriers and challenges that the banking industry faces in promoting digital financial literacy through fintech solutions.

1.4. Research Questions

I. How have fintech innovations critically impacted digital financial literacy in Pakistan's banking sector?
II. Which fintech innovations have the most significant influence on enhancing digital financial literacy in Pakistan?
III. What does the banking industry in Pakistan face as the primary barrier and challenge in promoting digital financial literacy through fintech solutions?

1.5. Significance of the Study

This study is essential for researchers, policymakers, and entrepreneurs because Pakistan's financial situation is changing rapidly. This study investigates how fintech innovations affect digital financial literacy, a neglected topic. It fills knowledge gaps that can boost literacy and fintech adoption. This study fills in critical academic literature gaps. Fintech and financial literacy research is widespread, but few studies focus on Pakistan. The research will provide real-world data and analysis for future studies and theoretical models. Understanding Pakistan's banking sector's unique challenges and opportunities can help academics create region-specific frameworks for similar emerging markets (Bakhshi et al., 2024).

Policymakers can use the study's findings to improve digital financial literacy. The State Bank of Pakistan (SBP) and other regulatory bodies can use the study's findings to create educational programs and policies that address the challenges. Rural residents can use digital financial services more easily if policies encourage them to get online and use their phones (Velazquez et al., 2022). For users wary of fintech due to cybersecurity concerns (Johnson et al., 2023), the study can help create safe and secure rules. This study shows that industry professionals,

especially bankers, must combine fintech solutions with vital educational programs. The study's findings can help banks create fintech products that are simple to use, increasing their adoption. Knowing which fintech innovations impact digital financial literacy most can help banks invest in technology (Butt & Khan, 2019).

The study's findings would enable individuals in Pakistan to manage their finances using technology. The study can improve educational materials and training by identifying the most critical fintech innovations that affect literacy. Easy-to-use digital payment systems and mobile banking apps can be promoted (Lukonga, 2018). The Pakistan Telecommunication Authority (2020) found that digital literacy campaigns increase the use of digital financial services. Targeted awareness programs increased mobile banking transactions by 15%.

The study may also simplify fintech use. The study can help financial institutions improve outreach by examining fintech barriers like trust and knowledge. Campaigns promoting online safety and ease of business can reduce fintech doubts (Andriani et al., 2023). By revealing socioeconomic factors influencing fintech adoption, the study can help women and rural residents who are not always served (Kiky, 2023) better meet their needs. This study relies on statistical data to support its claims. According to a 2021 SBP survey, 62% of Pakistanis do not know about digital financial services. Improving literacy programs is crucial. The World Bank (2020) found that countries with higher digital financial literacy adopt fintech more. This suggests a direct link to increased Pakistani fintech adoption. This study provides valuable information for academic research, policymaking, and business practices. It examines how fintech affects digital financial literacy to make Pakistan's financial system more open and digitally literate.

1.6. Scope and Limitations

This study examines how fintech innovations have changed Pakistan's banking sector's digital financial literacy. This study investigates how financial management is affected by fintech solutions like mobile banking apps, digital wallets, and online banking platforms. The study uses quantitative methods, specifically structured questionnaires, to gather data from Pakistanis of all ages, genders, and socioeconomic backgrounds. This comprehensive approach aims to show digital financial literacy levels and how fintech innovations improve them. This study covers Pakistani banking only. It ignores microfinance banks, insurance companies, and non-banking financial institutions. This is important to study because Pakistani banks use fintech innovations most (Manzoor et al., 2021). The research examines urban and rural areas to get a representative sample of Pakistanis. Only fintech innovations introduced and working in Pakistan as of 2023 are examined. This keeps data current.

Despite its many features, the study may have challenges that affect the results. Structured questionnaires increase sample bias, a significant challenge. Poor infrastructure makes rural people harder to reach, so this method may not represent them enough (Butt & Khan, 2019). Another concern is response bias, when people give socially acceptable answers instead of honest ones. Such can happen when asked about financial knowledge and technology use (Lusardi & Mitchell, 2017). Technology can also be hard to get. Various Pakistani localities use the internet and smartphones differently, making the study's findings hard to apply. Khan et al. (2020) find that financial inclusions may not be accurately captured in low-tech areas. Because they do high-frequency trading, and fintech is fast-paced, your great idea will be outdated tomorrow. This study may not cover current Fintech changes (Puschmann, 2017).

New technologies often face cultural resistance, making fintech field evolution difficult. This cultural barrier should be considered when predicting loadings (Hassan et al., 2020). The regulatory environment may affect study results. Regulatory changes during the study may affect Fintech adoption and use (Lukonga, 2018). Fintech's impact on digital financial literacy in Pakistan's banking sector was the study's primary focus, but it had limitations. These challenges must be addressed in research design and data collection to ensure study validity and reliability. This study will significantly improve Pakistani fintech and digital financial literacy.

1.7. Research Methodology Overview

This quantitative study examines how fintech innovations have changed Pakistan's banking sector's digital financial literacy. The primary data collection method will send straightforward questionnaires to a representative group of Pakistani cities and rural residents of various ages, genders, and socioeconomic backgrounds (Kusumawardhani et al., 2023). Bank and fintech users are targeted. Widyaputri and Gunanto (202) recommend using SEM to find correlations and causes in data analysis. This method helps us understand how fintech innovations affect digital financial literacy by considering user trust, technological accessibility, and socioeconomic factors (Rahman, 2024).

1.8. Structure of the Dissertation

The dissertation includes 5 chapters. Chapter 1 provides context for the study by introducing the topic, objectives, and questions. Chapter 2 discusses fintech and digital financial literacy literature. Chapter 3 describes the research methodology, including data collection and analysis. Chapter 4 reports the findings on fintech and digital financial literacy in Pakistan. Finally, Chapter 5 discusses the findings and makes policy, industry, and future research recommendations.

Chapter 2

2. Literature Review

2.1. Introduction

This chapter reviews all the research on how fintech innovations have affected Pakistan's banking sector's digital financial literacy. Find critical ideas, research related theories, and determine how fintech and digital financial literacy relate. This review critically evaluates previous studies and identifies knowledge gaps, preparing for the subsequent empirical analysis.

2.2. Conceptual Framework

Fintech, the term for "financial technology," encompasses a variety of emerging technologies designed to improve financial services. Examples include mobile banking, blockchain, digital payments, and peer-to-peer lending (Amnas et al., 2024). Fintech makes financial services more accessible, faster, and more straightforward. This increases money access and economic growth. However, digital financial literacy involves understanding, using, and managing digital finance tools. According to Wu and Peng (2024), it means understanding digital financial services, safe digital transactions, and digital finance risks. Individuals who want to use fintech and make informed financial decisions need digital financial literacy. Fintech and digital financial literacy benefit each other. Fintech innovations can improve digital financial literacy by providing user-friendly interfaces and educational resources (Bermeo-Giraldo et al., 2023) for financial tools. Knowledge of digital finances increases trust and the use of digital financial services, which can boost fintech (Uddin & Shelina, 2023).

Financial technology and digital financial literacy theories vary. The Technology Acceptance Model (TAM) describes technology adoption. According to Wu and Peng (2024), TAM states that technology use is driven by perceived ease and usefulness. These influence fintech adoption. Everett Rogers' Diffusion of Innovations Theory is also helpful. Why do modern technologies and ideas transcend cultures so easily? This theory states that different groups use fintech (Tahir & Sudarmoyo, 2023)

The Theory of Planned Behaviour (TPB) states that affect, subjective norms, and perceived behavioural control influence intentions. Digital financial literacy and fintech-specific mindsets influence their use, as reported elsewhere [12]ORIZONTAL)shear Reduced et al. (2020). Fintech is helping close the bank account gap and increase financial inclusion. According to the literature, digital financial services reduce transaction costs and increase transaction reach (Pentury, 2023). How well these two new capabilities work depends on the user's digital financial literacy. Low digital literacy in Pakistan makes fintech adoption difficult (Lobozynska et al., 2021). Fintech and digital financial literacy could improve tech adoption for economic empowerment.

2.3. Fintech Innovations in the Banking Sector

Financial technology has transformed global finance. Traditional banking has become more efficient, user-friendly, and customer-friendly. Mobile banking, digital payments, blockchain, and peer-to-peer lending are global fintech innovations (Harsono & Suprapti, 2024). Mobile banking apps make banking more accessible and reduce the need to visit the bank (Borysiuk et

al., 2023-5). PayPal, Apple Pay, and Alipay have accelerated and secured transactions (Dharmadasa, 2021).

According to Bobryshev (2023), blockchain technology decentralises transactions, improving security and openness, which are crucial for financial transactions. Online lenders like LendingClub and Prosper allow anyone to borrow money. Borrowers and lenders are connected directly, eliminating intermediaries (Meyer & Okoli, 2023). These new ideas have opened the financial system to groups that did not have them before.

Pakistan's fintech scene has changed quickly due to more internet and cell phone use and supportive regulations. Pakistan's most significant fintech innovations are mobile banking apps, digital wallets, and blockchain-based financial services (Akymenko & Mamontenko, 2021). UBL and HBL, two central banks, offer complete digital phone banking solutions. These mobile banking apps allow users to manage accounts, transfer money, and pay bills. Pakistanis love digital wallets like Easypaisa and JazzCash for safe, fast online transactions. These platforms enable online money transfers, bill payments, and purchases, promoting financial inclusion (Tahira & Sudarmoyo, 2023). Blockchain technology may make financial transactions safer and more transparent. Onunka et al. (2023) report that Pakistani fintech startups are developing blockchain-based banking solutions to reduce fraud.

Traditional banking has changed business practices and customer service due to fintech. Fintech competition has forced traditional banks to innovate and improve services. Digital payment systems and mobile banking have reduced bank branch dependence, reducing bank costs and increasing efficiency (Dharmadasa, 2021). Customers are satisfied because FinTech makes services more personalised and user-friendly. Using AI and machine learning in fintech, banks can offer personalised financial products and services, satisfying customers (Borysiuk et al., 2023). Fintech streamlines financial transactions (Meyer & Okoli, 2023). This has reduced wait times and improved service. However, fintech has caused challenges for traditional banks. More fintech startups have reduced traditional banks' payments and lending market share (Harsono & Suprapti, 2024). Rapid technology changes require banks to purchase and update existing technologies, which can be resource-intensive (Bobryshev, 2022). In conclusion, fintech innovations have changed the banking industry in Pakistan and worldwide. New ideas have made things easier to get to, more efficient, and better for customers, but they have also made traditional banking models harder to use. Fintech's growth will likely change the financial services industry, making the financial system more open and effective.

2.4. Digital Financial Literacy

Digital financial literacy helps individuals use digital financial services correctly, make smart financial decisions, and stay safe online in today's digital economy. Online banking, mobile wallets, digital payment systems, security, and the financial world are covered. Digital financial literacy improves financial health and inclusion (Lyons et al., 2019). To use digital financial services safely and effectively, digital financial literacy is needed as the number of services grows. Digital financial literacy includes knowing about digital financial products, using digital tools for financial transactions, understanding digital finance risks, and protecting personal financial information. These parts enable people to use digital financial services fully, boosting the economy (Rehman & Mia, 2024).

Digital financial services are difficult to use in Pakistan because people do not understand them. Ullah et al. (2022) found that a digital literacy gap makes digital payment systems and mobile

banking less accessible. Rural areas and women face more significant challenges accessing digital financial services due to social and cultural barriers (Amber & Chichaibelu, 2023). Pakistan has tried to improve digital financial literacy despite these challenges. SBP and other financial institutions teach people about the benefits and uses of digital financial services. As shown by the low use of digital financial services nationwide, these efforts have had little impact (Khan & Siddiqui, 2019). Lacking comprehensive digital financial literacy programs, many people struggle to use digital tools safely and effectively (Ejaz & Qayum, 202).

Pakistani digital financial literacy depends on education, technology, socioeconomic status, and culture. Educated people use digital financial services better (Maji & Laha, 2020). Smartphones and the internet are essential. Poor technology infrastructure slows digital financial services, say Ansari et al. (2024)—socioeconomic status matters. Fewer low-income people have access to digital technologies and education on financial services. Aijaz et al. (2024) say this income gap worsens the digital divide and hinders financial inclusion. The cultural views on technology and money affect digital financial literacy. Older people and women may resist new tech in conservative areas (Liu et al., 2021).

Self-control, which is optimism, and loss phobia can hinder financial learning and decision-making. These biases can lead to bad financial decisions, making digital financial literacy harder to improve (Liu et al., 2021). Financial literacy programs must address these behaviours to improve money management. Government policies and institutional support are also important. Clear regulations encourage digital financial literacy. Toor et al. (2024) recommend teaching digital skills in schools and raising awareness to improve digital financial literacy. Finally, Pakistan must address education, technology, society, and cultural barriers to digital financial literacy. Teaching people to manage their money with technology in Pakistan can boost financial stability, empowerment, and inclusion.

2.5. Impact of Fintech on Digital Financial Literacy

Fintech has changed the global financial landscape, improving financial literacy. According to Rahman, blockchain, digital wallets, and mobile banking simplify money education. These novel ideas simplify financial transactions, making money management more effortless. Users become financially savvy from digital tools (Lyons et al., 2019). Wicaksana (2023) analyses how fintech money management education promotes financial inclusion and long-term growth. The report says fintech is essential to connect bank accounts and make financial services accessible to all. Fintech can reduce economic inequality by giving underprivileged groups financial resources. This increases their economic power and helps them learn more about money (Miah, 2023).

Khan and Farooqui (2023) examined fintech during COVID-19. They said fintech services increased digital financial literacy as more people used digital banking and payment solutions. The study found that more people using fintech platforms during the pandemic raised awareness and knowledge of digital financial tools, improving financial literacy. More Pakistanis are realising that fintech has changed digital financial literacy education. Research shows that fintech innovations are slowly changing finance. However, significant challenges remain. Khan and Siddiqui (2019) found that low digital literacy makes digital financial services harder to use in Pakistan. This applies especially to women and rural residents. Despite these challenges, good things are happening. Ullah et al. (2022) found that digital literacy strongly influences mobile payment and banking use. This suggests that digital financial literacy may increase fintech use.

In Pakistan, Ejaz and Qayum (2023) found gender differences in financial inclusion and literacy. According to their research, women are less likely to use digital financial services because they do not know how. This shows why women need specific educational programs to learn how to use technology to manage their money. They can become financially included. Amber and Chichaibelu (2023) noted that Pakistan has many social and cultural barriers to digital financial literacy. Their research showed that cultural resistance and a lack of digital skills make using cell phones for financial transactions complex, even though more people have them. They propose comprehensive literacy programs to solve these challenges and open the financial world.

Pakistanis are learning digital financial literacy management with new fintech innovations. HBL and UBL's mobile banking apps make banking easier. These apps provide educational materials and simple interfaces to help people manage their money (Ullah et al., 2022). Ejaz and Qayum (2023) say digital wallets like JazzCash and Easypaisa have improved digital financial literacy by simplifying transactions and providing safe, user-friendly platforms for daily financial activities. Blockchain technology is another new idea that could teach digital financial literacy management. Blockchain makes transaction records clear and safe, helping people understand and trust digital financial processes, according to Rahman (2024). Fintech companies should also partner with educational institutions on educational projects.

2.6. Challenges and Barriers

Pakistan faces many significant fintech challenges. One major challenge is the perception that fintech services have high transaction costs. Dependability, uncertainty, asset specificity, ease of use, and complexity affect how consumers view these costs, according to Zhao et al. (2024). High transaction costs deter fintech users, especially in traditional banking markets. Trust and safety are also crucial. Digital financial services are distrusted due to fraud and cyberattacks (Wahga et al., 2023), making fintech less popular.

Another challenge is that people prefer cash transactions. Pakistanis are still wary of digital financial services, so cash is still the main form of payment. Fintech adoption is difficult due to this ingrained cultural preference (Butt & Khan, 2019). Fintech services are also poorly understood, especially by educated and rural people, slowing adoption (Imam et al., 2022).

Teaching Pakistanis how to use technology to manage their money is difficult. Poor school facilities are a significant challenge. Few schools teach digital financial literacy, so students are unprepared for the digital financial world (Ejaz & Qayum, 202). Due to this education gap, many people still struggle to use digital financial services. Increased social and economic inequality worsens the challenge. Aijaz et al. (2024) say low-income people often lack the technology and resources to learn digital financial literacy. Fintech benefits the rich but not the poor, creating a digital divide—gender differences in digital financial literacy. Social and cultural norms limit women's access to digital financial tools and education.

Due to cultural barriers, Pakistanis struggle to use fintech and manage digital financial literacy. As mentioned, Pakistani culture values cash transactions. Cultural resistance is difficult to overcome, especially in rural areas where old-fashioned finance management is joint (Butt & Khan, 2019). Socio-cultural norms also limit women's financial services, widening the gender gap in financial literacy and inclusion (Amber & Chichaibelu, 2023). Infrastructure challenges matter, too. Pakistan's digital infrastructure is significantly poor nationwide. Wahga et al. (2023) say low smartphone and internet access make fintech solutions harder to use. If digital

infrastructure is weak, educating people about digital financial literacy and fintech will not work. Challenges with regulations complicate things. Fintech regulation has been attempted, but there are still gaps and inconsistencies. Regulation uncertainty can prevent fintech companies from entering the market and investing in new ideas (Imam et al., 2022). Fintech startups may struggle to comply with strict rules, preventing them from growing and serving more people (Lukonga, 2018).

2.7. Strategies and Best Practices

Fintech's creativity and ease of use can improve digital financial literacy in many ways. Promote financial education with easy-to-use fintech apps, in-depth educational programs, and public-private partnerships. Making fintech apps simple is smart. These apps should have simple interfaces to increase digital financial tool use and simplify transactions. Balaskas et al. (2024) recommend in-app tutorials and educational materials to improve tool use. Mobile banking apps that demonstrate transactions can boost digital financial literacy.

Also important are educational programs. Both formal and informal education should have these programs. Schools and colleges can teach digital financial literacy, and community centres and non-profits can hold workshops and seminars. Online courses and webinars can expand these educational programs and give students of all ages and backgrounds more flexible learning options (Supriadi et al., 2023). Growing financial education requires public-private partnerships. Fintech companies, banks, schools, and government agencies can collaborate on literacy education programs. Partnerships can share knowledge and resources to improve educational programs and reach more people (Danladi et al., 2023).

Case Studies from Other Countries

Pakistan can learn from other countries fintech-enhanced digital financial literacy:

I. **Singapore:** It is a leader in fintech and money education. The Monetary Authority of Singapore (MAS) runs many programs to teach individuals how to use technology to manage their money. Flip is a financial literacy and inclusion program that provides learning materials and tools to fintech companies. This program's website covers money, online classes, and interactive workshops. These efforts have significantly improved Singaporeans' digital financial literacy management knowledge (Cambaza, 2023).
II. **India**: Fintech has improved digital financial literacy in India, primarily since the PMJDY was implemented. The financial inclusion program teaches digital financial literacy, including mobile banking and digital payments. Thanks to fintech companies, many people now use digital financial services more efficiently, improving their financial knowledge (Bakhshi et al., 2024).
III. **Kenya**: Kenya's M-Pesa success shows how fintech can teach people how to use money online. By making mobile payments easy, M-Pesa has transformed Kenya's financial transactions. Campaigns that teach mobile payment usage are critical to the platform's success. These campaigns have increased digital financial literacy and inclusion in Kenya (Masłoń-Oracz & Eso, 2024).

Recommendations for Pakistan

Specific crucial suggestions can help Pakistanis learn about fintech-based digital financial literacy management. Starting with simple interfaces, fintech companies should create user-friendly apps. In-app tutorials and help centres guide digital financial tool use. This simplifies these services for non-technical people (Tan, 2023). However, the need for comprehensive educational programs is urgent. Second, implement comprehensive educational programs. Financial literacy should be taught at all grade levels, but schools, colleges, and universities should focus on digital financial literacy management for kids. To reach adults and rural populations, community-based programs and online learning platforms are needed (Yang & Jung, 2024).

Third, public-private partnerships are crucial; if government, fintech, banks, and schools collaborate, financial literacy programs can reach more people and be more effective (2013, Danladi et al.) These partnerships make creating complete educational materials easier and holding nationwide workshops and seminars. Their collaborative efforts can significantly expand the reach and impact of financial literacy programs. Fourth, campaigns promoting the benefits and safety of digital financial services can increase trust and usage. These campaigns should use radio, TV, and social media to reach the most people (Cambaza, 2023).

Fifth, improving digital infrastructure helps fintech reach more people. This includes increasing online access and improving mobile networks, especially in rural areas. Government support and infrastructure investments can achieve this (Imam et al., 2022). Better regulations foster fintech growth and digital financial literacy. Suppriadi et al. (2023) recommend that the government encourage innovation while protecting consumers and data. Finally, behavioural insights in schools can dispel digital finance myths. Know the behavioural barriers to fintech adoption to improve financial education (Balaskas et al., 2024). These tips can help Pakistan use fintech to educate people about financial literacy, participate in the economy, and gain economic power.

2.8. Research Gaps

Fintech has advanced and could improve digital financial literacy, but research is still lacking. First, while fintech has been studied for its effects on financial inclusion, its effects on digital financial literacy in different socioeconomic settings have not. Most studies focus on financial inclusion rather than digital financial literacy (Lyons et al., 2019). Second, few studies examine fintech's long-term impact on digital financial literacy. Recent research has focused on short-term results without considering long-term effects (Ranabahu, 2022). This gap casts doubt on fintech-driven financial education's longevity and efficacy.

Another gap is where most research is done. Many studies focus on developed nations or emerging markets like India and Kenya. Few studies have examined the impact of fintech on digital financial literacy in South Asia, particularly Pakistan, which faces unique social and economic challenges (Ololade, 2024). Not enough research has examined how culture affects digital financial literacy. Cultural beliefs about technology and financial literacy significantly influence fintech adoption and use, but empirical studies often overlook this (Rahayu et al., 2023). The gender gap in digital financial literacy and fintech adoption needs further study (Amber & Chichaibelu, 202).

Future researchers should focus on a few main areas to fill these gaps. Long-term studies on fintech and digital financial literacy are needed first. These studies can reveal fintech-based financial education programs' long-term benefits and viability (Ranabahu, 2022). Further

research is needed on fintech's impact on digital financial literacy. Fintech features like user interface and educational content help different groups learn about financial literacy (Lyons et al., 2019). Third, Pakistan-South Asian studies matter. Ololade (2024) proposes studying those areas' social, economic, cultural, and legal conditions and consulting these communities.

Understanding how cultural attitudes and norms affect fintech adoption is crucial. It helps create culturally appropriate financial literacy programmes (Rahayu et al., 2023). Amber & Chichaibelu (2023) suggest expanding gendered fintech adaptation and digital financial literacy to prevent declines and create more productive financial systems. Research in social, technology, education, and finance must be smart. Fintech and digital media play a role in financial literacy (Lyons et al., 2019).

2.9. Hypotheses Development

Hypothesis 1:

- **H1:** Fintech innovations significantly predict digital financial literacy in Pakistan.

Hypothesis 2:

- **H2:** The relationship between fintech innovations and digital financial literacy is statistically significant.

2.10. Conclusion

Fintech innovations have the potential to democratize financial solutions and improve digital financial literacy, according to studies. Many countries have successfully implemented user-friendly fintech solutions and comprehensive educational programmes, often with public and private sector involvement. Despite cultural barriers, high transaction costs, and poor infrastructure that persist, this broad study fills gaps in the literature on Fintech's contribution to Pakistan's digital financial literacy, making it important for policymakers. This study will inform policy, education, and fintech growth by examining Pakistan's unique social, economic, and cultural conditions. By improving digital financial literacy, fintech can promote financial inclusion and economic growth in developing countries. The next chapter discusses research methods. It will describe the research design, data collection, target audience, and analysis to determine how fintech has affected Pakistani digital financial literacy. The methodology chapter will methodically fill the literature review's research gaps to clarify the study's goals and questions.

2.11. Conceptual Model of Study

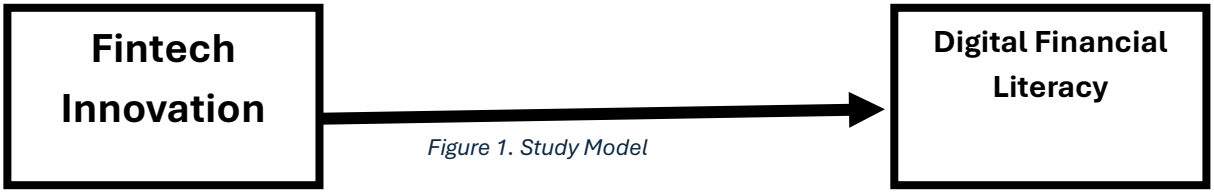

Figure 1. Study Model

Chapter 3

3. Methodology

3.1. Introduction

This section briefly describes the scientific inquiry method used in research and emphasises the importance of methodological frameworks for credibility and dependability. Valid and valuable results advance knowledge and aid practical applications and strict methods.

3.2. Research Philosophy

A research philosophy is a belief about undertaking an investigation. It directs the search process at all levels, establishing and guiding data collection that affects the methods employed and how results will be interpreted for discussion (Leedy & Ormrod, 2010). There are three key research philosophies: positivism, interpretivism and pragmatism. Positivism - promotes the application of scientific methods to social research, emphasising empiricism, looking for sensible interpretations and verifying their main findings (Bryman, 2016). The dominant approach is linked with interpretivism, which utilises 'sense making' to explore and interpret social phenomena by their subjective meaning, taking the form of a qualitative method (Denzin & Lincoln, 2018). Positivist and interpretativist research methods are used in practice based on the questions of a study condition (Saunders et al., 2019). Quantitative, primary research- The most appropriate doctrine for explaining this type of research is positivism. Positivism promotes testing hypotheses based on empirical evidence and a scientific method organised in logical, numerical order (Creswell, 2014). Its philosophy aligns with the research objectives to measure fintech innovations' impact on digital financial literacy in Pakistan's banking sector.

Therefore, this research applies positivism - an appealing, impartial and absolutistic philosophy that can be applied across this study. A positivist approach is appropriate for collecting and analysing numerical data required to examine fintech's impact on digital financial literacy (Bryman, 2016). This chapter addresses positivist scientific research, where hypothesis testing forms the basis of reaching factual conclusions from the evidence tested (Saunders et al., 2019). Findings will have greater generalizability with positivism (Bhattacherjee, 2012). In other cases, standardised data sources like survey responses must be transformed this way for research validity and reliability (Creswell, 2014). Positivism's systematic and replicable characteristic as a philosophy underpins academic knowledge (Easterby-Smith et al., 2018).

Positive research lets researchers plan and execute their studies, which case studies that want to change policy or practice immediately can benefit from if they can show (Johnson & Onwuegbuzie, 2004). This statistical analysis can help explain fintech innovations and their effects on banking and beyond (Bryman, 2016). Positivist research is quantitative and investigation-led, like this study. Systematic research must be impartial, rigorous, reliable, valid, and generalisable. Positivism improves research credibility and generalizability through methodological rigour.

3.3. Research Approach

These research streams have led to different study designs and data collection methods. Deductive, inductive, and abductive are the main research methods. The deductive method begins with a theory and generates hypotheses for our research plan. It is a top-down approach

that moves from the general level to its specific level (Saunders et al., 2019). The induction approach is a bottom-up process starting from observations and increasingly moving towards constructing theory/making generalisations based on these (Bryman, 2016). Abduction or abductive reasoning: Abductive inference often goes from an observation to a theory that seeks the more likely explanation (Hansson, 2006).

In this study, the deductive approach is more applicable. In the above context, this selection can be justified as the research needs not only to test specific hypotheses related to how much fintech innovations impact digital financial literacy in Pakistan. It is more appropriate for the deductive approach as it allows hypothesis development based on theories and later testing using empirical data collected (Robson & McCartan, 2016). In streamlining the deductive approach, this research can methodically examine whether the relationships derived in theory apply to the banking sector of Pakistan. This inductive and deductive creation determines the research design and the type of data collection. This requires a structured approach and may include using quantitative methods to help collect data to test the predefined hypotheses empirically (Creswell, 2014). Scientific research: Researchers develop and test hypotheses by collecting appropriate data supporting or rejecting the hypothesis. Moreover, the employment of statistical analysis to quantify data adheres well with the deductive method's emphasis on objectivity and empirical validation (Saunders et al., 2019).

3.4. Research Strategy

Research design explains which research strategies to select for collecting and analysing data, aiming at answering the questions posed by your research. Such well-thought-out research methods are surveys, case studies, experiments, grounded theory and Ethnography. Surveys are often conducted in quantitative research to collect data from many respondents, which is helpful for generalising findings across a population (Bryman, 2016). Through the lens of case histories, context can be examined in greater depth, and natural variation can be studied experimentally to test causal relationships. Grounded theory deals with a view of forming theories which have been created based on collected data, and the ethnographer takes into account the understanding of culture that drives immersion. Methodology In this study, the survey strategy is used. The method is appropriate for our study as it helps to collect massive quantitative data, which is needed to test the hypotheses that test the fintech effect on digital financial literacy (Saunders et al., 2019). Surveys are beneficial for developing standardised data that can be coded with numbers and used to analyse patterns or correlates. Surveys gather specific information regarding the research questions due to their structured form, and this data is comprehensive yet focused (Robson & McCartan, 2016).

Therefore, measuring the variable related to fintech usage and digital financial literacy among different demographics can be answered by using surveys. This approach allows the researcher to select a comprehensive sample that is well-distributed and representative, therefore increasing generalizability (Bryman, 2016). Surveys entail a more structured manner of collecting data on perceptions, attitudes, and behaviours (Creswell, 2014), thus providing critical insights into fine-tuning digital financial literacy and fintech adoption.

3.5. Research Choice

Research choice refers to the method used in collecting, analysing and interpreting data. Mono method, mixed methods and multi-method are the main research options. The mono method is one data collection technique type and analysis process (quantitative or qualitative, rarely

both). Conclusion thus far regarding Data Collection Method: Mixed methods merge the use of quantitative and qualitative resources to provide a more well-rounded look at the research problem(s) by complementing each other's strengths (Creswell & Plano Clark, 2018). In contrast, a multi-method approach uses several data collection forms within one paradigm - either qualitative or quantitative (Tashakkori & Teddlie, 2010).

The study adopts a mono method, utilising a quantitative way of data collection. Primarily when, this research aims to examine specific hypotheses through these Fintech innovations on digital financial literacy in Pakistan; hence, it justifies selecting a source country. Mono-methods enable the area being studied to be very narrow and systematic so that, from data collection to analysis, research is apparent (Saunders et al., 2019). Benefits of a mono method: In many ways, using the same research for all participants improves the validity and reliability. It ensures first consistency in data collection and analysis processes so that methodological errors and potential biases are present, if any. Secondly, the organised nature of quantitative methods like surveys allows for generating standardised data with a propensity to be rationalised and replicable, enhancing retest reliability (Creswell, 2014). Also, the quantified research using stated and revealed techniques offers excellent tools for validating hypotheses and making realistic assumptions, which is an essential prerequisite to achieving such objectives in investigations (Bhattacherjee, 2012).

3.6. Time Horizon

This is the period during which the data was collected for this study, which may be longitudinal or cross-sectional. A single snapshot of the phenomenon being studied is provided by a cross-sectional time horizon (DATA). Data gathered over a long period is referred to as longitudinal (time horizon) data; this ability to conduct changes and developments over time makes longitudinal data unique (Saunders et al., 2019). The study's time horizon was cross-sectional. The examination objectives, which analyse fintech innovations' current effects on advanced financial proficiency in Pakistan, support this conclusion. One benefit of a cross-sectional study design is that it allows for observing many different types of data, if not all, at one time for patterns and trends (Bryman, 2016). Fintech is changing quickly, so having current data that can offer insightful information.

A cross-sectional approach is consistent with the research objectives of examining associations between fintech usage and digital financial literacy by demographic groups. It allows data collection diversity within a suitable time frame that allows the assignment to be completed efficiently and expediently (Robson & McCartan, 2016). Further, the cross-sectional design allows quantitative techniques like surveys to be easily administered to a large sample supporting statistics (Creswell & Creswell, 2018). While longitudinal studies provide the benefit of capturing change over time, these are also more resource and labour-intensive. We adopted a cross-sectional approach because of the scope and limitations of this research, which is practical so that it would be adequate in achieving the aims (Bhattacherjee, 2012). The study goes straight to the heart of digital financial literacy and fintech adoption today, informing those multitudes on what they can do now.

3.7. Techniques and Procedures

3.7.1. Data Collection Methods

Surveys have been utilised as the primary data collection method in this study. This quantitative data collection method involves structured questionnaires designed to gather the responses of many respondents (Creswell & Creswall, 2018). Given the ability of surveys to collect standardised data statistically analysed for valid, generalisable conclusions, particularly suitable for this research, they would be used to test hypotheses concerning how people generally glean from internet finance innovations over digital financial education in Pakistan. The defence of surveys is that they are much more efficient and effective at capturing a broader dataset from different demographics (Bryman, 2016). It allowed us to collect descriptive and inferential data and assess how far digital financial literacy has stayed away from our current life reality or the scale of fintech adoption. For this study, the execution of surveys required outlining an extensive questionnaire that captures the research questions and objectives. The survey was then disseminated online to make it available widely and obtain a good cross-section of respondents.

3.7.2. Sampling Techniques

This mixture of sampling strategies is essential in this type of data, which should be collected as an accurate representation of the targeted population. There are two main types of sampling techniques: probability and non-probability sampling. Probability sampling makes a random selection, which means that every member of the population has an equal chance to be covered by it, leading to higher representativity and generalizability patterns in findings (Saunders et al., 2019). It may seem that non-probability sampling is a risk-laden, biased approach. However, it has its place in research when lower risks or more thorough and definitive inclusion of specific insights for certain groups are necessary as utilised during exploratory phases (Etikan et al., 2016).

This study utilised probability sampling, precisely a stratified random sample. In this technique, the entire population is divided into groups (strata) based on age, sex, and geographical location, and then samples are randomly selected from each stratum (Creswell & Creswell, 2018). This method is helpful as it results in a sample with equal representation from Pakistan's diverse demographic regions. The sample size was determined using a power analysis to ensure the statistical significance of effects and relationships (Bryman, 2016). Once the sampling process target population was to be defined, once this is done, his determinate set of characteristics or strata around which each potential respondent is grouped - and then randomly select members within their categories. This approach improves the validity and reliability of the research by guaranteeing that no relevant subgroup is underemphasised.

3.7.3. Data Analysis Methods

Given that the data is collected via surveys, quantitative methods were used in this study to analyse its content. The essential data analysis methods were statistical descriptive, reliability, correlation and regression. Descriptive statistics helped summarise your data set's key variables and patterns (Field, 2018). Reliability statistics (Cronbach's alpha) were conducted to assess survey instruments' internal consistency and reliability. This used correlation to explore the relationship between different variables, fintech use and digital financial literacy. This research used regression analysis to study the relationships between fintech innovations and state-of-

the-art digital financial literacy, trace causal relations and measure the effect size of each invented fintech (Pallant, 2020).

Data was analysed using SPSS (Statistical Package for the Social Sciences). This popular social science statistical software program covers all statistical analysis areas and computation tools with many procedures (Pallant, 2020). SPSS helps with data maintenance, analysis, and interpretation, ensuring the validity and reliability of your findings.

3.8. Ethical Considerations

Protection and respect for research participants require ethical considerations. Informed consent, privacy, and harm prevention are common ethical concerns (Bryman, 2016, p. 53). This study examines ethical issues to uphold research ethics and participant welfare. First, get informed consent. Before consenting, participants must be informed about the research's purpose, goals, risks, and benefits. Questions were welcomed and reminded that participation is voluntary and that quitting at any time is without consequence (Creswell & Creswell). Simple, understandable, informed consent forms so participants know what they are doing.

The other main ethical concern is confidentiality. This study has taken steps to keep participants' identities confidential, and data will not be shared publicly with third parties. The dataset had personal identifiers removed and maintained securely so only the research team could access it (Tabuena et al., 2021). This ensured that their responses were only for research purposes and that findings were reported as a group so no one could be identified. Furthermore, the study worked to eliminate any potential threats participants could suffer. These include ensuring the questions in these surveys are not invasive or could potentially cause harm. An appropriate ethics committee confirmed that the study was conducted according to accepted ethical standards and guidelines (Diego et al., 2018).

3.9. Reliability and Validity

Fundamental research concepts that determine a study's credibility are reliability and validity. While reliability aims to stabilise a process against deviations, validity researchers address the issues of accuracy and truthfulness through face, content, criterion-related, internal networks, and ecology within an interview context (Bryman, 2016). To ensure study reliability, standardised data collection tools like pre-tested surveys would be required (Creswell, 2014). The reliability test measurement was evaluated using statistical methods, such as Cronbach's alpha, to evaluate the internal consistency of survey instruments (Tabuena et al., 2021). Ensuring higher reliability requires replicability of the data collection process and consistent results across multiple administrations.

Several measures are taken to address validity. To ensure content validity, survey questions were developed based on a comprehensive review of literature and groups (Creswell & Plano Clark, 2018) because the items must comprehensively cover the digital financial literacy construct and the use of fintech. Construct validity evaluation consists of checking that the survey items measure what they are supposed to represent through factor analysis (Pinnawala, 2019). Also, a sample size representative of the population should be used, and proper sampling techniques should be used to increase generalizability (external validity) (Bertills et al., 2017).

3.10. Conclusion

This chapter describes this study's methodology, including data collection, sampling, data analysis, ethical considerations for reliability reasons, and reliability measures. This study's methodology determines how well we can meet our research objectives. Recent rhythmic and structured approaches are best for studying fintech's effects on financial literacy. The study implements parameters that prevent biases, appropriate data collection methods, and thorough analysis processes within a predetermined scope to deliver credible and reliable findings contributing to our knowledge base and practicality needs. The next chapter will elaborate on the analysis of collected data to answer research questions. The work compares its results to existing literature and theoretical framework, drawing implications for policymakers, educators, and industry practitioners.

Chapter 4

4. Analysis & Findings

4.1. Introduction

This chapter delves into the impact of fintech innovations on digital financial literacy in Pakistan, using structured surveys with a representative sample to ensure the reliability and validity of our data. Descriptive statistics were employed to summarise critical variables, reliability analysis was used to demonstrate survey instrument consistency, and correlation and regression analyses were used to test causal relationships. These methods were chosen to provide rigour in data analysis for concrete conclusions.

4.2. Descriptive Statistics

The demographic data reveals the diverse composition of the sample population in terms of age, gender, qualification, and experience. The age distribution shows a broad range, with the majority of respondents falling within the 26-30 age group (27.5%), followed by the 21-25 age group (23.5%) and the 31-35 age group (19.6%). Gender distribution is nearly even, with 49% male and 51% female respondents. There is a balanced representation regarding educational qualification, with 35.3% holding a bachelor's degree, 33.3% a master's degree, and 31.4% a Ph.D. The sample also exhibits a diverse range of professional experience, with notable clusters in the 1-3 years (22.5%) and 3-6 years (21.6%) ranges.

Key variables related to fintech usage and digital financial literacy were analysed using summary statistics. The mean age is 2.69 with a standard deviation of 1.357, indicating a young to middle-aged sample. The median and mode for age are both 2, showing a central tendency towards the 26-30 age group. Gender has a mean of 1.51 and a standard deviation of 0.502, reflecting the nearly equal male-female ratio. The qualification variable has a mean of 1.96 and a standard deviation of 0.820, indicating a balanced representation across educational levels. Experience has a mean of 3.02 and a standard deviation of 1.407, suggesting a diverse range of professional expertise among respondents. These statistics provide a comprehensive sample overview, ensuring a robust foundation for further analysis.

4.3. Reliability Analysis

The study will determine if measurement scale items hang together to test consistency and stability (dependability). Cronbach's alpha values for Digital Financial Literacy (dependent variable) = 0.997 and Fintech Innovation (independent variable) = 0.978, indicating internal solid consistency. Nunnally & Bernstein (1994) estimate that a seven-item Digital Financial Literacy Cronbach's alpha of 0.711 is reliable. Cronbach's alpha for Fintech Innovation (0.75), measured by eight items, showed high reliability. These values demonstrate the survey instruments' reliability and suitability for future statistical analyses by repeatedly measuring their target constructs (Tavakol & Dennick, 2011).

Table 1. Reliability Statistics

Reliability Statistics	
Variable	**Cronbach's Alpha**

Digital Financial Literacy (DV)	0.711
Fintech Innovation (IV)	0.750

Table 2. Descriptive Statistics

Age		
	Frequency	Percent
21 - 25	24	23.5
26 - 30	28	27.5
31 - 35	20	19.6
36 - 40	16	15.7
Above 40	14	13.7
Total	102	100
Gender		
	Frequency	Percent
Male	50	49
Female	52	51
Total	102	100
Qualification		
	Frequency	Percent
Bachelor	36	35.3
Master	34	33.3
PhD	32	31.4
Total	102	100
Experience		
	Frequency	Percent
0 - 12 months	18	17.6
1 - 3 years	23	22.5
3 - 6 years	22	21.6
6 - 9 years	17	16.7
Above 9 years	22	21.6
Total	102	100

4.4. Correlation Analysis

Key variable relationships were examined using Pearson correlation analysis. Digital Financial Literacy (NDFL) and Fintech Innovation (NFI) correlated strongly. The Pearson correlation coefficient of 0.990, with a significance level of $p < 0.01$, indicates a strong positive correlation between the variables (Cohen, 1988). This implies that fintech innovations boost digital financial literacy.

Table 3. Correlation Analysis

Correlations

		NDFL	NFI
NDFL	Pearson Correlation	1	.990**
	Sig. (2-tailed)		0
	N	**102**	**102**
NFI	Pearson Correlation	.990**	1
	Sig. (2-tailed)	0	
	N	**102**	**102**

The high correlation coefficient suggests that fintech innovations improve respondents' digital financial literacy. Its statistically significant p-value (0.000) proves that this correlation is not random. The literature suggests that fintech tools and applications can significantly improve users' financial knowledge and skills (Lusardi & Mitchell, 2014). The reliability analysis confirms the survey instruments' reliability, while the correlation analysis shows a strong, positive relationship between fintech innovations and digital financial literacy. These findings support the hypothesis that fintech innovations drive digital financial literacy and provide a solid foundation for further research.

4.5. Regression Analysis

Regression analysis was used to examine fintech innovations and digital financial literacy. A simple linear regression model quantified how well fintech innovations predict digital financial literacy changes among respondents. The regression model summary indicates that fintech innovations explain ~20.9% of the variance in digital financial literacy among the study sample (Fig 3), with R^2 = 0.209. This modest value confirms that fintech innovations drive much of the variation in digital financial literacy (Field 2018). Less than 7.5% - Adjusted R^2 value of.201 provides more accurate estimates by considering the number of predictors in the model.

The regression model is statistically significant, and fintech innovations affect digital financial literacy, as the F-statistic is 25.943 with a significance level (Sig. F Change) of 0.000 (Pallant, 2020). The significant F-test confirms that the model better fits the data than a model with no predictors. Examining the coefficients table, the unstandardised coefficient (B) for fintech innovations (NFI) is 0.884 with a standard error of 0.174. This coefficient indicates that for every one-unit increase in fintech innovations, digital financial literacy increases by 0.884 units. A standard Beta of 0.458 indicates a moderate to strong positive relationship between variables. The t-value is 5.093, and the p-value is 0.000, indicating a significant correlation between fintech innovations and digital financial literacy.01 arenas The model intercept (constant) has a value of 0.350 with an associated standard error of 0.779. However, the p-value is 655, indicating that even digital financial literacy is nearly zero in the sample when fintech innovations are zero.

The above results show that fintech innovations significantly impact digital financial literacy. This suggests that digital financial literacy increases fintech adoption and use. According to the literature, fintech products improve financial literacy and capability (Lusardi & Mitchell, 2014). The regression analysis showed that fintech innovations significantly affect Pakistani digital financial literacy. Significant model coefficients and r-square values show that fintech can improve financial literacy and inclusion, affecting economic development and monetary stability.

Table 4. Regression Model Summary

Model Summary							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.458[a]	.209	.201	.278	.209	25.943	1

Table 5. Regression Coefficients

Coefficients						
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.350	.779		.449	.655
	NFI	.884	.174	.458	5.093	.000

4.6. Hypotheses Testing

Hypothesis 1 (H1): Fintech innovations significantly predict digital financial literacy in Pakistan.

The regression analysis shows that the coefficient for fintech innovations (NFI) is 0.884 with a significance level (p-value) of 0.000. This indicates that fintech innovations are a significant predictor of digital financial literacy.

- **Decision:** Accept H1

Hypothesis 2 (H2): The relationship between fintech innovations and digital financial literacy is statistically significant.

The R-squared value is 0.209, indicating that fintech innovations explain 20.9% of the variance in digital financial literacy. The F-statistic is 25.943 with a significance level (Sig. F Change) of 0.000, confirming that the model is statistically significant.

- **Decision:** Accept H2

Table 6. Hypotheses Testing

Hypothesis	Description	Regression Results	Decision
H1	Fintech innovations significantly predict digital financial literacy in Pakistan.	Coefficient: 0.884, p-value: 0.000	Accepted
H2	The relationship between fintech innovations and digital financial literacy is statistically significant.	R-squared: 0.209, F-statistic: 25.943, Sig. F Change: 0.000	Accepted

The regression results provide strong evidence to support both hypotheses. Fintech innovations significantly predict digital financial literacy, and the relationship between these variables is statistically significant. These findings underscore the importance of fintech innovations in enhancing digital financial literacy in Pakistan.

Chapter 5
5. Discussion

5.1. Introduction

This chapter elaborates on the analysis results by comparing them to the literature and theoretical frameworks. The review returns to research questions and findings to reflect on how fintech innovations change digital financial literacy dynamics in Pakistan. The main research objectives were to examine how fintech innovations relate to digital financial literacy and the determinants of this relationship. Analysis suggested that since fintech innovations increased, so did digital financial literacy, and the positive contribution of Fintech to users' understanding or ability on finance was more than moderate.

5.2. Interpretation of Findings

The regression analysis showed that fintech innovations affect digital financial literacy (20.9% of variance). This result supports the conceptual framework and prior research that fintech can promote financial literacy through user-friendly systems. TAM and Diffusion of Innovations Theory help explain these findings. Such an article on knowing how to use and finch role from perceived ease use most significant from level will not appear in case adoption. The strong link between fintech innovations and digital financial literacy sent a signal to policymakers that these tools are relevant and easy to use, making them suitable for adoption and improving financial literacy.

Lobozynska et al. (2020) support the Theory of Planned Behaviour (TPB), which states that financial literacy and attitudes affect usage. The significant impact of fintech on digital financial literacy suggests that consumers view new finance innovations positively due to perceived benefit and usability. Comparing this to the literature confirms this. Khan and Farooqui (2023) and Ullah et al. (2022) found that fintech platforms—function-based mobile apps like digital wallets that offered simpler and better services—improved financial literacy. Fintech can improve financial literacy, as shown by their strong correlation and this study's significant regression results.

This has significant practice implications. Policymakers and financial institutions should encourage fintech innovations that improve financial literacy and long-term inclusion. Educational initiatives and awareness campaigns about the utility, safety, accessibility, etc., of digital financial tools can also strengthen this virtuous cycle (Miah, 2023). In theory, this study extends the first application of TAM and TPB in Pakistan's fintech (financial literacy), adding to existing knowledge through empirical validation. These findings contribute to the financial inclusion debate because fintech innovation can fill a financial literacy gap to improve access and use of quality finance, particularly in developing economies (Pentury, 2023).

The study also notes limitations; fintech solutions may be less beneficial due to low digital literacy and socio-cultural issues, especially among women and rural populations (Amber & Chichaibelu, 2023; Khan & Siddiqui, 2019). Tailored approaches are needed to address digital financial literacy gaps in different populations. This study also supported earlier findings on fintech adoption barriers, exceptionally high transaction costs, and digital service untrustworthiness (Wahga et al., (2023) and Imam et al. (2022). This means creating the right regulatory environment, investing in infrastructure to overcome barriers, and ensuring FinTech can improve financial literacy. According to this study, the impact of fintech on digital financial

literacy in Pakistan is significant. These examples show that fintech can improve financial inclusion and economic livelihoods, but existing barriers make measuring impact difficult, requiring focused strategies to address these gaps.

5.3. Practical Implications

The findings in this paper have important implications for policymakers, educators, and industry practitioners. Regulators should acknowledge the potential of fintech innovations in boosting digital financial literacy and, by extension, financial inclusion. For instance, regulatory regimes must be implemented to effectively harness fintech to support innovation while allowing for consumer protection and data security (Supriadi et al., 2023). Policymakers need to invest in digital infrastructure, particularly in rural areas, to increase internet penetration and accessibility, which will support the use of fintech (Imam et al., 2022). Digital financial literacy should be integrated into the curriculum at all educational levels through educators. In academia, all schools and colleges should also focus on integrating in-depth courses linked with digital financial tools related to their risk-free usage. This makes students cope quickly once they enter a Digital Economy (Yang & Jung, 2024). Flexible learning opportunities for adults and marginalised, community-based programs online can bridge the digital divide (Aijaz et al., 2024).

The study reminds industry practitioners, especially fintech companies, to build easy-to-use apps with intuitive interfaces. Two Low-Digital-Literate Tools: In-app tutorials and help centres. These two features can guide low-digital literacy users through digital financial tools (Tan, 2023). Fintech companies can increase their reach and effectiveness by partnering with government agencies or educational institutions to promote financial education (Danladi et al., 2023). The study also found that targeted awareness campaigns are needed to build trust and promote digital financial services. Fintech's benefits and safety should be promoted across multiple media platforms (Cambaza, 2023).

5.4. Theoretical Contributions

It contributes significantly to fintech and digital financial literacy theories and knowledge. The Technology Acceptance Model (TAM) and Theory of Planned Behaviour examine how a financial technology company's perceived ease of use and credibility can influence a positive attitude toward fintech and digital capability for better financial management (Wu & Peng, 2024). These theories are supported by a strong positive correlation between fintech innovations and financial literacy in another context. Thus, this study adds to the literature by examining how fintech affects digital financial literacy and its future in Pakistan, a developing nation. This helps expand the few discussions in this area. This context-specific analysis of Nigeria and SAFTA adds to the literature on developed nations or emerging markets like Kenya and India (Ololade, 2024). The study follows TPB principles and uses behavioural insights to examine perceived high transaction costs and trust as fintech adoption barriers (Wahga et al., 2023).

Additionally, these findings disprove the delusion that digital financial literacy can only be achieved through formal education and technological access. This implies that fintech can educate people by providing real-world financial knowledge and experience through simple platform interfaces (Ullah et al., 2022). This research raises the question of whether the government and financial industry's traditional financial literacy strategies are effective or if technology-driven solutions may be better. The study examines the dynamic relationship

between user practices and technological design to provide fine-grained digital financial literacy insights. Its implications provide more comprehensive theoretical frameworks for studying how fintech can promote financial inclusion and economic empowerment.

5.5. Limitations

Despite its limitations, it is worth studying how fintech can improve Pakistan's digital financial literacy. Cross-sectional data is limited to one point. This approach may overlook temporal trends (immediate, medium, and long-term effects) of different explanatory variables on dependent variables by not considering fintech usage and digital financial literacy changes Bryman et al. A longitudinal study may capture more dynamic fintech-financial literacy interactions to overcome this limitation. Data collection may be limited by recollection bias, self-esteem threat, and social status because people are asked to share their grounds and activities outside the home. The respondents may overreport their digital financial literacy (e.g., these results are upper bounds to estimates). Triangulating self-reported data with fintech platform usage data can help validate the findings (Creswell & Creswell, 2018).

The sample was diverse, but it may not represent overall Pakistan. How demographically and gender-representative the sample is may affect its generalizability. Future studies should sample more broadly and representatively to understand fintech's impact better (Saunders et al., 2019). The study also focuses on how fintech innovations increase digital financial literacy rather than user experiences or challenges. In-depth interviews or focus groups may help reveal how people use fintech tools and their challenges (Bryman, 2016). This research study identifies high transaction costs and low trust as fintech adoption barriers but does not elaborate. Qualitative research can investigate these barriers' causes, effects, and solutions (Wahga et al., 2023). Researchers found that fintech innovations affect digital financial literacy, advanced practice, and theory.

5.6. Future Research Directions

Future research should track fintech use and digital financial literacy longitudinally. This would illuminate Fintech's financial education sustainability (Bryman, 2016). Qualitative methods like interviews and focus groups can reveal user experiences and hidden cultural or behavioural barriers to fintech adoption (Creswell & Creswell, 2018). Research can also examine how fintech has affected women, rural areas, and the elderly. Validate these potential segments with tailored digital financial literacy education (Amber & Chichaibelu, 2023). Investigating how trust and security affect fintech adoption, engagement, and satisfaction may yield more insights (Wahga et al., 2023). Researchers must also understand how regulations affect fintech accommodation at the firm level. One policy-relevant question arises: Can regulatory arrangements reveal their effects on fintech and financial literacy?

5.7. Conclusion

This chapter concludes with a summary of the study's findings and their practical implications. Results show that new financial technologies improve digital literacy in Pakistan and that user-friendly technology and educational campaigns can help reduce disparities by encouraging financially inclusive behaviours. These findings have implications for existing theories, policymakers, educators, and industry practitioners, as discussed in the rest of this article. This emphasises the study's importance in showing that fintech helps developing nations achieve

economic empowerment and financial stability. Overcoming these barriers and using the suggestions could improve fintech innovations. After this, the study will summarise its main findings and offer research implications (including opportunities to apply results) and recommendations.

Chapter 6
6. Conclusion & Recommendations

6.1. Conclusion

The study examined how fintech innovation has improved digital financial literacy in Pakistan, focusing on ad inclusion. Fintech adoption positively correlates with digital financial literacy, demonstrating its transformative role in promoting widespread inclusion and meaningful empowerment. The regression analysis shows that fintech innovations predict digital financial literacy and explain 20.9% of its variance. This high effect shows the importance of financial education and empowerment thanks to fintech tools' user-friendly apps. The Technology Acceptance Model (TAM) states that perceived ease of use and usefulness drive technology adoption (Wu & Peng, 2024). The positive association of fintech with digital financial literacy suggests that they are relevant and understandable, encouraging greater use.

These findings can be verified by comparing the literature. Example: Bermeo-Giraldo et al. (2023). Due to their user-friendly interface and educational resources, fintech platforms improve financial literacy (2023). Ullah et al. found that gel filtration chromatography lost over 82% of the protein peak in rattlesnake venom using HPLC. Khan & Farooqui (2023) found that mobile banking apps and digital wallets that increase financial awareness improved knowledge, primarily during COVID-19, when DFS dependency increased. Many theoretical contributions result from this study. This study applies TAM and TPB to fintech in Pakistani financial literacy. The article describes the TAM and UTAUT theories and empirically supports their predictions, including the roles of attitude, perceived ease of use, and perceived usefulness in technology adoption. The study also shows that fintech usage is heavily influenced by psychological factors like positivity and digital financial literacy (Lobozynska et al., 2020).

This study has policy, educational, and industry applications. Public policy and regulatory frameworks should support fintech innovation and protect consumer and data privacy. In line with this, fintech providers need more digital infrastructure, especially in the suburbs, to conduct online economic transactions (Imam et al., 2022). Digital financial education should be included in all educational levels to prepare students for the digital economy. Community-based programs and online learning platforms can give marginalised groups and adults flexible education opportunities (Aijaz et al., 2024). Fintech developers and practitioners should prioritise user-friendly apps with simple interfaces. Improved in-app tutorials and help centres can make digital financial tools more accessible to those with lower digital literacy (Tan, 2023). Financial literacy programs can be more effective when public and private partners collaborate to improve service delivery and promote financial inclusion (Danladi et al., 2023).

The present study has limitations despite its significant contributions. Since this data was collected cross-sectional, this could not report on how fintech usage and awareness or digital FI knowledge has changed over time due to the cross-sectional design. Longitudinal studies may explain these relationships more naturally (Bryman, 2016). Self-reported data may also be biased by social desirability or low morale. Future research can strengthen findings by triangulating self-reported data with fintech platform usage (Creswell & Creswell, 2018). The sample was diverse, but it may not represent all Pakistani settings. Reducing demographic biases in future studies would improve generalisation. This study focuses on the psychological impact of fintech innovation on DFL but does not extensively explore qualitative data on experiences and barriers. To better understand fintech use and barriers, quantitative data like

surveys could be supplemented by qualitative methods like interviews or focus groups (Bryman, 2016).

For future research, longitudinal studies on fintech's long-term effects on digital financial literacy are needed. The result will show fintech-enabled financial education's longevity and impact. In addition, studying the relative effects of fintech innovations on diverse population groups (e.g., women, rural and Indigenous people, and the elderly) would inform more targeted educational programming (Amber & Chichaibelu, 2023). Another critical research area is how trust and perceived security affect fintech adoption user engagement and satisfaction (Wahga et al., 2023). Understanding fintech acceptance and regulatory frameworks is crucial. A: Regulatory evolution affects fintech development and financial activism. Comparisons of global fintech trends and their effects on local markets will help inform price practices (Ololade, 2024). In conclusion, fintech innovations significantly influenced digital financial literacy in Pakistan through the telecommunication sector, providing policymakers, educators, and industry practitioners with information or suggestions. This can boost digital financial literacy, DFS adoption, and economic growth while meeting national Financial Inclusion targets.

6.2. Recommendations

This study provides critical insights into how users, policymakers, and finding organisations can improve. This list provides policy options for policymakers, educators, and industry professionals to promote digital financial literacy and inclusivity. First, develop user-friendly fintech solutions. Fintechs should simplify their apps so the poor and illiterate can use them. In-app tutorials, help centres, and user guides guide users through digital financial tools (Tan, 2023). By responding to user input in real-time, apps with feedback mechanisms improve user experience.

Second, broad educational programs. Digital financial literacy should be taught in primary and higher education. Schools and universities can teach children about digital finance and how to function in a digital world (Yang & Jung, 2024). Community-based programs and online learning platforms should reach adults and marginalised groups by offering flexible, non-traditional education. Fintech companies could collaborate to host workshops and training to improve educational opportunities. Third, financial literacy: supporting public-private partnerships. Combining government, fintechs, banks, and academia can scale financial training significantly. These partnerships can develop and deliver educational content, workshops, hands-on learning sessions, and conferences nationwide (Danladi et al., 2023). Public-private partnerships can also help create policies that balance fintech innovation with consumer and data security.

Awareness campaigns are widespread to build trust for adopting digital financial services. To educate a large portion of society about fintech's benefits and safety, the media should run campaigns on social media, radio, and TV (Cambaza, 2023). Highlighting security and legal safeguards to prevent fraud can ease this issue and inspire trust in digital services for financial benefits. Enabling a FinTech ecosystem requires digital infrastructure development. Rural internet penetration and mobile network stability will increase. Government initiatives and infrastructure investment are needed to bridge the digital divide and provide fintech innovations to all (Imam et al., 2022).

This study believes a favourable regulatory environment has been created for growth in fintech and virtual financial fitness. Technology providers could innovate while protecting consumer rights and data privacy under government-friendly policies. Precise regulation helps fintech companies operate and innovate, fostering a growing digital financial ecosystem (Supriadi et al., 2023). Cost-benefit analyses of behavioural insights in educational programs could finally dispel some digital finance myths. This insight can be used to target effective educational initiatives to overcome fintech adoption behavioural barriers and increase positive financial behaviours (Balaskas et al., 2024). These educational programs may help overcome psychological barriers to digital financial tools, boosting confidence and financial literacy. In conclusion, stakeholders must adopt user-friendly fintech solutions; legitimate educational programs and public-private partnerships can boost digital financial literacy in Pakistan. With targeted awareness campaigns, improved digital infrastructure, supportive regulatory environments, and behavioural insights, these actions can boost economic growth and financial inclusion.

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8. Appendix

8.1. Questionnaire

Digital Financial Literacy

1. **I** find fintech services offered by my bank to be innovative and user-friendly.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
2. **I** feel that fintech innovations have improved the efficiency of banking transactions.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
3. **I** understand how to use digital banking services provided by my bank.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
4. **I** am aware of the security measures needed to protect my digital banking information.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
5. **I** am confident in performing online transactions using my bank's digital services.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
6. **I** know how to resolve common issues that arise with digital banking.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
7. **I** regularly use digital banking services due to my comfort and familiarity with them.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)

Fintech Innovation

1. My bank frequently updates its fintech services to incorporate the latest technology trends.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
2. Fintech innovations by my bank have made banking services more accessible.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
3. Fintech services provided by my bank enhance my overall banking experience.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
4. The technical infrastructure supporting my bank's fintech services is reliable.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
5. My bank's technical infrastructure ensures secure and safe transactions.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
6. I rarely experience technical issues when using my bank's fintech services.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
7. The technical infrastructure of my bank allows for fast and seamless fintech transactions.
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)
    - Strongly Agree (5)
8. My bank's fintech services are easily accessible through various devices (e.g., mobile, web).
    - Strongly Disagree (1)
    - Disagree (2)
    - Neutral (3)
    - Agree (4)

- Strongly Agree (5)