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Impact of Fintech on Financial Inclusion: The Mediating Role of Digital Financial Literacy

Hamza Khatri (Corresponding Author)
Research Scholar at Salim Habib University, Karachi, Pakistan
hamza.khatri18@gmail.com
Muhammad Abdullah Idrees
Lecturer at Salim Habib University, Karachi, Pakistan
Farzeen Sultan
Lecturer at Ilma University, Karachi, Pakistan

ABSTRACT
This study examines the influence of Fintech on financial inclusion, particularly in developing economies, and explores the mediating role of digital financial literacy (DFL). By leveraging the Technology Acceptance Model (TAM), the research analyses how Fintech innovations such as mobile payments, digital wallets, and peer-to-peer lending can enhance access to financial services among marginalized populations. A structured questionnaire was administered to 153 respondents, and the data were analysed using Structural Equation Modelling (SEM). Findings reveal that Fintech significantly improves financial inclusion both directly and indirectly through digital literacy. Digital literacy was found to be a crucial enabler, allowing users to better understand and utilize digital financial platforms. The study highlights the need for targeted policies, regulatory support, and educational initiatives to maximize Fintech's potential. Theoretical and practical implications suggest that bridging digital gaps can contribute to equitable financial growth and economic empowerment, particularly in underserved communities.
Keywords: *Fintech, Financial Inclusion, Digital Financial Literacy, Technology Acceptance Model (TAM).*

Introduction

The process of making sure that all people and businesses, especially those in underprivileged and marginalized communities, have timely and cheap access to financial services and products is known as financial inclusion. (2020) Peterson K. Ozili. Financial inclusion, which makes it possible for people to save, invest, and obtain credit, is crucial for lowering poverty and fostering economic growth, according to the World Bank (2020). Providing savings, consumer credit, insurance, and payment systems to those who have previously been shut out due to socioeconomic hurdles is known as financial inclusion.

Financial inclusion's significance is in the likely positive impacts it has on individuals, firms and whole countries' efficiencies that lead to their quality-of-life improvement. In the case of economies trying to cope with the issue of the unbanked masses and keeping themselves on a stable level, financial inclusion stands as one of the most important tools available to them (Kunt et al., 2018)

Financial inclusion, across the world, is indeed a very important pillar for economic growth and poverty alleviation. It really empowers formal financial systems to help individuals to find the way money stays with them, to increase their education, health, or businesses, and finally to enjoy better life. For small business houses such as micro, small, and medium enterprises (MSMEs), finance inclusion would be a very important key to capital for growth and job creation. On a wider scale, it is essential to attain macroeconomic stability and further reduce inequalities within societies.

This continued to be a major global challenge despite the critical importance of financial inclusion. In 2022, the World Bank reported that 1.4 billion adults are still not banked worldwide, mostly in developing countries. The barriers range from a very limited banking infrastructure towards rural areas to some high transaction fees and stringent requirements for opening even a basic account. Cultural and social norms also cut off women and many other marginalized groups from being able to access formal financial services.

Financial inclusion takes shape in the context of the United Nations Sustainable Development Goals (SDGs), probably being the most powerful marker of resources towards collective human development. For example, SDG 1 for No Poverty, meaning there shall be none that are extremely poor in all the economies of nations, endowments would be opening up as possible opportunities for all economic entrants. SDG 8 (Decent Work and Economic Growth) emphasizes the power of inclusive financial systems in fostering entrepreneurship and job creation; thereby two SDGs will take care of the agenda toward financial inclusion, including SDG 10 (Reduced Inequalities) calling to eliminate all barriers to the economy for marginalized sections. Financial inclusion thus relates directly to these goals by enabling access to the kinds of tools for saving, borrowing, and investing allowing the potential for socio-economic empowerment.

Fintech for developing countries has been probably the greatest answer to the concern about financial exclusion around the world. Such innovations as mobile payments, online and digital wallets, and thin-film transistor technologies help FinTech provide even better solutions but at lesser and more scalable costs for access to financial services. Mobile banking, for example, M-Pesa in Kenya, has extended the scope of people who do not have banking access and enables them to transact, save, and borrow through their cell phones but outside the banking system (Ozili, 2018). Indonesia is a better instrument in tapping SMEs through financial platforms into business development and national productivity (Shofawati, 2019).

Although it has the potential to achieve extraordinary benefits, adoption of fintech is still patchy across the globe especially in some areas with extreme challenges to face such as poor infrastructure, low digital literacy, and regulatory factors. Indeed, the above-mentioned digital divide is characterized by the difference in access to technology and connectivity; thus, the segment denoted as most rural or underserved has little chance of receiving digital financial services (Zetzsche et al., 2017). Similarly, those who are not digitally literate do not realize the full benefits of the available fintech platforms; thus, these tools are poorly used, resulting in increased vulnerability to fraud and misinformation (Amnas et al., 2023). Moreover, regulatory regimes are also slow while there is very rapid growth in the fintech sector where issues such as data privacy, cybersecurity, and consumer protection are being raised (Siddik & Kabiraj)

Background of the Study:

Financial inclusion is currently the most important concern of the world community because it is one of the main factors in the development of the countries and poverty reduction. In fact, it enables families and entrepreneurs to save, invest and protect themselves by spreading the risks with the many instruments supplied by banks and other financial intermediaries. However, there are millions of people remain excluded from the financial system. Some relevant barriers are high transaction costs, geographical isolation, and low levels of financial literacy regarding services. These exclusions do drain masses, particularly from low-income households, rural residents, and women (Siddik & Kabiraj).

Digital finance has emerged as a real solution to this domain. Digital finance deploys mobile phones, digital wallets, and online platforms to deliver financial services remotely, which lessens dependency on a physical bank branch. M-Pesa (Kenya) is a mobile money service designed to give millions of unbanked people the capability of saving, transferring money, paying bills, etc., using their mobile phones (Ozili, 2018). Likewise, digital platforms actively support SMEs in Indonesia by accessing multiple financial tools and credits, resulting in the growth of SMEs that continue to give higher contributions to the economy (Shofawati, 2019).

The term fintech is used to describe the advanced technologies brought within financial services to further broaden the scope of digital finance. New technologies such as blockchain, artificial intelligence, and peer-to-peer lending platforms have been used to provide people with secure and efficient alternatives to traditional financial systems so that faster and more accessible financial services are provided. Such innovations help rural populations and small businesses to tailor solutions that address their unique needs in terms of finance (Hegde & Kavyashree).

There are still obstacles regarding the availability of digital financial services. The so-called Digital Divide- in other words, the inequalities regarding technology and digital infrastructures have a similar effect on the degree to which different entities can benefit from what fintech is offering. Infrastructure gaps within a country would include poor internet coverage and low penetration of smartphones, especially in rural areas (Zetzsche et al., 2017). It is also worthy to note the issue of digital literacy, where many would-be users have no knowledge and skills to use digital financial platforms well.If effective instructional pathways have not been instituted to overcome these hurdles, the pace of adaptation is going to remain slow, and proliferation of fintech solutions will be almost inevitable (Amnas et al., 2023).

The regulatory frameworks surrounding digital finance become yet another debate. While promising wider access to finance, fintech also has the risks such as fraud, breach of data, and biased lending. Under this circumstance, it will without a doubt not be easy finding the balance in which the regulation finally wins between innovation and consumer protection. Because such regulation represents real and perceived support for establishing trust for consumers to adopt digital financial services, it becomes a very significant area for policymakers (Siddik & Kabiraj).

In this way, digital finance and fintech contribute crucial points to financial inclusion. Whereas they cut costs of the provision of financial services, they also enable the marginalized to participate in the economy more actively. This study thus conducts exploration in these areas of the effects of digital finance on removing the hurdles that single out some individuals from financial inclusion and how this could contribute to promoting socio-economic development.

Problem Statement

Financial exclusion is still one of the principal global challenges that is considered despite the advanced technological era and the fact that the nearly 1.4 billion adults are still without access to the formal financial system (World Bank, 2022). This exclusion does not make it possible for people to save, invest, and manage financial risks, which is often a never-ending cycle of poverty.

In the case of the lacking or non-existence of the traditional bank infrastructure in rural and low-income areas, this problem becomes more severe, so new and innovative solutions to the disparities are crucial.
Using financial technologies and digital financial services might be an instrument for resolving financial exclusion hardships. The impressive results of the digital financial services thus far include M-Pesa, which has issued millions of customers a low-cost service, therefore, helping to reduce poverty and giving them an option to participate in the economy (Ozili, 2018). Specifically, Fintech can tap into the mobile space to introduce new financial products for the unbanked, as it is an independent channel of banking infrastructure. A major disadvantage of fintech is in underserved areas, i.e. areas that do not have any dependence on the internet. and the majority of residents who cannot afford equipment Will not be able to enjoy all the benefits.
Despite the promises but there are significant barriers to fintech adoption: low levels of digital literacy prevent many people from using financial platforms effectively. This leads to low service use (Hegde and Kavyashree). Additionally, a lack of trust in new technologies. along with inadequate awareness campaigns. It also limits acceptance in underserved communities. These challenges highlight the need for user-centric platforms and digital literacy initiatives tailored to the region's unique needs.
Regulatory obstacles, like worries about data privacy threats to cyber security and unscrupulous financing methods. Fintech adoption is made more challenging in the absence of efficient regulation. Users could be reluctant to trust digital financial systems in the absence of strong regulatory frameworks. According to research, perceived regulatory support has a critical role in promoting fintech uptake, especially in regions with low financial literacy (Siddik & Kabiraj). Resolving these issues is essential to maintaining fintech's reputation and long-term viability.
The present study will analyze if the application of technology in finance can be a cure for the disparities in the financial inclusion in the main economy empowered to have access to money while the rest are limited. The paper will look at digital financial implications for the infrastructure, education, and regulatory requirements as the main issues and attempt to create solutions. The plan is to bring out the information clearly so that it can be used in practice by giving a roadmap, a payload or action items that can be applied that will help to make fintech platforms more inclusive and trustworthy, hence contributing to the financial inclusion and equity.

Research Objectives

1. To determine how FinTech promotes financial inclusion in Pakistan.

Research Question

1. In what ways does fintech contribute to improving financial inclusion in Pakistan?

Scope of the Study

This study investigates how financial inclusion is improved by the fintech sector, especially in emerging nations. It analyzes certain fintech developments and evaluates their effects on marginalized communities, including peer-to-peer lending, digital wallets, mobile payments, and blockchain technology (Arner, Barberis, & Buckley, 2015). The study aims to explore how fintech might help people in places where traditional banking is difficult to reach, like low-income, rural, and distant communities (Demirgüç-Kunt et al., 2018).
The study also analyzes the challenges associated with implementing fintech solutions, including issues such as digital illiteracy, infrastructure limitations, and regulatory constraints (World Bank, 2020). While the research does not aim to provide a comprehensive global survey, it relies on

specific case studies of countries or regions where fintech has significantly improved financial inclusion (Suri & Jack, 2016).

In addition, this study addresses theoretical and practical questions relevant to stakeholders, including fintech developers, governments

Significance of the Study

This study's importance stems from the knowledge that it is likely to expand on the current understanding of how financial technology, or fintech, is advancing financial inclusion, with specific reference to developing nations that are mainly isolated from traditional financial services. This study investigates the disruption made by fintech through its inventions like mobile payments, digital wallets, peer to peer lending, and block chain technology, in an attempt to open access to financial services by augmenting traditional banking systems. This study thus fills the void in the existing literature in that it shows potential on how fintech could transform the state of financial inclusion in the country and its wider socio-economic implications. In such endeavours, both theoretical and practical contributions would be made, thus proving important to researchers, policymakers, fintech entrepreneurs, and international organizations.

Theoretical Implications

There are significant theoretical implications in this study relating to the field of financial inclusion and fintech. Even though financial inclusion has been so well researched in the context of traditional banking systems, the role of fintech as a transformative force is a relatively new area of investigation. A disruptive approach to managing financial exclusion brought about by fintech means that understanding individual impact will open up existing theories on how financial services can reach marginalized sections of populations.

This study's theoretical contribution is in how fintech is incorporated into the current financial inclusion frameworks. Through this research, a deeper understanding of how new technologies can improve the efficiency, affordability, and accessibility of financial services will be developed. To start, the study can help develop or enhance financial inclusion models by incorporating the unique characteristics of fintechs, such as digital wallets, peer-to-peer lending platforms, and mobile banking. These developments tend to upend traditional banking models by boosting the efficiency and scalability of reaching the unbanked without raising expenses.

Besides this, the study will contribute to understanding the socio-economic effects of financial inclusion through fintech. It will look at the wider societal consequences of enhanced access to financial services, including greater economic stability, poverty reduction, and social mobility, all important areas for both policymakers and academics.

Practical Implications

The practical aspects of this study are important because it will concretize the recommendations for different stakeholders, such as policymakers, fintech companies, financial institutions, development organizations, and consumers. The research findings will be instrumental in establishing the policy environment as well as business strategies critical to mainstreaming fintech solutions for financial inclusion.

Policy Development and Regulatory Frameworks:

It is for analysts and policymakers to ensure that financial innovation does not compromise consumer protection or financial stability at this time. Research would help regulators in developing international best practices for the management of fintech innovation against regulatory measures for safety and soundness. Policymakers could then use the results to create regulations that foster both the growth of new digital financial services and reduce the potential harms associated with them. An example might involve how to preventively address issues of privacy, fraud, or cybersecurity as they pertain to digital financial services. It would, therefore, further provide insights in the developing regulatory frameworks needed for the enhancement of growth for digital banking and mobile payments, which will facilitate a stronger financial system. (Ozili, 2018; Hegde & Kavyashree, 2024).

Fintech Companies and Service Providers:

Understanding certain barriers to adoption in different regions could be the most important point for any fintech entrepreneur or company for product development and market expansion. This will show precisely what consumers are trusting and relying on to motivate adoption of digital financial services. For instance, by examining consumer preferences and challenges regarding digital literacy, infrastructure limitations, and high transaction costs, fintech providers could better design service offerings for those portions of the population that remain underserved. The evidence from this study would give actionable recommendations on how fintechs can design user-friendly platforms that could accommodate lower-income users or people with very limited digital skills. Practical implications on these would provide sound decisions to such companies on market segmentation and partnerships with local businesses, telecommunications companies, and governments. (Al-Slehat, 2023; Thomas & Hedrick-Wong, 2024).

International Development Organizations:

Best suited for analysis and understanding by development organizations-the World Bank, United Nations, and all the numerous international nongovernmental organizations-orienting and focusing on the global financial inclusion would be the research conducted in this article. The concept of how much fintech can deliver to the underserved populations will now better inform the organizations that are designing financial inclusion initiatives to incorporate various fintech innovations. It will also enable organizations like that to realize how fintech is impacting the reduction of poverty and economic empowerment for Global South. The research can point to the need for collaboration between international institutions and fintech firms to offer sustainable financial products to improve global financial capability among developing countries. (Yue et al., 2022; Al-Slehat, 2023).

Financial Institutions and Banks:

Banks and credit unions are adopting fintech solutions rapidly in order to keep pace with one another. This study will help all these institutions better place fintech in that scenario where it can supplement rather than replace traditional banking models used in certain markets. Such as showing how mobile banking applications and virtual wallets would provide consumers with more appealing and cheaper alternatives to bank branches. The findings would spur financial institutions to innovate and collaborate with fintech startups to come out with products that would fill the gap in the underserved sections of the population, such as the unbanked or underbanked. The study also helps banks in realizing the importance of these financial literacy programs to consumers and to use them effectively for accessing benefits from fintech innovations. Siddik & Kabiraj, 2020; Thomas & Hedrick-Wong, 2024).

Economic and Social Development:

This study intends to cover a wider horizon concerning regional economic development in conditions of limited financial services. Financial inclusion has close relationships with economic growth, poverty removal, and social stability. Throwing light on how fintech may be avenues to empower oneself and communities will, therefore assist those who have an argument for reducing economic inequalities. Digital financial access will allow people to savings and investment besides accessing credit, which would eventually lead to entrepreneurial behavior-job creation and financial independence. The finding will come out how better financial inclusion would thus propagate create an equitable society with tools for disadvantaged groups to participate fully in the economy. (Ozili, 2018; Hegde & Kavyashree, 2024).

Thus, it's practical significance may well change the face of the financial services industry and propel inclusive economic growth. The evidence will be available for policymakers, businesses, and development organizations that want to harness fintech in ways that maximize its benefits for financial inclusion. Above all, the research will orientate the sphere of discussion toward addressing challenges and opportunities for achieving financial inclusion through fin-tech, while also indicating how-proof against restrictions will be made to both benefit the most vulnerable from the digital financial services.

Literature Review

Financial inclusion is one of the vital drivers for economic development since it guarantees access to financial services among underserved people, hence contributing to participation in formal economic activities. The new era of Fintech and digital finance has revolutionized the financial systems since they addressed geographic isolation, high transaction costs, and limited infrastructure for traditional banking. Innovations such as mobile payments, digital wallets, and blockchain reduce costs and improve access, particularly for individuals and small businesses, especially in rural and low-income areas. However, the basic challenges that are still in place are the digital divide, low digital literacy, and deficient regulatory frameworks in some places and tend to limit the full potential of digital finance. To harness the full transformational power of fintech towards sustainable and inclusive economic growth, these barriers have to be resolved.

Theoretical Framework

This study is based on the Technology Acceptance Model proposed by Davis in 1989. Basically, TAM describes how technology adoption occurs through two fundamental concepts: perceived utility and perceived ease of use. According to Davis, if people perceive a technology as useful for achieving their goals and easy to use, they will be more accepting of it.

In Fintech, factors such as trust, security, and service quality all play a significant role in perceived utility (Thathsarani & Jianguo, 2022); while on the other hand, digital banking literacy has become an essential dimension of perceived ease of usage (Ozili, 2018).

This study extends TAM by including regulatory support as a moderating factor. A strong regulatory framework safeguards data privacy, increases trust and creates sense of security in the digital financial system which increases its potential for adoption (Amnas et al., 2024). TAM is further expanded by articulating these factors put together all impacting the uptake of Fintech services and bridging the financial chasm for the marginalized. The paper depicts how with the increase digital literacy and perceived regulatory support contributes to the financial inclusion through Fintech (Howard & Hedrick-Wong, 2019).

Review of Related Literature

The study investigates the role of Fintech in promoting financial inclusion, with particular focus on the areas of digital financial literacy, and regulatory support. The study finds that trust, service quality, and security perception appeared to be a significant part of the perceptions in adopting fintech service. The authors refer to these measures to generate user confidence in engaging with digital financial platforms. Highlights of the research- key enablers- digital financial literacy, using digital financial literacy is funding skills to use with fintech; bridging the gap of an access rate to finance; regulatory support, has a relationship with perceived trust and enhances data protection security- increasing acceptance of fintech services. The researchers collected data analysing areas of interest from Indian fintech users, and reports on the extent of their findings with offer recommendations for fintech providers and authorities on how to create friendly regulations, user-centric design, and, education. The follow of the study contributes to developing theoretical models, as well as how practitioners can find real strategies to eliminating the digital divide of trust to build an inclusive eco-system of finance. (Amnas et al., 2024)

Using the Technology Acceptance Model, Thathsarani and Jianguo's (2022) study examines the relationship between the performance of small and medium-sized businesses (SMEs) and the use of digital finance through the financial inclusion channel. Using data from 366 Sri Lankan SMEs' owner-managers and the quantitative research approach, it was determined that digital finance had a major impact on the performance and degree of financial inclusion of SMEs. This study demonstrates the TAM model's role as a mediator through the usage of digital financial instruments, trust, and ease of use. However, in order to improve SME outcomes by providing accessible, reasonably priced, and secure financial services, this article lays out the bidirectional relationship between digital finance and TAM. The report also highlights the need to improve digital financial literacy and provide suitable financial solutions that address the demands of certain SMEs from both a supply and demand standpoint.

Advancements in digital finance are playing an important role for increasing access to financial inclusion and for pushing the growth of SMEs in Indonesia. Innovations such as mobile money and online lending platforms have notably improved access to financial services and further enhanced it particularly for underserved groups. These tools surmount traditional problems of high transaction costs and geographical distances; SMEs gain access to available credits and sources of finance. Therefore, by giving easy access to saving, investments, and credit through digital finance, it fosters SME expansion toward achieving economic scale benefits. The research also points to some challenges: low digital literacy and lack of proper infrastructure, to name a few, which will be needed to have higher adoption. In general, digital finance was shown to be a transformative force in enhancing economic participation and fostering inclusive growth for the SME sector in Indonesia. (shofawati, A. 2019)

Ozili (2018) wrote an article about how digital finance affects financial inclusion and economic stability. It provides digital money services like mobile banking, digital wallets, and peer-to-peer lending. It appears that digital finance makes financial services more accessible, particularly to underserved people like those in rural areas and those with low incomes. Because it gives people the ability to manage their financial risk and participate in the economy, this would promote economic growth and the reduction of poverty. The report highlights the possible dangers of unmanaged digital money, including debt accumulation, cyberattacks, and unstable finances. Ozili stated that "All risks in the digital finance must be mitigated by the robust regulatory framework for enhanced long-run prospects of stability in the economy"

In the paper "The Rise of Digital Finance: Financial Inclusion or Debt Trap", P Yue, AG Korkmaz, Z Yin, H Zhou. (2022), the authors analyze the two sides of digital finance: one as a contributor to financial inclusion and the other as a threat to over-indebtedness. The study argues that, although digital finance has made financial services considerably more accessible and, especially in the case of underserved people, it brings with it other risks, specifically in the form of excessive borrowing and debt traps in low-income regions.The study discusses how the quick growth of digital lending has expanded credit availability while simultaneously raising questions about customers' capacity to repay, particularly for financially disadvantaged populations, using data from many fintech platforms.The authors believe that there is a need for strict regulatory control in reducing the dangers of financial instability, and they demand an equilibrium be maintained between financial inclusion and enough consumer protection measures. In its conclusion, the paper claims that digital finance has to be kept under careful control to prevent financial inequity and ensure that it does promote long-term economic viability.

Al-Smadi (2023) in this study has looked into the impact of digital finance on financial inclusion to the MENA area. He has used composite score that would comprise access and availability, yearly data for 12 countries of the MENA region during the period of 2004 and 2020 to quantify the study of financial inclusion. In his study, he has taken the sys-GMM approach in the analysis. Findings: The digital finance enhances the financial inclusion in the region considerably and bridges the gaps in delivering financial services to the underserved population. It is primarily because of the growing number of ATMs and adoption of digital technologies that enhance accessibility and efficiency of service delivery. This study highlights the need for policy interventions tailored to support digital finance initiatives and underlines the significance of regulatory frameworks and digital literacy in expanding financial inclusion in MENA countries.

Digital finance is recognized as a leading tool toward financial inclusion. This research checks its impact on the reduction of financial barriers such as geographical constraints and access costs in addition to improving the supply of financial services. Carrying out a mix of primary and secondary data collection methods, the study analyzes how mobile payments and blockchain are tools that facilitate inclusion. Results show that as much as this digital finance expands access to significantly improve its utilization, problems do exist and go on unabated in form of digital illiteracy gap in addition to some weak regulations surrounding the provision S Hegde, K Kavyashree (2024).

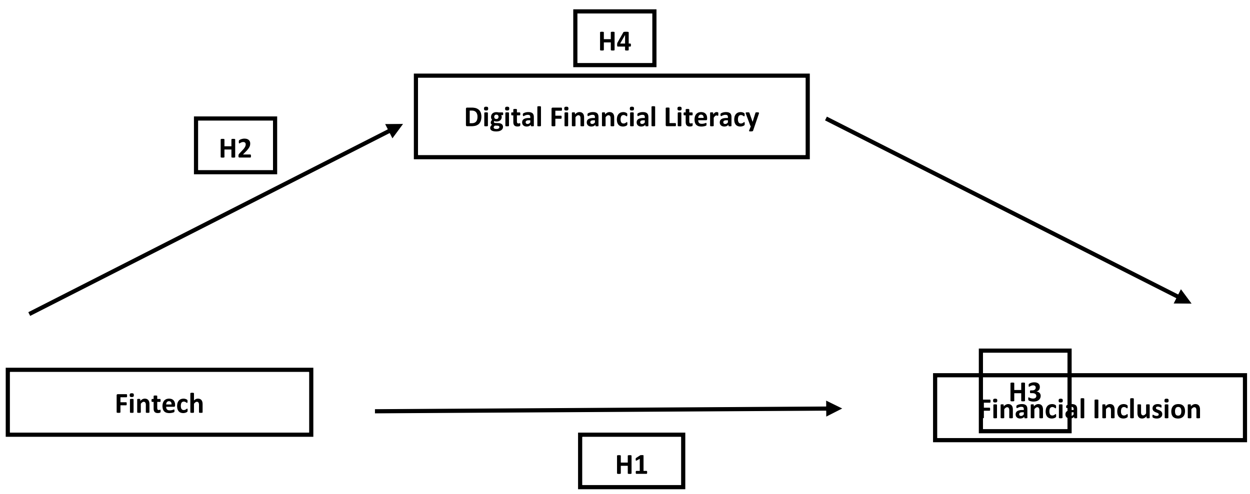
Siddik and Kabiraj (2020) shed light on the role of digital finance (DF) in the promotion of financial inclusion (FI) and fostering inclusive economic growth. DF fills gaps in formal financial services by enhancing accessibility, affordability, and usage among the marginalized sections, especially in developing regions. Through mobile money and digital payments, tools of digital financial services make it possible for rural and unbanked people to engage in a formal economy. The study emphasizes proper implementation of DF to ensure financial stability, increase banking profitability, and reduce gender disparities in FI. Strengthening digital literacy and regulatory frameworks are also important for achieving sustainable growth through digital finance.

Howard Thomas and Yuwa Hedrick-Wong (2019) examine, in their paper, the way digital finance and fintech drive financial inclusion and the ways digital finance and fintech make these services more available, affordable, and efficient-especially for poorer and underserved populations. One of the examples was Kenya's M-Pesa service, which offered mobile payments to people with otherwise limited access to them due to either geographical isolation and high transaction costs or lack of financial education. Breaking down such barriers, therefore, not only provides access to financial services but also empowers the economically disadvantageous population with the potential of fostering inclusive growth. However, such initiatives for their success and sustainability require a more enhanced digital literacy, better infrastructural facilities, and supportive regulatory environment to bring out equitable benefits in the long term.

This paper is by Al-Slehat in 2023, which evaluates the relationship of fintech with financial inclusion with the mediator of digital marketing for the Jordanian banking sector. Data was gathered using the descriptive analytical method from 375 employees. The findings of the data processing were analyzed by structural equation modeling using SmartPLS software. The results of the paper show that digital marketing indeed strengthens the effect of fintech in improving the degree of financial inclusion among customers in terms of their access and involvement. Banks can use digital platforms to promote financial services more efficiently, reach underserved populations, and strengthen customer trust and satisfaction. This suggests that combining innovative technology with potent digital marketing tactics can best use financial technology towards optimizing benefits on financial inclusion. Some of the recommendations would therefore be creating favorable conditions for advancement in technology while investing in some of the required digital marketing products to multiply this impact.

Literature Gap

The literature that is now available concentrates on the growing contribution of Fintech to financial inclusion since it is thought to be a viable means of getting over traditional obstacles including access, high transaction costs, and geographic limitations. Still, there are a number of undiscovered gaps that require more study. First, there is ample evidence of the connection between Fintech and financial inclusion; nevertheless, the crucial mediating function of digital literacy in this link has not been adequately explored. In addition to facilitating the successful adoption of Fintech solutions, digital literacy also helps determine how inclusively different socioeconomic groups can use these solutions. These regulation frameworks can either help or hinder financial inclusion through Fintech, and are somewhat ambiguous, with evidence mostly empirical in such studies on this topic. Most of the studies are on developed economies that dismiss the special challenges and opportunities of developing regions, where financial exclusion is more acute. This paper assumes a general Fintech adoption strategy rather than specifying particular services such as mobile banking, digital wallets, or even blockchain-enabled solutions in assessing their role and influence towards variable effects in exclusion. Considering such gaps may, therefore, guide well-informed and targeted policy interventions to most fully capitalize the value proposition associated with the possible reductions of Fintech-generated inequalities around the world.



Hypothesis Development

Relationship between Fintech Adoption and Financial Inclusion:

Fintech has significantly improved access to financial services for underserved and rural populations by fostering digital platforms that eliminate physical presence at bank branches (Arner et al., 2020; Shaikh et al., 2023; Yang & Zhang, 2022). Reducing costs associated with traditional banking has improved affordability and access to banking services even for individuals with little technology expertise (Shen et al., 2020). As a result, excluded groups can enter into the official financial system due to the technological change in the financial system (Bongomin & Munene, 2021; Senyo & Osabutey, 2020). In addition, FinTech offers financial services through peer-to-peer lending and microfinance, providing credit to small businesses and individuals that would have been otherwise unavailable (Björkegren & Grissen, 2018; Yue et al., 2022). Another role of FinTech-government collaboration is the efficient distribution of subsidies and social benefits (Asif et al., 2023). Clearly, FinTech is dismantling persistent financial barriers to financial inclusion and is trying to enhance the availability of financial services (Aleemi et al., 2023; Yeyouomo et al., 2023). Thus, it is hypothesized:

H1: Fintech adoption positively influences financial inclusion.

Relationship between Fintech Adoption and Digital Literacy:

FinTech platforms can be seen providing educational opportunities to build digital financial literacy, making educational materials easier to access; platforms produce educational material, such as articles, videos, and tutorials, to break down and simplify the complexities of financial concepts and investment approaches (He et al., 2024; Kumar et al., 2023; Setiawan et al., 2022). Most Fintech platforms include budget tools as well, so users can track spending habits, identify financial spending goals, and budget their finances (Carè et al., 2023; Uthaileang & Kiattisin, 2023). AI powered fintech applications, can provide users with personalized financial advice with a quality no different from an actual virtual financial advisor (Zarifis & Cheng, 2022; Gautam et al., 2022; Shen et al., 2018). Gamification can also be introduced as a way to make learning finances fun, where users are permitted to take part in virtual financial scenarios and gain knowledge through experience, while interacting in a risk-free environment (Lai & Langley, 2023; Kakinuma, 2022; Şenol & Onay, 2023). Further, these platforms may prompt encouraging community interactions, nudging users to share ideas, ask questions, and even learn together and encourage the creation of a community space for newcomers of digital finance (Ravikumar et al., 2022; Malladi et al., 2021). Thus, it is hypothesized:

H2: Fintech adoption positively influences digital literacy.

Relationship between Digital Literacy and Financial Inclusion:

To increase digital financial inclusion and build an understanding and knowledge of digital financial services, individuals must have knowledge and skills regarding the digital financial literacy (DFL) (Choung et al., 2023; Malladi et al., 2021). If users have DFL, they would also have a more positive perception of the risks of using digital platforms as risks rather than threats as users would be better equipped to analyse and manage risk (Kumar et al., 2023; Panos & Wilson, 2020).A positive disposition towards the formal financial system is initiated by individuals who are appropriately equipped with DFL services as they have a propensity to trust their own capacity to utilize digital financial platforms (Lyons & Kass-Hanna, 2021). DFL empowers an individual to make an informed decision when engaging with digital financial services to enhance further engagement within the digital financial ecosystem (Prasad et al., 2018; Shen et al., 2018).Its further improvements in

financial inclusion due to the promotion of adoption of digital services, the betterment of financial decision making capacities, awareness of security, and advancement of responsible use of digital financial platforms (Amnas, M. B., Selvam, M., & Parayitam, S. 2024).Therefore, it is hypothesized:
H3: Digital literacy has a positive impact on financial inclusion.

Mediating Role of Digital Literacy between Fintech Adoption and Financial Inclusion

Previous research has sought to explore the complex and multi-layered relationship between FinTech adoption and financial inclusion (Sampat et al., 2023; Yue et al., 2022; Wang, 2023). For instance, Al-Slehat (2023) certified digital marketing as a mediating aspect, while Bongomin and Ntayi (2020) certified digital consumer protection as a mediating factor. However, it remains evident from the literature that there has not been any effort to explore digital financial literacy as a mediating aspect between financial inclusion and FinTech adoption. This study will be predicting that FinTech will have a direct and indirect influence on financial inclusion through digital financial literacy. Digital financial literacy will increase the effectiveness of FinTech in promoting economic inclusion through the transfer of knowledge and skills that users can utilize to leverage the services and capabilities available via digital channels (Amnas, M. B., Selvam, M., & Parayitam, S. 2024). This study provides a fresh perspective by proposing the mediating role of digital financial literacy, whilst measuring its intervening function for the purpose of constructing an exploratory mediation hypothesis in the context of direct and indirect impacts on financial inclusion. Accordingly, it is hypothesized:
H4: Digital literacy mediates the relationship between Fintech adoption and Financial Inclusion.

Methodology

This study employs a cross-sectional research design to explore the relationships between FinTech adoption, digital literacy, and financial inclusion, incorporating an explanatory dimension by assessing the mediating role of digital literacy. The target population includes individuals aged 18 and above, both current and potential users of FinTech services in underdeveloped urban regions, reflecting the growing adoption of digital financial services in both urban and rural areas. A non-probability convenience sampling method is used due to time and resource constraints, with respondents grouped by region (urban/rural) through a lottery technique to reduce sampling bias and ensure representativeness regarding poverty and digital literacy disparities. Primary data is collected through a structured, Likert-scale-based questionnaire covering demographics, FinTech adoption, digital literacy, and financial inclusion, with a pilot test of 30 respondents validating the instrument's reliability. Secondary data from academic, industry, and government sources supplement the primary findings. Data analysis involves descriptive statistics, correlation analysis, Structural Equation Modelling (SEM) to test hypothesized relationships, and reliability and validity assessments using SmartPLS. The study operationalizes FinTech adoption as the frequency and type of digital services used, digital literacy as the ability to navigate and understand digital platforms, and financial inclusion as access to financial services like savings and credit. Ethical standards are upheld through informed consent, anonymity, and adherence to Salim Habib University's research guidelines, ensuring academic integrity.

Data Analysis

Demographic Analysis

Table 1: The participants' demographic details

Sample Characteristics	N	%
Gender		
Male	105	68.7
Female	48	31.3
Age		
18-12	2	1.30
21-25	59	38.6
26-30	61	39.9
31-35	27	17.6
36 and Above	4	2.6
Experience in Fintech		
Less than a year	22	14.37
1 - 3 years	51	33.33
2 - 5 years	54	35.29
More Than 5 years	26	17.01
Frequency of FinTech use		
Always	84	54.9
Often	36	23.5
Sometimes	23	15.0
Rare	10	6.6

Note: N=153, n=number of respondents

Table 1

Demographic study reveals that the majority of fintech users in the sample are young adults belonging to the age group of 21–30 years, with a overwhelming majority of males. Most participants have limited experience with fintech (1–5 years) and report high frequency of usage, showing high engagement with digital financial services. This shows that fintech adoption is most evident among the youth, particularly males, who are not only aware of but also actively using the platforms. The findings point to the growing significance of fintech in the daily finances of youth and show its promise in advancing financial inclusion among youth.

Table 2: Outer loadings, reliability & AVE

Construct	Item Code	Outer Loadings	Cronbach's alpha	Composite reliability (rho_a)	Average variance extracted (AVE)
Fintech	**Fintech1**	0.81	0.851	0.859	0.693
	Fintech2	0.895			
	Fintech3	0.865			
	Fintech4	0.753			
Financial Inclusion	**FI1**	0.844	0.821	0.83	0.652
	FI2	0.854			
	FI3	0.785			
	FI4	0.741			
Digital Finance Literacy	**DL1**	0.876	0.871	0.881	0.721
	DL2	0.891			
	DL3	0.821			
	DL4	0.806			

Note: The reliability and convergent validity of reflective constructs are examined in the above table.

Measurement Model

The measurement model was evaluated against external loadings, internal consistency reliability, and convergent validity in order to confirm the validity and reliability of the constructs used in this study. The analysis adhered to the recommendations made by reputable scholars Hair et al. (2019) and Wong (2013).

Outer Loadings

To assess indicator reliability, the outer loadings of each indicator were examined. Wong (2013) states that a loading above the 0.708 threshold value is permissible. With loadings ranging from 0.741 to 0.895, every item in the Fintech, Financial Inclusion, and Digital Financial Literacy constructions had loadings higher than 0.708. This demonstrates that each item captures more than 50% of an indicator's variance and significantly contributes to its related latent variable.

Internal Consistency Reliability

Composite Reliability (CR/rho_A) and Cronbach's Alpha were employed to assess internal consistency. According to Hair et al. (2019), values greater than 0.70 can indicate sound reliability.

- The composite reliability and Cronbach's alpha for the Fintech construct were 0.859 and 0.851.
- Composite Reliability for Financial Inclusion was 0.830 and the Cronbach's Alpha was 0.821.
- Composite Reliability for Digital Financial Literacy was 0.881 and the Cronbach's Alpha was 0.871.

All constructs exceeded the minimum threshold which validated the internal consistency of the scales.

Convergent Validity

Convergent validity was measured using the Average Variance Extracted (AVE). The AVE should be at least 0.50 to show good convergent validity (Hair et al., 2019).

- Fintech showed an AVE of 0.693
- Financial Inclusion had an AVE of 0.652
- Digital Financial Literacy demonstrated an AVE of 0.721

These results indicated that each construct explained over 50% variance in its indicators providing strong convergent validity.

In conclusion, the measurement model demonstrated good levels of internal consistency, convergent validity, and indicator reliability, which means that the measurement model can now be used with greater structural model analysis.

Table 3

Fornell Larcker Criterion

	DL	FI	Fintech
DL	0.849		
FI	0.824	0.808	
Fintech	0.754	0.798	0.832

Note: The above table checks the discriminant validity of the constructs.

Discriminant Validity – Fornell-Larcker Criterion

The Fornell-Larcker Criterion, which states that each construct's square root of Average Variance Extracted (AVE) (the diagonal values of the matrix) must be large in relation to the correlation coefficients between that construct and all other constructs, was used to assess discriminant validity in order for each construct in the study to be empirically distinct from the others (Fornell & Larcker, 1981).

As shown in Table 3:

- Digital Financial Literacy (DL) has a square root of AVE of 0.849, greater than its associations with Fintech (0.754) and Financial Inclusion (0.824).
- The square root of AVE for Financial Inclusion (FI) is 0.808, higher than its connection with Fintech (0.798).
- AVE has a square root of 0.832 for Fintech, which is higher than its correlations with the other two components.

These findings support the idea that each construct has a greater amount of variance with its own measurements than with the other model components. Consequently, discriminant validity for all constructs is confirmed by the Fornell-Larcker Criterion.

Table 5

Model Fitness		
	R-square	**R-square adjusted**
DL	0.568	0.566
FI	0.751	0.748

Structural Model Assessment

Model Fitness – R-Square (R^2)

R-squared (R^2) and Adjusted R^2 values were estimated in order to measure the structural model's explanatory power. Hair et al. (2019) state that significant, moderate, and weak predictive validity are indicated by R^2 values of 0.75, 0.50, and 0.25, respectively.

As presented in Table 5:

- Strong predictive power is suggested by the construct Financial Inclusion (FI), which has an R^2 value of 0.751, meaning that the independent components account for 75.1% of the variance in FI.
- The R^2 value for Digital Financial Literacy (DL) is 0.568, meaning that Fintech accounts for 56.8% of the variance, which is in the moderate range.

These results confirm that the model's predictive relevance for the dependent constructs is high enough.

Table 6

Hypothesis Testing			
Direct Effect	**T statistics (O/STDEV)**	**P values**	**Result**
Fintech -> FI (H1)	5.77	0.000	Supported
Fintech -> DL (H2)	10.766	0.000	Supported
DL -> FI (H3)	7.071	0.000	Supported

Indirect Effect	**T statistics (O/STDEV)**	**P values**	**Result**
Fintech -> DL-> FI (H4)	4.985	0.000	Supported

Hypothesis Testing

To verify the formulated hypotheses, path analysis was conducted by utilizing T-statistics and p-values. As per Hair et al. (2019), a hypothesis is considered significant at the statistical level if the T-value is more than 1.96 and the p-value is less than 0.05.

Table 6 presents the hypothesis testing results:

- H1: Fintech → Financial Inclusion

T = 5.770, p = 0.000 → Supported

- H2: Fintech → Digital Literacy

T = 10.766, p = 0.000 → Supported

- H3: Digital Literacy → Financial Inclusion

T = 7.071, p = 0.000 → Supported

- H4: Fintech → Digital Literacy → Financial Inclusion (Mediation)
- T = 4.985, p = 0.000 → Supported

Since the p-values are 0.000 and the T-values are all significantly higher than 1.96, all path relations are statistically significant, providing strong support for each hypothesis. These findings suggest that Fintech has a substantial positive impact on both financial inclusion and digital financial literacy, and that digital financial literacy significantly contributes to financial inclusion.

Discussion

The research's conclusions highlight the significance of Fintech in promoting financial inclusion, either directly or indirectly through the development of digital financial literacy. The analysis across demographics shows that young adults between 21–30 are the main users of Fintech services, mirroring international trends towards digital uptake among younger age groups. As a general rule, most interviewees expressed moderate experience and regular usage of Fintech platforms, which implies increasing familiarity and over-reliance on these servicesWith all constructs having adequate outer loadings, internal consistency (Cronbach's Alpha and Composite Reliability > 0.70), and convergent validity (AVE > 0.50), the measurement model was determined to be extremely valid and reliable. The Fornell-Larcker criterion was also used to confirm discriminant validity, and VIF values below 3.3 suggested that multicollinearity was not an issue. With R2 values of 0.568 for digital literacy and 0.751 for financial inclusion, the structural model demonstrated moderate to strong predictive power. All of the expected associations were statistically significant, confirming that Fintech positively affects both financial inclusion and digital literacy and that financial inclusion is boosted by digital literacy. These findings demonstrate how Fintech access and digital education can support equitable financial growth, particularly for young people who are tech-savvy.

Conclusion and Recommendations

Conclusion

With an emphasis on the mediating function of digital literacy, this study aimed to explore how Fintech affects financial inclusion. By improving consumer's digital financial literacy, Fintech both directly and indirectly increases financial inclusion, as the study's findings make abundantly evident.

The analysis showed that:

- Fintech adoption positively influences both financial inclusion and digital financial literacy.
- Digital literacy, in turn, also has a significant positive effect on financial inclusion.
- The mediating role of digital literacy is critical in maximizing the effectiveness of Fintech tools.

These results demonstrate how crucial it is to combine Fintech breakthroughs with digital literacy programs to provide universal and fair access to financial services, particularly for marginalized groups. The majority of Fintech users are young, tech-savvy people, according to the report, which implies that specific interventions are still needed for other user segments (such as senior citizens or users in rural areas).

Practical Recommendations

For Policymakers and Regulators

a) Promote digital literacy campaigns in rural and low-income areas to bridge the digital divide.
b) Establish clear regulatory frameworks for Fintech operations to ensure consumer protection, privacy, and cybersecurity.
c) Encourage partnerships between Fintech companies and government agencies to extend services to underserved communities.

For Fintech Companies

a) Design user-friendly platforms that are accessible to users with limited digital experience.
b) Offer localized support and language options to improve trust and usability across diverse regions.
c) Collaborate with NGOs and educational institutions to train users in digital financial tools.

For Financial Institutions

a) Integrate Fintech solutions into traditional banking to serve unbanked populations more efficiently.
b) Leverage data and analytics to develop tailored financial products for marginalized groups.
c) Invest in mobile banking infrastructure to ensure wider reach and affordability.

For Development Organizations

a) Fund Fintech pilot projects that target financial exclusion in remote or underdeveloped areas.
b) Promote research and knowledge-sharing on successful Fintech inclusion models globally.
c) Support cross-sector collaboration between tech, finance, and public sector stakeholders.

Theoretical Contributions

This study makes the following contributions to existing literature:

a) It offers the inclusion of digital literacy and regulatory support to the Technology Acceptance Model (TAM).
b) It demonstrates that digital literacy mediates the incremental impact of Fintech on financial inclusion.
c) It provides evidence from a context of a developing country that has been less frequently researched within Fintech studies.

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