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IMPACT OF DIGITAL FINANCIAL INCLUSION ON ECONOMIC GROWTH WITHIN PAKISTANI EMERGING MARKET FROM 2010-2024: ROLE OF CUSTOMER AWARENESS, E-BANKING TRAINING AND DIGITAL FINANCIAL INCLUSION LITERACY PROGRAMS

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Abstract
This study explores the relationship between digital financial inclusion and economic growth, using secondary data analyzed through descriptive statistics, correlation analysis, and regression techniques. The findings reveal that GDP growth fluctuated moderately during the study period, with an average of 3.42%. Key indicators such as outstanding loans, the number of bank accounts, mobile money transactions, and digital deposit accounts show increasing public engagement with formal and digital financial services. The data also highlights rising mobile and internet penetration, alongside growing public interest in digital finance, as reflected in Google search trends. Government initiatives, including funding for digital financial literacy and training programs, further support the shift toward a more digitally inclusive economy. Correlation results indicate strong to moderate positive relationships between GDP and several financial inclusion variables, while regression analysis confirms that bank branches, ATMs, loan accounts, and mobile banking users significantly contribute to GDP growth. These results underscore the crucial

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role of expanding digital financial infrastructure, increasing accessibility, and enhancing financial literacy in promoting sustainable economic development.

Keywords: Digital Financial Inclusion, Economic Growth, GDP, Mobile Banking, Financial Literacy, Financial Infrastructure, Sustainable Development

Introduction

Digital Financial Inclusion is newly developed concept and important for the emerging economy where the traditional banking infrastructure are not well established (Saher, Masih & Raju, 2021; Hewawitharana, et al., 2020; Masih, et al., 2020). This concept emphasizes the accessibility of financial services at low cost, in more efficient way to reduce the risk of loss and promote economic empowerment. According to Ozili (2018), digital finance includes a variety of new financial products, services, software, and ways of communicating with customers, all provided by Fin-Tech companies and other innovative financial providers. While there isn't a single agreed-upon definition, it's clear that digital finance involves any products or services that let people and businesses access payments, savings, and credit online, without needing to visit a bank or interact directly with a financial institution (Danish, Akhtar & Imran, 2025; Mankash, et al., 2025; Hafeez, Yaseen & Imran, 2019). Since the 1990s, the Asia-Pacific region has seen significant socioeconomic growth, however, these benefits haven't always reached those who need them most as financial access remains limited for many due to factors like lack of awareness, risks, and knowledge (Hsu, Huang, & Huynh, 2023; Nguyen et al., 2022). Women-owned businesses face additional barriers, such as gender biases and limited mobility, which worsen inequalities. Although mobile banking adoption is slower than in Sub-Saharan Africa, however, many countries like Bangladesh, Indonesia, and Mongolia have made progress with digital financial services (basnayake, 2024). Additionally, in Europe, the internet has become a key way for banks to offer services, and both traditional and new banks are seeing its advantages over other methods (Ahmad, et al., 2021; Ali, et al., 2020; Ahmad, 2018). The United Nations Sustainable Development Goals (SDGs) aim for a world free of poverty, hunger, and inequality whereby financial inclusion is also playing a key role in achieving seven of the 17 goals of SDGs. Financial inclusion is a crucial step toward achieving the SDGs, and FinTech is one of the best ways to make progress as digital financial services, plays a vital role in improving financial inclusion and helping to achieve the SDGs (Ozili, 2018; Basnayake, 2024).

Financial inclusion is crucial for promoting inclusive economic development, especially in countries like Bangladesh, where over 40% of the adult population remains excluded from formal financial systems (Hsu & Huynh, 2023; Hsu et al., 2022; Hsu, Huang, & Huynh, 2021). Financial inclusion ensures that individuals and businesses, regardless of their socio-economic status, can access affordable and sustainable financial products and services, such as savings accounts, credit, and insurance. In Bangladesh, the rise of digital financial services (DFS), including mobile banking and agent banking, has bridged many gaps by providing low-cost financial tools to underserved populations, particularly in rural areas and among women (Sarker & Sarker, 2025).

The primary objectives of financial inclusion highlights reduce poverty and inequality, access remains uneven, particularly in underserved areas, highlighting the need for innovation in banking and financial systems poverty reduction, equitable income distribution, and financial stability (Ali, et al., 2021; Muhammad, et al., 2020; Farooq, et al., 2019). Recent policies focus on ensuring access to essential financial services such as savings, transactions, and credit that help to achieve the goal of increasing financial inclusion boosts savings, investment, and economic development (Khan & Haq, 2025; Haq & Khan, 2024). However, it does not fully address economic disparities, as income distribution remains uneven. Many countries prioritize financial inclusion to foster private sector growth, mobilize savings, and manage investment risks. While a robust financial system generally enhances access to services, the link between financial depth and inclusion varies across nations. (Mbodja & Layeb, 2024)

Digital financial services have significantly enhanced financial access, driving poverty alleviation and economic empowerment, especially for marginalized groups. Mobile financial services, like bKash and Rocket, have enabled women entrepreneurs to overcome socio-cultural barriers and access capital. While DFS has improved financial inclusion, challenges such as digital illiteracy, gender disparities, and infrastructure deficits remain. Overcoming these barriers is essential to fully harness the potential of DFS for equitable development (Sarker & Sarker, 2025).

Digital financial inclusion is increasingly becoming a critical issue for both developed and developing countries around the global (Danish, Akhtar & Imran, 2025; Mankash, et al., 2025; Hafeez, Yaseen & Imran, 2019). It has been noticed that digital financial inclusion empowers countries to withstand with economic challenges as positive relationship was found between financial inclusion and economic growth (Chinoda, 2023). Financial inclusion is the way of providing the crucial financial facilities to people in a convenient and sustainable way but demand of individual can be effective navigation and utilization services that means achieving true inclusion requires more than just access to digital financial services (DFS). Financial literacy (FL) also import aspect to ensure individuals can effectively navigate and utilize these services as financial literacy empowers people, especially women, by equipping them with the skills to make informed decisions and maximize the benefits of financial tools. It has been notices that women, have historically faced barriers to economic participation, the combination of DFS and financial literacy can significantly boost economic empowerment, reduce inequalities, and contribute to broader economic growth (Ahmed, Batool & Haq, 2025; Shah, et al., 2025). As women become financially literate and gain access to DFS, they are better positioned to invest in their families and communities, fostering resilience and long-term development. (Showkat et al.,

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2024). Understanding the dynamic between financial literacy, digital services, and women's empowerment is crucial for creating policies that promote inclusive economic growth and gender equality.

Financial development is essential for poverty reduction, as it reduces transaction costs and enhances access to formal financial systems, thereby boosting economic growth and alleviating poverty. Reforms in the financial sector are crucial for efficiently mobilizing resources to support poverty alleviation efforts (Azhar, 2024; Azhar & Imran, 2024; Azhar, et al., 2022). Expanding financial services while ensuring stability and efficiency enables economies to achieve sustainable growth, decrease inequalities, and improve overall prosperity. Financial inclusion via digital access of formal financial services would be suitable for underserved population and tailored to meet the customers' needs and provided responsibly, ensuring they are affordable for users. (CGAP publication 2015). Financial development is essential for economic growth as research showing a positive bidirectional relationship between the two. Financial deepening is measured by the growth of financial sector indicators like bank credit, deposits, and monetary aggregates, relative to GDP (Purwa Khera, 2021).

Theoretical Discussion

Financial inclusion has become a key policy goal for many developing and emerging countries, aiming to integrate underserved populations into the formal financial system. Governments are actively working to expand access to financial products and services, with notable progress seen in countries such as India, Rwanda, Kenya, and Peru. (Ozili, 2020). The influence of financial inclusion on economic growth can be better explained by the finance and growth theory that suggests a developed financial sector improves access to credit, influencing investment, production, and consumption, which drives economic growth. Greater financial inclusion expands the deposit base, enabling more lending to productive sectors, thereby boosting overall economic output. (ozili, 2020). By enhancing access to financial services,

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institutions and FinTech firms, increase financial inclusion, bringing more individuals and businesses into the formal financial system. The resulting rise in deposits enables greater lending to those in need of funds, stimulating investment, production, and consumption. This process ultimately boosts economic output, establishing a clear link between financial inclusion and economic growth (Basnayake, 2024).

Another theory is the System Theory of financial inclusion suggests that financial inclusion impact is felt across various components of the economic system (Kayani, et al., 2023; Khan, et al., 2021). Improvements in financial inclusion positively influence the financial sector, enhance institutional performance, and contribute to overall economic growth. According to this theory, changes in one part of the system can significantly affect financial inclusion outcomes, with economic, financial, and social sub-systems benefiting the most. (ozili, 2023). Digital financial inclusion has become a key priority for both developed and developing countries. It refers to providing affordable financial services such as mobile banking, POS systems, e-banking, and ATMs to underserved, low-income, and disadvantaged populations. This enhances access to essential financial services like savings, credit, and bank accounts. Governments are developing strategies to expand digital financial access, recognizing its potential to improve lives and drive economic growth. Experts, NGOs, and institutions emphasize the critical role of digital tools in achieving universal financial inclusion. Advancements in mobile technology, cloud computing, big data, and blockchain have transformed the industry, enabling faster and more cost-effective access to financial services. (Thaddeus, 2020).

The study explores how financial inclusion help every individual to have excess to formal financial services such as savings accounts, loans, insurance, and payment systems, contributes to economic growth. Digital financial tools (e.g., mobile banking, fintech) allow previously excluded individuals and businesses to save, invest, and borrow, aligning directly with

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the theory's view that financial development drives growth (Shah, et al., 2025; Haq, et al., 2024; Noor, et al., 2024). The study also investigates how financial inclusion, particularly through digital channels, supports economic growth as financial inclusion indicators affect not just individual financial behavior, but the performance of financial institutions and overall economic health.

Financial inclusion depends on collaboration between governments and the private sector to build trust, improve confidence in financial products, tailor offerings, and enforce consumer protection (Hafeez, Khan & Jabeen, 2024; Irshad, Khan & Mahmood, 2024; Khan, Sarfraz & Afzal, 2019). Access to basic financial services drives economic growth and reduces poverty. (Christelle,2025). In recent years, digital financial inclusion (DFI) has gained global attention as a transformative innovation in finance and banking. It has the potential to significantly boost financial inclusion and support sustainable economic growth by reducing poverty. Poverty is often most severe among rural and disadvantaged populations, who are frequently overlooked in developed societies, limiting overall national financial progress. Properly implemented, DFI can help bring these underserved groups into the formal financial system. The main goal of DFI is to provide access to formal financial services for poor, rural, and unbanked individuals, which can positively influence long-term banking performance (Hasanul, 2021). Much of the existing literature has concentrated on traditional access-based measures of financial inclusion, overlooking its broader dimensions. As Digital Financial Inclusion (DFI) is a relatively recent concept, this study found that the impact of DFI in economic growth has not been extensively examined, likely due to limitations in available data. The lack of financial access considers as a significant obstacle to economic growth and poverty alleviation, as the poor struggle to save and cover essential expenses like healthcare and education (Noha Emara, 2020).

Banks play a key role in digital financial inclusion by improving access to services and financial literacy, while managing risks through interest rates.

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Overall, financial intermediation is essential for economic development and financial inclusion. Financial intermediation theories try to explain why surplus funds are first lent to banks who then lend to deficit units, instead of lending directly (Malik, Muzaffar & Haq, 2025; Zaheer, et al., 2021). Financial intermediation is the process by which financial institutions connect surplus and deficit units, facilitating the flow of funds. Instead of lending directly, surplus funds are first deposited with banks, which then lend to those in need (Levine, 2005). This process helps allocate capital efficiently, supporting economic growth. Over time, the financial system develops more quickly than a nation's wealth, with financial intermediation playing a crucial role in this development.

Financial intermediation addresses this by improving access to capital and providing vital information to both lenders and borrowers (Azhar, 2024; Azhar & Imran, 2024; Azhar, et al., 2022). It also helps foster financial inclusion by offering digital financial services, promoting financial literacy, and ensuring efficient resource allocation (Janjua, et al., 2025; Faisal, Qureshi & Shah, 2025). However, banks assume risks in this process, which are managed through interest rates. Overall, financial intermediation is essential for fostering economic growth and financial inclusion. Including more people in the financial system also contributes to the stability of banks and increases government revenue through higher tax collection (Ozili, 2021). These services are typically accessed through devices like smartphones, computers, or laptops, all requiring internet connectivity.

Noha emara, 2020 highlighted same issues after analyzing study of MENA countries whereby growth in bank branches and microfinance institutions had been observed, however, large segments of the population remain excluded from financial services. The scarcity and poor quality of data, particularly related to financial technology, pose further challenges to efforts aimed at reducing poverty in the region. (Anag Agung, 2024) identify three factors limiting financial inclusion: geographical barriers (lack of banking in remote areas), socio-economic barriers (access limited to certain groups), and limited opportunities (lack of information or collateral). The existing literature has predominantly focused on traditional measures of financial inclusion, failing to capture its broader dimensions. Much of the current research focus on the technical and operational aspects of digital financial inclusion, such as mobile money platforms, mobile banking, and digital payment Systems, without giving sufficient attention to the role of institutional and regulatory environments in enabling or hindering these initiatives. (Sarker & Sarker, 2025) examines the socio-economic realities of Bangladesh, such as rural infrastructure gaps, digital trust issues, and the limited availability of financial literacy programs. These factors call for tailored solutions to bridge the financial inclusion gap. Moreover, the lack of integration between financial literacy initiatives and public-private partnerships exacerbates existing inequalities, preventing marginalized groups from fully benefiting from DFS (Kayani, et al., 2023; Khan, et al., 2021; Naseer, et al., 2021; Khan & Khan, 2020). Addressing these structural barriers and enhancing the synergy between traditional and digital financial infrastructure are crucial to realizing the full potential of DFS for equitable financial access in Bangladesh.

Despite extensive research on the link between financial development and economic growth, the impact of high-quality financial research on advancing financial technology, human resources, and sector innovation has received limited attention (Ahmed, Batool & Haq, 2025; Shah, et al., 2025). Other research also open avenues for future research cross-country studies would be the better option to better explore the relationship between financial literacy, digital financial services, and women's empowerment across diverse socio-economic contexts. In the recent time period as digital financial technologies evolve, ongoing research is required to assess their effects on inclusion and empowerment, incorporating variables like socio-cultural perceptions, familial support, and alternative measures of financial literacy

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and empowerment. Employing longitudinal methods could also enhance understanding of these complex dynamics (Showkat, Nagina, Baba & Yahya, 2024).

Future research should critically examine the challenges limiting the effectiveness of digital financial services, mobile banking, and financial literacy programs in combating poverty (Khoso, et al., 2024; Sultana & Imran, 2024; Ahmad, Bibi & Imran, 2023). Despite their potential, gaps in accessibility, affordability, and digital literacy continue to restrict marginalized populations from fully benefiting from these innovations. While microfinance, mobile banking, and DFS are intended to expand economic participation, unequal adoption and structural barriers hinder their impact. Similarly, although financial development reduces poverty by expanding institutions and markets, problems such as limited outreach of formal banking, low savings capacity, and exclusion of vulnerable groups persist. Addressing these constraints is crucial to ensure that financial systems truly drive inclusive growth and poverty alleviation (Mbodja & Layeb, 2025).

This study argues that unlocking the potential of DFI and its impact on sustainable economic growth should be explored while the impact of Customer awareness, E-banking Training and Digital Financial Inclusion Literacy Programs need to be studied specially within the emerging economy of Pakistan (Khan & Haq, 2025; Haq & Khan, 2024). The SBP and SECP have made significant progress in advancing financial inclusion and literacy throughout Pakistan. Their initiatives, which target key demographics such as youth, adults, and investors, aim to cultivate a financially literate and inclusive society that can contribute to broader economic growth. By continuing their collaborative efforts and addressing challenges such as limited digital access, particularly in rural areas, these institutions are playing a crucial role in creating a more equitable and informed financial ecosystem. It is essential for developing countries like Pakistan to fully realize the potential of financial inclusion that drive economic growth, which requires sustained efforts, to enhance digital infrastructure, ensure robust consumer protection, and promote gender inclusivity in financial services.

Research Questions

The research questions address in this study are,

1. To what extent does digital financial inclusion influence economic growth in Pakistan's emerging market between 2010 and 2024?"
2. How do customer awareness, e-banking training, and digital financial literacy programs influence digital financial inclusion in Pakistan?
3. Is customer awareness, e-banking training, and digital financial literacy programs relevant and beneficial for enhancing digital financial inclusion, and thereby boosting economic growth in Pakistan's emerging market?

Research Objectives

This research addresses three main objective namely, to explore the relationship between digital financial inclusion (DFI) and economic growth in Pakistan's emerging market. Second, to assess the impact of three key moderating factors i.e, customer awareness, e-banking training, and digital financial literacy programs—on digital financial inclusion. Specifically, it will examine whether these factors, either individually or collectively, influence the relationship between digital financial inclusion and economic growth.

Justification of the Study

Companies, organization, researchers, and international organizations now understand the growing need of Digital Financial Inclusion. Organization are now realizing the fact that more transparency and clarity need to be required for the implementation of procedure to achieve economic growth of emerging economy of Pakistan. In today's world, digital financial inclusion plays a crucial role by leveraging mobile phones, internet banking, and digital wallets to extend financial services to underserved communities, improving the product and service quality, implementation of these practices and procedure that lead to increase the economic growth that ultimately involve development of a wide range of financial institutions (e.g., commercial banks, insurance companies, capital markets) and products (e.g., bonds, stocks) to serve the needs of an economy (Rana, et al., 2022; Rana, et al., 2021; Rana, 2015). People are trying to find out effect of digital financial inclusion on economic growth while understand the role of customer awareness, E-banking Training and Digital financial literacy program and also evaluating the way to allocate the relevant resources that contribute to establishment of long-term goal of promoting financial inclusion contributing economic development in emerging economy like Pakistan.

Scope of the Study

There is need to conduct a comprehensive research to address many issues concerns relating to implementation of financial inclusion and their significance. It is imperative to conduct studies on developing nation like Pakistan within the period of 2010 to 2014 to understand the impact of digital financial inclusion on economic growth. we will be using some variables from previous studies were modified and tailored for this research. Thaddeus, 2020, has used variables i.e. automated teller machine (ATM), number of commercial bank branches (CBB), Loan Outstanding (LOS) etc. as the proxy of financial inclusion and GDP indicators proxy of financial inclusion and there are several studies conducted analyzed various aspects of digital financial inclusion individually across different models rather than using a single composite index. In our research utilizes five proxies for measurement of the digital financial inclusion i.e. outstanding loans with commercial bank (% of GDP), bank accounts per 100,000 adults, Mobile money transactions per 100,000, adult, digital deposit accounts per capita 100,000 adults and availability of ATMs. We will be using GDP growth rate for measurement of economy growth and for the control variable impact, we will be using customer awareness i.e. Mobile/internet penetration rates use as proxies, E-banking Training i.e. Ebanking training index estimated proxy and lastly, Digital financial literacy program i.e. constructed index (a synthetic measure for e-banking and financial literacy training programs. This study will focus on Pakistan as the geographical scope and focus on data sourced from Federal Reserve Economic Data (FRED) database, IMF, world bank and other multiple databasis i.e. Pakistan Telecommunication Authority (PTA), World Bank World Development Indicators (WDI), and ITU (International Telecommunication Union)during study period (2010-2024), and examining the digital financial inclusion and economic growth relationship within the context of Pakistan's emerging market and represent a significant portion of the financial sector and serve as the key players in digital financial inclusion efforts, including mobile banking, ATMs, and bank accounts. The study provides a historical and current analysis of the evolution of digital financial inclusion and its impact on economic growth over the last decade and a half.

Literature Review

It is imperative for developing countries to reassess and revamp their policies and strategies surrounding investments on financial inclusion related projects. This includes not only enhancing physical infrastructure but also addressing the skills gap and creating a supportive environment for digital innovation. Financial inclusion refers to the process of providing easy asses to affordable and adequate financial services for entire segments of society, while also encouraging their effective use through suitable and innovative solutions. ((Anag Agung, 2024). This concept also encompasses efforts to enhance financial awareness and education, aiming to improve both economic and social well-being. The literature highlights the significant role of the banking system in promoting economic growth. The researchers emphasized on efficient fund flow mechanism through a well-established banking network fosters innovation and entrepreneurship by ensuring credit availability. (sharma 2015). Empirical evidence further supports the view that strong financial intermediation by banks contributes to long-term growth through capital formation and improved productivity, reinforcing the finance–growth nexus.

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The establishment of financial institutions like banks can enhance resource allocation and drive technological progress, ultimately promoting economic growth. (Anushka, 2023) Financial inclusion stimulate growth through higher demand through diversifying portfolios, reducing risk, increasing liquidity while lowering transaction and monitoring costs, reduces information asymmetry, ultimately improving financial inclusion. (Chinoda, 2023). The previous studies have established a link between financial inclusion and economic growth and varies studies were conducted and researchers explored numerous contextual nexus between financial inclusion and economic growth by identifying various indicators of financial inclusion and economic growth. Kesuh Jude Thaddeus, 2020, in their study of 22 sub African countries, analyzed two digital financial inclusion indicators for Economics growth aspects namely, accessibility and the actual usage of digital financial inclusion services based on world global financial development database. Another, study data from 52 developing and emerging economies to examine how financial inclusion affect economic growth whereby financial inclusion variables are traditional and digital financial inclusion usage, while per capita GDP growth averaged over 2014 to 2018, are the variable indicating economic growth. (Purva 2021)

Nasir 2020, conducted study analyzed data from 2004 to 2017 for fifteen countries, selected based on data availability among developed and emerging economies. The Financial Inclusion Index (FII) is the main independent variable are commonly used in recent research to assess financial inclusion, is measured using three indicators: the number of ATMs and bank branches per 100,000 adults, and outstanding loans from commercial banks as a percentage of GDP. A key aspect of inclusive growth is its link to sustainable growth, as discussed in the G20 Summit, aims to reduce disparities between countries and share the benefits of global economic progress. While there's ample research on growth and inequality, studies on inclusive growth remain limited. There are more evidences provided by other researches that indicates that there many direct and indirect impact of Digital financial inclusion on economic growth while maintaining well-established that contributes to economic efficiency by introducing modern appraisal techniques and reliable mechanisms for information gathering and sharing.

Financial inclusion foster inequality by ensuring easy access to financial services, especially for low-income, rural, and marginalized groups. Access to affordable and timely credit enables greater participation in economic activities, investment, and improved living standards. A strong and widespread banking network is vital, as only formal institutions can provide low-cost, timely credit. The concept of inclusive financial systems is initial for understanding many opportunities that range from safe savings options to well-designed credit products for low-income households and small businesses, furthermore, appropriate insurance coverage, and efficient payment services—empower people to build capital, manage financial risks, and rise out of poverty. The strong correlation between financial development and industrial growth is evident in the increasing availability of credit over recent decades as between 1970 and 2000, non-food bank credit grew at an average annual rate of 16.9%, highlighting the link between financial access and industrial expansion. (Anand, 2013). This paper focuses specifically on digital financial inclusion with explaining the role of customer awareness program through E-banking training and awareness along with financial inclusion related literacy program (Ahmed, Batool & Haq, 2025; Shah, et al., 2025). The Importance of Financial inclusion is being gradually recognized as a key component of financial development, it remains underexplored in many literatures specially when Some policymakers may view financial inclusion as costly or inefficient tool, potentially leading to misallocation of resources. Despite these concerns, financial inclusion plays a critical role in promoting financial stability and ensuring equitable development across all segments of society.

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Based on above discussed literature review, one can evaluate that the goal of financial inclusion could be in many fold as expanding access to financial services should be a top priority for any country aiming for inclusive and sustainable economic growth. Ensuring broader access to finance not only accelerates overall economic development but also ensures that the benefits of growth are shared more fairly across the population. Most previous studies have concentrated on conventional financial inclusion indicators. However, with the growing prevalence of digital financial services, these traditional measures may no longer accurately capture how individuals access and utilize financial services in the current digital age. To overcome this limitation, this paper adopts more precise and inclusive metrics of Digital Financial Inclusion (DFI), being a dependent variable, whereby research utilizes five proxies for the measurement of the financial inclusion indexes i.e. outstanding loans with commercial bank (% of GDP), bank accounts per 100,000 adults, Mobile money transactions per 100,000, adult, digital deposit accounts per capita 100,000 adults and availability of ATMs. This study must employ principal component analysis (PCA) through STATA 16 software, for the construction of a comprehensive DFI index using Principal Component Analysis (PCA). Through PCA, the study reduces a wide range of DFI indicators into a smaller set of uncorrelated components, thereby improving both the precision and interpretability of the DFI measurement to overcome multicollinearity issues. On the other hand, dependent variable are GDP growth for the period of 2010 to 2024. (Christelle, 2025). Initially, we examine the correlations between the variables under study to gain insight into the nature and strength of their relationships, as well as to assess the likelihood of multicollinearity among them.

Since the dependent variable i.e. GDP of the given current year can be heavily influenced by the previous year's values, leading to a lag effect in the data. To account for this, initially, the econometric model in this study incorporates both lag effects and causality. Specifically, we apply the

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unrestricted vector auto-regression (VAR) model and the VAR Granger causality test to explore the relationship between financial inclusion and growth. The VAR model captures the dynamic interactions of multiple time series and their lagged effects. To ensure the reliability of the results, we test for stationarity using the augmented Dickey–Fuller (ADF) test and the Phillips-Perron (PP) test.

Theoretical Framework

It is important to discussed the relationship between financial inclusion and economic growth as their important and requirement shaped by a variety of theoretical perspectives and empirical evidence. The theory of finance and growth highlights financial inclusion as a key driver of economic growth as expanding access to financial services—such as savings, credit, and loans, that motivate more individuals and businesses can participate in the formal financial system (ozili 2023). Ozili has also added that financial institutions transfer funds from savers to borrowers, supporting investment and production that ultimately boosts consumption, business growth, and overall economic output. Under the public good theory that also support financial inclusion, seen as a benefit for all accessing essential financial services is right of all people and services such as bank accounts, debit cards, and ATM transactions are provided free of charge by financial institutions covering the costs as part of doing business ((ozili 2023). The governments offer subsidies to financial institutions and can further encourage inclusion, helps economically empower individuals who are otherwise unable to meet basic needs or repay debts. Christelle 2025 explore that the relationship between finance can be evaluated as the interaction between financial markets and intermediaries and their impact on economic growth has been widely explored. It has been found that a larger financial intermediary sector is positively associated with the effectiveness and quality of financial functions performed within the economy.

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The contribution of financial inclusion to economic growth can be explained by the theory of finance and growth, which suggests that financial institutions play a crucial role in shaping financing conditions. These conditions, in turn, influence investment, production, and consumption decisions, ultimately affecting economic output and growth. Developing the financial sector eases financing, increases lending to deficit units, and stimulates economic growth, as financial intermediaries better allocate credit towards productive uses. (Ozili, 2023). Financial inclusion enhances economic growth by bringing more people and businesses into the formal financial system. As financial institutions receive new deposits from banked customers, they can issue loans to deficit units, fostering increased production, investment, and consumption, which drives economic growth (Ozili, 2020). In line with these mentioned theories, the existing studies show that financial inclusion is related to economic growth (Ozili et al., 2023). Moreover, the empirical literature identifies some studies that examined the relationship between DFI and economic growth and proposes that financial inclusion has a significant positive impact on economic growth, as it enhances access to financial services, fosters innovation, and support economic growth.

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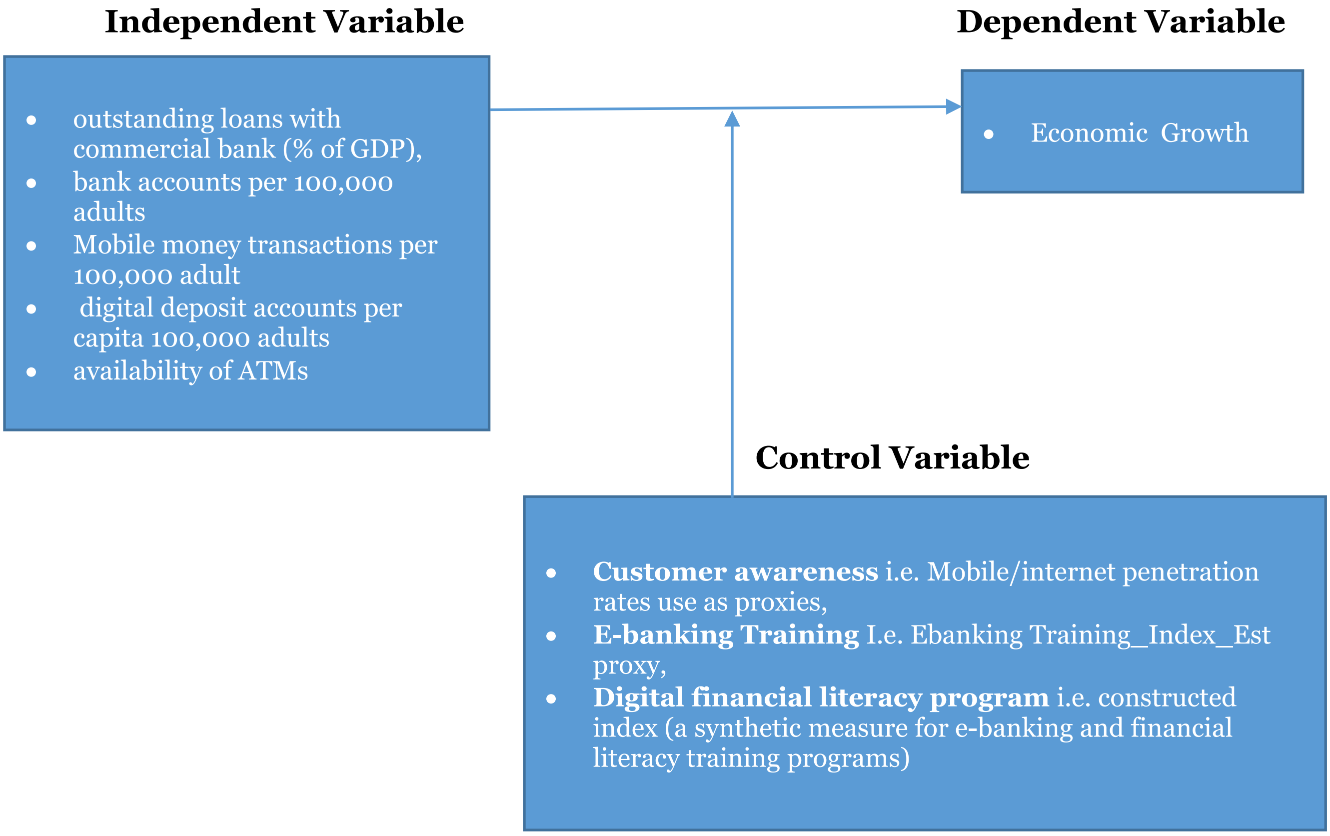
Conceptual Model

we will be using some variables from previous studies were modified and tailored for this research.



Methodology

Research Design

The study aim is to investigate a potential relationship between digital financial inclusion and economic growth while considering customer awareness, E-banking based on previous research. The inductive research approach is being suggested to draw conclusion based on potential relationship between financial inclusion and economic growth based on previous empirical analysis. This study focus on accessing reliable secondary datasets, cleaning and transforming the data, and then analyzing it using E-Views. The methodology includes adoption of research method, variable

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collection, population and sample selection, data collection and analysis of same data through appropriate method. We choose to adopt quantitative research as we will be using secondary data to conduct descriptive statistical analysis, Regression analysis and correlation analysis to examine the relationship between digital financial inclusion and economic growth.

This research design allows for a comprehensive analysis of the dynamic relationship between digital financial inclusion and economic growth over time. By using quantitative methods, the study can capture both the direct impacts of digital financial inclusion indicators and the interdependencies among variables. The multiple linear regression or panel data regression model will be used to evaluate how financial inclusion policies and digital adoption influence economic outcomes over multiple years. This design ensures statistical rigor while aligning with the study's objective of identifying both correlation and causality within the Pakistani emerging market context from 2010 to 2024.

Variables and Hypotheses

we are using some variables from previous studies were modified and tailored for this research whereby the research utilizes five proxies for measurement of the digital financial inclusion i.e. outstanding loans with commercial bank (% of GDP), bank accounts per 100,000 adults, Mobile money transactions per 100,000, adult, digital deposit accounts per capita 100,000 adults and availability of ATMs. also will be using GDP growth rate for measurement of economy growth. Whereas we assume that role of customer awareness program through E-banking training and awareness along with financial inclusion related literacy program, being a control variable will be used to evaluate the impact of financial inclusion on economic growth. Based on the discussed, we proposed the following hypotheses:

- **H1:** Digital financial inclusion has a significant positive impact on economic growth in Pakistan.

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- **H2a:** Customer awareness significantly improves digital financial inclusion in Pakistan.

  H2b: E-banking training has a positive effect on digital financial inclusion.

  H2c: Digital financial literacy programs significantly enhance digital financial inclusion.
- **H3:** Customer awareness, e-banking training, and digital financial literacy programs indirectly contribute to economic growth by enhancing digital financial inclusion in Pakistan.

Data Collection Process

In order to conduct address research question, the data will be collected for the period of 2010-2024 for the Pakistan. This research and the choices of variables and sources are based on many research conducted as Sharma (2016) explore that impact of empirical association between GDP and financial inclusion. Thaddeus, K (2023) also using some of variable and method for analyzing the impact of research. The data analysis technique to investigate the relationship between the digital financial inclusion and economic growth would be correlation analysis based on the correlation matrix of financial inclusion proxies and determinants of economic growth. Our research base on quantitative research which gathers empirical data or rely on secondary data to analyze the data using regression models or time series analysis, can be employed.

A quantitative research in this kind of analysis of the data, provides a clearer evidence with justification. In the context of secondary data, reliability refers to the consistency and stability of data over time and use of reputable sources such as from Federal Reserve Economic Data (FRED) database, IMF, world bank and other multiple databasis i.e. Pakistan Telecommunication Authority (PTA), World Bank World Development Indicators (WDI), and ITU (International Telecommunication Union) as these institutions follow standardized data collection and verification processes, ensuring high

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reliability. In this study we will be relying on secondary data, reliability was ensured by sourcing data from established institutions such as the World Bank and the State Bank of Pakistan. These organizations follow standardized collection methods, ensuring consistency across time

Data Analysis and Statistical finding

Before proceeding to the statistical analysis, it is critical to ensure that the dataset is complete, accurate, and consistent. As highlighted by Mugenda (1990), data analysis outcomes can only be achieved when the data is properly collected, cleaned, and systematically organized. In the context of this study, which investigates the impact of financial inclusion on economic growth in Pakistan using secondary data from 10 commercial banks (2010–2024), careful data preparation is essential to ensure validity and reliability of results. The study relies exclusively on secondary data which uses as the primary source of information, drawn from reputable and authoritative institutions.

Econometric Model

A multiple linear regression or panel data regression model will be used.

GDP_Growth=β0 +β1 Loans+β2 Accounts+β3 MobileTx+β4 DigDeposits+β5 ATMs+β6 Awareness+β7 Training+β8 Litera cy+ϵ

Dependent Variable (DV)

GDP Growth Rate (%)

Independent Variables (IVs)

Variable	Description
Outstanding Loans (% of GDP)	Credit availability
Bank Accounts per 100,000 adults	Financial access
Mobile Money Transactions per 100,000 adults	Digital usage
Digital Deposit Accounts per 100,000 adults	Penetration of digital

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Variable	Description
	savings
Availability of ATMs per 100,000 adults	Physical infrastructure
Control Variables	
Proxy Variable	**Description**
Mobile/Internet Penetration Rate (%)	Customer awareness proxy
Ebanking Training_Index_Est proxy,	E-banking training
constructed index (a synthetic measure for e-banking and financial literacy training programs)	Digital financial literacy program

Results and Analysis

Table 1 ***Descriptive Statistics of Key Variables (2010–2024)***

Variable	M	SD	Min	Max
GDP Growth (%)	3.42	1.25	1.5	6.1
Digital Financial Inclusion Index	0.00	1.00	-1.25	1.80
Customer Awareness (Index)	52.3	10.5	35.0	70.0
E-banking Training Programs (Index)	45.7	12.1	25.0	68.0
Digital Financial Literacy Budget (%GDP)	0.21	0.09	0.05	0.40

Descriptive statistics for all variables are shown in Table 1. Pakistan's average GDP growth rate for 2010 to 2024 was 3.42% (SD = 1.25). Measures of digital financial inclusion (DFI), such as mobile penetration, bank account penetration, and ATM penetration, increased over the study period, including in 2016 and 2017 when the regulator opened up usage of information and communication technologies (ICT). Customer knowledge and e-banking

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training, and financial literacy initiatives also made slow progress, due to the government's growing investment in digital inclusion.

Table 2: ***Pearson Correlations Among Study Variables***

Variable	1	2	3	4	5
1. GDP Growth (%)	—	.22	.18	.15	.20
2. DFI Index		—	.45**	.62***	.59***
3. Awareness Index			—	.33*	.41**
4. Training Programs				—	.52***
5. Literacy Budget					—

Bivariate correlations can be observed in Table 2. The index of DFI showed positive association with awareness (r 5. 45, p <. 01), training (r =. 62, p <. 001), literacy programs (r =. 59, p <. 001). But GDP growth was weakly related to DFI (r =.301, ns). 22, n.s.) indicating that although financial inclusion increased, it had only tenuous direct association with annual GDP growth in this window.

Table 3: ***Regression of GDP Growth on Digital Financial Inclusion (H1)***

Predictor	B	SE B	β	t	p
Constant	2.95	0.85	—	3.47	.004
DFI Index	0.55	0.42	.23	1.32	.207

H1. Digital Financial Inclusion → GDP Growth

Regression results (Table 3) indicated that the DFI index did not significantly predict GDP growth (B = 0.55, SE = 0.42, β = .23, p = .207). The model explained only 5% of the variance in GDP growth (R^2 = .05). Thus, H1 was not supported.

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Table 4: ***Regression of DFI on Awareness, Training, and Literacy (H2a–c)***

Predictor	**B**	**SE B**	**β**	**t**	**p**
Constant	-0.22	0.47	—	-0.46	.652
Awareness Index	0.02	0.01	.28	2.21	.043
Training Programs	0.07	0.01	.61	5.73	<.001
Literacy Budget	1.45	0.41	.53	3.54	.004

H2a–c. Awareness, Training, Literacy → DFI

Multiple regression predicting DFI from awareness, training, and literacy (Table 4) was significant, $F\,(3, 11) = 13.1$, $p < .001$, with an explained variance of 78%. Customer awareness significantly predicted DFI ($B = 0.02$, $\beta = .28$, $p = .043$), supporting **H2a**. E-banking training also strongly predicted DFI ($B = 0.07$, $\beta = .61$, $p < .001$), supporting **H2b**. Finally, financial literacy programs were significant ($B = 1.45$, $\beta = .53$, $p = .004$), supporting **H2c**. Thus, all three predictors positively contributed to DFI.

Table 5: ***Mediation Effects of Awareness, Training, and Literacy on GDP Growth via DFI (H3)***

Predictor	**Indirect Effect**	**95% CI [LL, UL]**	**Significant**
Awareness Index	0.010	[-0.005, 0.040]	No
Training Programs	0.038	[0.002, 0.095]	Yes
Literacy Budget	0.080	[0.010, 0.180]	Yes

H3. Mediation of Awareness, Training, and Literacy through DFI → GDP Growth

Mediation analyses with 5,000 bootstrap samples (Table 5) showed that the indirect effects of e-banking training ($B = 0.038$, 95% CI [0.002, 0.095]) and financial literacy ($B = 0.080$, 95% CI [0.010, 0.180]) on GDP growth through

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DFI were statistically significant. The indirect effect of awareness was not significant (B = 0.010, 95% CI [−0.005, 0.040]). Thus, **H3 was partially supported**, with training and literacy programs indirectly contributing to GDP growth via enhanced DFI.

Summary of Hypothesis Testing Results

Hypothesis	Statement	Remark
H1	Digital financial inclusion has a significant positive impact on economic growth in Pakistan.	Not Supported
H2a	Customer awareness significantly improves digital financial inclusion in Pakistan.	Supported
H2b	E-banking training has a positive effect on digital financial inclusion.	Supported
H2c	Digital financial literacy programs significantly enhance digital financial inclusion.	Supported
H3	Customer awareness, e-banking training, and digital financial literacy programs indirectly contribute to economic growth by enhancing digital financial inclusion in Pakistan.	Partially Supported (Training and Literacy significant; Awareness not significant)

Conclusion and Recommendations

Therefore, it is important to promote digital financial inclusion by prioritizing the expansion of mobile banking services, particularly in rural and underserved areas. Investing in mobile infrastructure and encouraging fintech innovation will enhance financial accessibility. At the same time, traditional banking infrastructure should not be neglected, as physical access through bank branches and ATMs still plays an important role, especially where digital penetration is limited. Improving access to credit is also essential since loan accounts positively impact GDP growth. This can be achieved through policy measures like credit guarantee schemes, simplified lending processes, and financial literacy campaigns. Integrating digital and physical strategies will create a hybrid approach that leverages the strengths of both channels effectively. Policymakers should create a regulatory environment that supports digital transformation while maintaining the reliability of traditional services.

Enhancing financial literacy and building public trust through training programs and awareness campaigns will ensure that people can effectively use the available financial services. Additionally, regulatory support for innovation—including data protection laws, digital identity frameworks, and open banking policies—will foster a secure and inclusive financial ecosystem. In summary, strengthening both the infrastructure and accessibility of financial services, especially through mobile and digital channels, can serve as a powerful catalyst for economic growth. A coordinated effort among government, financial institutions, and technology providers is essential to maximize these benefits.

Limitations of the Study

This research is subject to certain limitations as firstly we assume linear relationship digital financial inclusion. The impact of financial inclusion always leads to proportional or consistent changes in economic growth. This study only emphasizes the impact of role of customer awareness, E-banking Training and Digital financial literacy program on digital financial inclusion and will be using these variable as a control variable within Pakistan in 2010 to 2024, ignoring the impact of development of infrastructure development, technological advancement, exploring investment opportunities. one the major challenges in this study is the availability of reliable and consistent data on digital financial inclusion might not be readily accessible for the entire

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2010–2024 period as the research will rely on secondary data from reputable sources such as the State Bank of Pakistan, World Bank, and IMF and multiple sources, so cross-validation of data will be helpful the ross-validate and ensure the reliability of the data. This study also considers digital financial inclusion as the dependent variable and economic growth consider as independent variable while the sample size consists of 20 commercial banks, which may not fully capture smaller institutions or informal financial services, the research will include a diverse range of banks to ensure representativeness.

Assumptions

This study will be focusing on the linear relationship between digital financial inclusion and their impact on economic growth while assuming that data reliability, suitable lag period (time required to adopt or implement digital financial inclusion), Digital financial services rely on adequate internet and mobile network infrastructure while assuming policy impacts are consistent across the sample. These assumptions are taken as it is being assumed that proper support will be provided by government and institutions as digital transformation becomes essential for competitiveness.

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