

FinTech Adoption and Sustainability Performance: The Role of Digital Financial Literacy and Financial Inclusion in Pakistan's Banking Sector.

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ABSTRACT

Purpose - The aim of this research focuses on the potential FinTech adoption prospects in enhancing sustainable performance through financial literacy and financial inclusion. This study also explores the factors behind FinTech usage and its contribution to achieving sustainable performance, offering valuable implications for stakeholders in the financial institutions, particularly the banking sectors of Pakistan.

Study Design/methodology/approach- The primary data was collected through survey questionnaires from 384 banking professionals across Punjab using convenience sampling. The analysis was conducted using Partial Least Squares Structural Equation Modelling (PLS-SEM) to examine relationships among FinTech adoption, financial literacy, inclusion, and sustainability.

Findings-The empirical findings indicated that FinTech adoption has positive effects on the sustainable performance of the banking sector in Pakistan. In addition, financial inclusion significantly mediates this relationship, while digital financial literacy, despite its positive impact, does not act as a mediator. The results emphasize the need to integrate technological advancements and financial inclusion to achieve sustainability.

Research Implications - This study highlights how FinTech adoption and digital financial literacy jointly enhance financial inclusion and sustainable performance in Pakistan's banking sector. It offers practical insights into overcoming digital transformation challenges while contributing to economic growth. The research supports emerging markets in leveraging FinTech for building inclusive, resilient financial systems and provides strategic direction for policymakers, bankers, and financial institutions. Theoretically, it contributes to the Technology Acceptance Model and Good Public Theory by emphasizing how technology and knowledge, as public goods, enhance both organizational and individual sustainability outcomes.

Originality/value - Research on FinTech Adoption and Sustainable Performance remains a new topic in academic literature with the direct impact already well-studied. However, as far as the authors know, no study has looked at how FinTech adoption indirectly affects sustainable performance through digital financial literacy and financial inclusion. This study extends current research to examine the impact of FinTech adoption on sustainable performance while investigating how digital financial literacy might interact with it.

Keywords: FinTech Adoption, Sustainability Performance, Digital Financial Literacy, Financial Inclusion, Banking Sector

JEL Classification Codes: O32, O33, O44, Q01, Q55

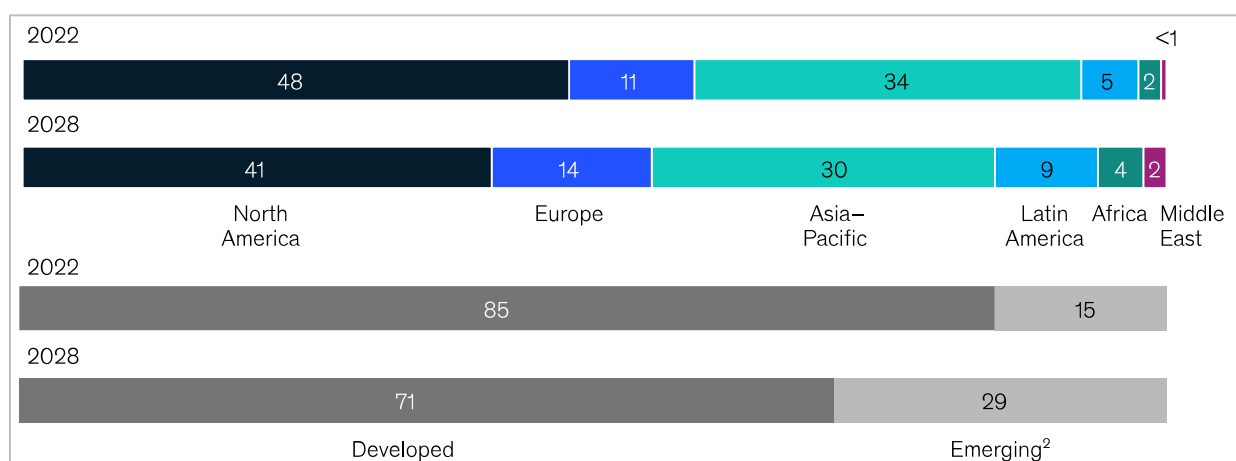
1 | INTRODUCTION

Sustainable performance has emerged as an important concept in modern organizations and management literature, emphasizing the ability of organizations to achieve long-term positive outcomes while addressing economic, social, and environmental challenges ([Yao & Wang, 2024](#)). This concept transcends the traditional focus on profit maximization by integrating sustainable strategies into organizational operations, thereby enhancing sustainable capabilities and creating value for shareholders and society at large public ([Busch et al., 2024](#)). Sustainability is defined as the capacity to maintain well-being over an extended period, encompassing the three pillars of sustainability: social, economic, and environmental. It is important to note that "environmental performance" and "sustainability performance" are not synonymous; the latter encompasses a broader spectrum of organizational impacts ([de Almeida Barbosa Franco et al., 2024](#)). According to [Zheng et al. \(2021\)](#), sustainability performance (SP) refers to a bank's ability to achieve long-term financial stability while considering environmental, social, and governance (ESG) factors, ensuring responsible banking practices. In today's challenging business environment, the integration of sustainable practices into business operations has become a priority for scholars and financial institutions alike. Financial institutions, particularly banks, play a vital role in supporting economic growth and development. However, businesses are increasingly compelled to adopt innovative solutions such as Financial Technology (FinTech) to improve their sustainability performance ([Zheng et al., 2021](#)). FinTech offers tools and technologies that address operational inefficiencies, enhance financial accessibility, and promote environmentally sustainable practices, making it a key driver of sustainable growth.

FinTech adoption (FTA) has become a global phenomenon, driving economic growth, social responsibility, and environmental stability, ultimately contributing to sustainable performance ([Zheng et al., 2021](#)). FinTech encompasses a wide range of technologies and innovative solutions that enhance the delivery of financial services. For instance, Financial Technology has enabled banks to improve sustainability performance through initiatives such as green finance, financial accessibility, and operational efficiency ([Guang-Wen & Siddik, 2023](#)). The [World Economic Forum \(2024\)](#) emphasizes the need for FinTech to promote environmentally sustainable growth, noting that while the sector has expanded rapidly, it faces increasing pressure to deliver sustainable returns. In developing economies like Pakistan, FinTech adoption is particularly transformative. It enables financial institutions to reach unbanked customers, thereby advancing national economic progress. According to a [McKinsey \(2023\)](#), the FinTech industry's revenues are projected to grow almost threefold between 2022 and 2028, with an annual growth rate of nearly 15% across different regions. Emerging markets, including Pakistan, are expected to experience the highest growth rates, with FinTech penetration increasing from 15% to 29% by 2028 (see Figure 1). This growth underscores the potential of FinTech to drive sustainable development in regions with limited financial infrastructure.

Figure 1*Role of FinTech in Revenue Growth*

Likewise, McKinsey highlights that FinTech, having experienced a phase of hypergrowth, is now transitioning into a new era defined by sustainable performance and profitable growth. The report further concludes that emerging markets currently exhibit the highest levels of FinTech penetration globally. These markets are projected to see significant growth, with FinTech adoption rates expected to rise from 15% to 29% by 2028, as illustrated in Figure 2.

Figure 2*Global FinTech Net Revenues by Region*

FinTech is revolutionizing financial management by enabling seamless transactions anytime and anywhere ([Amnas et al., 2024](#)). Moreover, financial services have become more affordable and accessible, enhancing financial inclusion. The integration of financial technology has played a crucial role in expanding financial services to underserved communities, aligning with the broader objectives of sustainable development.

Financial inclusion (FI) refers to the accessibility and availability of affordable financial services to individuals and businesses, particularly underserved populations, enabling broader participation in the banking sector. Over the past two decades, financial inclusion has emerged as a fundamental strategy for poverty alleviation and overall economic development, aligning with the Sustainable Development Goals (SDGs) set by the United Nations ([Ahmed et al., 2024](#)). Policymakers worldwide have implemented various initiatives to enhance financial inclusion through FinTech-driven solutions. Digital financial services, such as Internet and mobile banking, have significantly expanded access to financial products, particularly in underdeveloped economies like Pakistan ([Ahmed et al., 2024](#)). Recognizing the transformative role of financial inclusion, commercial banks in Pakistan are actively developing customer-centric strategies to improve retention and engagement. Alongside financial inclusion, these institutions are prioritizing innovative services and digital solutions that foster long-term customer relationships ([Basnayake et al., 2024](#)).

Digital financial literacy (DFL) is significant for the effective adoption of FinTech and other financial services, particularly in developing countries like Pakistan ([Shaikh et al., 2023](#)). DFL integrates digital literacy (DL) and financial literacy (FL), enabling individuals to understand and utilize digital financial platforms effectively ([Amnas et al., 2024](#)). Digital financial literacy (DFL) is the ability of individuals to understand and effectively use digital financial services, including online banking, mobile payments, and FinTech applications, to make informed financial decisions. On the other hand, financial literacy is somewhat different from it which refers to an individual's ability to make informed financial decisions, digital literacy focuses on the ability to use digital tools and platforms ([Prete, 2022](#)).

This study makes a significant and novel contribution to the existing literature by addressing a critical research gap in the interplay between FinTech adoption (FTA), digital financial literacy (DFL), and financial inclusion (FI) in enhancing sustainability performance (SP). While prior research has explored these constructs individually, this study uniquely integrates them into a cohesive framework, providing a comprehensive understanding of how they collectively contribute to sustainable development, particularly in the context of developing economies like Pakistan. Unlike previous studies that often examine FinTech adoption, financial inclusion, or digital financial literacy in isolation, this study develops an integrated framework that demonstrates how these constructs interact and reinforce one another to drive sustainability performance. This holistic approach offers a more nuanced understanding of the synergies between technological innovation, financial accessibility, and individual empowerment. The study shifts the focus from developed economies to developing regions, such as Pakistan, where FinTech adoption is rapidly transforming financial landscapes. By examining the role of FinTech in addressing challenges like financial exclusion and low literacy rates, the study provides unique insights into how technology can bridge gaps and promote sustainable growth in underdeveloped contexts. While financial inclusion and FinTech adoption have been widely studied, the role of digital financial literacy as a foundational enabler of these processes has received

limited attention. This study highlights the critical importance of DFL in ensuring that individuals can effectively utilize FinTech solutions, thereby amplifying the impact of financial inclusion on sustainability performance. The study provides actionable insights for policymakers and financial institutions, emphasizing the need for targeted interventions to improve digital financial literacy and expand FinTech infrastructure in underserved regions. These efforts are essential for achieving the United Nations Sustainable Development Goals (SDGs), particularly those related to poverty alleviation and inclusive economic growth. Hence, this study examines “FinTech Adoption and Sustainability Performance: The Role of Digital Financial Literacy and Financial Inclusion in Pakistan's Banking Sector”. Therefore, based on the above following are the objectives for this study:

1.1 | Research Objectives

RO1: *To assess the impact of FinTech Adoption on Sustainable Performance in Pakistan's banking sector.*

RO2: *To examine the effects of Digital Financial Literacy on Sustainable Performance in Pakistan's banking sector.*

RO3: *To investigate the influence of Financial Inclusion on Sustainable Performance in Pakistan's banking sector.*

RO4: *To evaluate the role of FinTech Adoption in Sustainable Performance, with and without the mediating effects of Digital Financial Literacy and Financial Inclusion in Pakistan's banking sector.*

1.2 | Research Questions

The primary objective of this research is to find out the answers to the following research questions:

RQ1: *What is the impact of FinTech adoption on sustainable performance in the Pakistani banking sector of Pakistan?*

RQ2: *How does digital financial literacy affect sustainable performance in the banking sector of Pakistan?*

RQ3: *How does financial inclusion affect sustainable performance in the banking sector of Pakistan?*

RQ4: *How do digital financial literacy and financial inclusion mediate the relationship between FinTech adoption and financial inclusion?*

2 | LITERATURE REVIEW

In this part the author describes the theoretical framework to begin this work, the literature review on the topic in question, and the theoretical framework for this research.

2.1 | Theoretical Foundation

The literature reveals that financial technology (FinTech) and its influence on banks' sustainable performance are supported by multiple theoretical frameworks. The first is the Technology Acceptance, derived from the Technology Acceptance Model (TAM), which suggests that there is a relationship between the utilization of any modern technology and its use ([Alnsour, 2024](#)). The theory highlights those various

factors shape decisions about how and when to use technological tools. Additionally, [Mohammad Ebrahimzadeh Sepasgozar et al. \(2020\)](#) found that adopting innovative technology facilitates easier access to finance and financial services, particularly within the banking sector. It is relevant to our study because, with the help of FinTech adoption, the banks maintain high customer service standards. In other words, the theory applies to the user perspective of the bank, the sustainable performance of the banking institution, and the effectiveness of operations in the financial sector. The Technology Acceptance Model (TAM) is particularly suitable for the banking sector in Pakistan due to its ability to explain user adoption of financial technologies, which is crucial in a rapidly digitalizing financial landscape. It helps to evaluate whether FinTech solutions, such as digital banking, mobile payments, and green banking technologies, are seen as beneficial and user-friendly by banking customers and employees. The model aids in understanding how attitudes toward FinTech adoption influence actual usage behavior, particularly in the context of Pakistan's financial sector, where digital financial literacy and infrastructure challenges exist.

TAM is particularly relevant because it explains the factors influencing the adoption of FinTech solutions, such as digital banking, mobile payments, and green financial technologies, which are critical for enhancing sustainability performance. Perceived usefulness and perceived ease of use drive FinTech adoption, which in turn improves banking performance. Studies show that Pakistani consumers and businesses adopt digital banking services when they find them easy to use and perceive them as secure ([Shaikh et al., 2023](#)). The State Bank of Pakistan (SBP) has reported that the rapid adoption of mobile banking has led to a 20% reduction in cash-based transactions, contributing to financial transparency and environmental sustainability ([Stock Exchange, 2023](#)). Institutions like Habib Bank Limited (HBL) and Meezan Bank have integrated FinTech to promote green finance, paperless banking, and financial accessibility, aligning with sustainability goals ([Amnas et al., 2024](#)).

The banking sector in Pakistan operates under rigorous regulatory constraints, therefore perceived usefulness of FinTech services is vital for both customers and compliance with a sustainable banking framework ([Abdul-Rahim et al., 2022](#)). As financial literacy develops, clients gain trust in digital financial services, strengthening TAM's significance in explaining FinTech adoption ([Abbas & Khan, 2024](#)). Digital financial services improve access to banking, particularly in rural and underserved parts of Pakistan, decreasing financial exclusion and complying with sustainable development goals (SDGs) ([Nizam & Rashidi, 2025](#)). The thesis supports the premise that policymakers and financial regulators must guarantee FinTech services stay open, safe, and generally accessible, which has a direct impact on sustainable banking performance ([Khan, 2024](#)).

The second theory of the current study is anchored on the Good Public Theory of Financial Inclusion, one of the key theories explaining the beneficiaries of Financial Inclusion. A lot of debate is already available in the literature regarding the core beneficiaries of Financial Inclusion initiatives. One of the most important studies points out the fact that women are also able to realize considerable gains from financial inclusion ([Nawaz et al., 2023](#)). Nevertheless, the role of the literature for younger and older groups appears to have received little attention. From the Good Public Theory, financial inclusion is considered a good to be provided to the public to benefit everybody within the society. Therefore, it asserts that finance should be unconditionally accessible to everyone. Based on this theoretical context, the current study proposes to

examine the effects of financial inclusion on sustainable performance in the context of the Pakistani banking industry. And financial inclusion is also a mediator of this study.

Technology Acceptance Model (TAM) and Good Public Theory (GPT) provide insightful information on FinTech adoption and sustainability performance. Perceived utility (PU) and perceived ease of use (PEOU) are the main emphasis of TAM, but social, regulatory, and institutional factors that are significant in banking are not taken into account which is critical in the banking industry, particularly in emerging economies such as Pakistan. Good Public Theory, on the other hand, emphasizes the need to generate public value through financial inclusion and digital literacy. While it provides a solid framework for understanding social and economic advantages, it does not include a behavioral focus on human decision-making processes in FinTech adoption.

2.2 | FinTech Adoption and Sustainable Performance

In the present digital era, the consumer must specify his/her choices to use a wide range of innovative and modern technologies (FinTech) products and services to manage their finance ([Basnayake et al., 2024](#)). Broadly or generally speaking, Fintech can be described as the application of technology in offering financial services. More particularly, Fintech is digital applications that solve financial brokerage problems ([Harsono & Suprpti, 2024](#)). Therefore, the Adoption of Fintech is a merger between financial services and technology and enhances rapid growth as well as improving sustainable performance ([Wibowo et al., 2022](#)). In addition, because of this advance in technology and the increase in sustainable performance are the major factors of concern to most scholars. In this case, it was possible to research to find out the new methods of functioning new financial technologies and their implications for sustainable performance.

According to [Subanidja et al. \(2021\)](#), the disruption of FinTech doesn't enhance the overall sustainable performance but enables collaboration to enhance sustainable financial and banking performance. [Joshi and Karmacharya \(2024\)](#), again, identified that FinTech integration into conventional financial systems has revealed a significant impact on sustainability performance. The technical literature review findings reveal that the FinTech Adoption has a mix of effects on the Sustainable Performance. This association has been supported by empirical investigations. For example, [Ali et al. \(2021\)](#) discovered that FinTech adoption greatly helps sustainable banking by lowering operational risks and enhancing financial stability in Pakistani banks. Similarly, [Aslam et al. \(2025\)](#) stated that mobile banking and blockchain technologies improve environmental sustainability by reducing paper transactions and encouraging green banking efforts. These findings suggest that FinTech is a strategic facilitator for long-term success in the banking sector. Thus, the need for the said study has given rise to examining the relationship between FinTech Adoption and sustainability. Thus, this has led to the development of the first hypothesis of the study which is as follows:

H1: *FinTech Adoption has a significant impact on the Sustainable Performance of the banking sector in Pakistan.*

2.3 | FinTech Adoption and Digital Financial Literacy

In this digital era, every business is migrating from the traditional system to the digitalized system, and financial literacy that used to be enough to ensure a good performance is not enough. Digital financial literacy

is the need to apply digitalization to the business's operation to enhance the sustainable performance of the organization ([Basar et al., 2022](#)). Moreover, the FinTech mechanism explains the process of creating, modifying or enhancing a business model into a new business model. Digital financial literacy refers to the ability of a person to effectively and safely utilize digital products and services like FinTech, to financial decisions and act in the best interest of the people within the financial institution ([Basar et al., 2022](#)).

In contrast to this study, only a handful of earlier works reported that digital financial literacy is better equipped to leverage technological platforms, including FinTech. For instance, [Islam and Khan \(2024\)](#), point out that digital financial literacy assists the organization in the adoption of Fintech. The author further stated that there is a strong relationship between digital financial literacy and FinTech Adoption. Empirical research from Pakistan shows that increased levels of financial literacy have a beneficial influence on FinTech adoption. [Hidayat-ur-Rehman and Alsolamy \(2023\)](#), performed a survey-based study on Pakistani SMEs and discovered that digital financial literacy greatly increases usage of FinTech products such as mobile wallets and lending platforms. Similarly, [Majid et al. \(2022\)](#), discovered that those who are more financially informed are more likely to utilize digital banking services, which leads to greater financial security and better financial decision making. Currently, there is scant research on digital financial literacy, therefore, this study is conducted to explore the relation between FinTech adoption and digital financial literacy. Based on the evidence above, the study suggests the following hypothesis:

H2: *FinTech Adoption has a significant impact on the Digital Financial Literacy of the banking sector in Pakistan.*

2.4 | FinTech Adoption and Financial Inclusion

FinTech has moved into the mainstream of transforming banking and other financial services for numerous consumers globally. However, a good number of people, globally estimated at 1.7 billion, still have no access to traditional financial services. This is changing now due to FinTech: it has emerged that one only requires a phone and internet connection and fingerprint to get all the financial services with a single click ([Aloulou et al., 2024](#)). According to the Financial Inclusion Report (2021-22, 2022), and Financial Inclusion Report (2020), financial inclusion is integrated into business operations all around the UAE has the highest rate at 46%, Bahrain at 39%, and Saudi Arabia at 31%. But, the financial inclusion rate in Pakistan was boosted from 21 % in year 2020 to 30 % in year 2022. However, there are still significant gaps in financial inclusion, particularly for women. Only 13% of women in Pakistan have financial accounts, compared to 34% of men. A majority of individuals in Pakistan are financially illiterate and do not understand how to utilize different financial tools such as FinTech.

[World Bank \(2022\)](#), also reported that easy accessibility to financial services has a significant impact on people's lives greatly and also promotes financial inclusion in contributing to overall sustainability performance and economic growth of the country. Earlier study shows that people who mostly adopt FinTech, are young people, relatively affluent, living in urban areas, and have good IT literacy ([Peng et al., 2024](#)). Finally, Fintech and financial inclusion are not business ends; these are orientations to expand the paradigm of sustainable development. The direct and indirect contribution of fintech for financial inclusion to enable

sustainable development goals is known as decent work and economic growth. As such, by engaging in such an approach, one will be able to start solving the many social, economic, and environmental problems noted in the SDGs to build a more sustainable world ([Danladi et al., 2023](#)). This association is supported by empirical studies. [Ali and Abdullah \(2020\)](#) discovered that FinTech adoption boosts financial inclusion in Pakistan by allowing unbanked people to access digital financial services. According to the survey, mobile wallets such as JazzCash and Easypaisa have transformed the financial landscape by allowing customers to do banking transactions without visiting physical banks. Another research, [Calderon \(2025\)](#), found that digital payment systems improve financial inclusion by lowering transaction costs and increasing financial accessibility. Consequently, this research is aimed at identifying how FinTech Adoption can integrate financial inclusion and impact the sustainability of the banking sector. Thus, this will formulate the following hypothesis:

H3: *FinTech Adoption has a significant impact on the Financial Inclusion of the banking sector in Pakistan.*

2.5 | FinTech Adoption, Digital Financial Literacy, and Sustainable Performance

Financial literacy and digital literacy were once viewed as separate concepts, but in the digital economy era, they must be closely interconnected. In today's technological era, consumers need both traditional and digital financial literacy to effectively use modern technologies like FinTech, as a result enhancing sustainable performance ([Mir, 2024](#)). Financial Literacy is the ability to manage funds, but it is also highly related to improving the financial sector in every country. As same like that Digital Financial literacy also plays a very important role in the development of the economy as well as the sustainable performance enhancement of the organization especially the banking sector ([Rehman et al., 2023](#)).

Digital financial literacy has a positive impact on sustainable performance as proven by the increased adoption of FinTech applications, which enriches people's knowledge, increases security consciousness, and improves decision making in digital money transactions ([Amnas et al., 2024](#)). Recently, the concept of digital financial literacy, FinTech Adoption, and Sustainable Performance has gained increasing attention from scholars and institutions. Nonetheless, the generality of the identified research gap; no scholar had examined digital financial literacy as a moderator between FinTech Adoption and Sustainable Performance.

Existing literature from Pakistan supports this relationship. [Islam and Khan \(2024\)](#), discovered that digital financial literacy improves the influence of FinTech adoption on financial sustainability in banks because educated users are more likely to engage in responsible financial conduct. Similarly, [Khan et al. \(2025\)](#), demonstrated that digital literacy training programs significantly improve the efficiency of FinTech services, ultimately enhancing sustainable performance in the banking sector. This study posits that FinTech Adoption has a total influence on Sustainable Performance both direct and mediated by digital financial literacy. Nonetheless, the relationship between FinTech and Sustainable Performance is relatively novel in the literature but the direct impact is well documented while no study, known to the authors, has explored the indirect relationship between FinTech through digital financial literacy. Based on the prior literature, the following hypothesis was derived:

H4: *Digital Financial Literacy significantly associated with the sustainable performance of the banking sector in Pakistan*

H5: *Digital Financial Literacy significantly mediates the relationship between FinTech Adoption and the sustainable performance of the banking sector in Pakistan.*

2.6 | FinTech Adoption, Financial Inclusion, and Sustainable Performance

In the early twenty-first century, access to financial services has become a major concern for policymakers, governments, and central banks in developing countries like Pakistan. But all the possible through financial inclusion because it helps the financial institution deliver financial services to their customer at affordable prices ([Omar & Inaba, 2020](#)). Thus, with the deployment of Information and Communication Technologies (ICTs), currently, Financial Inclusion is perceived to be active in the banking sector because it also leads to improvement in banking efficiency, thus; fostering inclusive sustainable economic development. Therefore, the banks regarded as one of the major players in the world economy, are now initiating different sorts of easily accessible and low-cost services to their customers through Financial Inclusion ([Basnayake et al., 2024](#)). [Nawaz et al. \(2023\)](#), have also examined that financial inclusion mediates the relationship between financial literacy and women's economic empowerment.

Last but not least, the study of [Basar et al. \(2022\)](#), also suggests that financial inclusion via FinTech necessitates a better degree of digital financial literacy to navigate the available finances and prevent misleading, fraud detection, hacking attacks, unauthorized access, discrimination, and behavioral problems like over-indebtedness. Hence, this study is conducted to see how FinTech Adoption integrates financial inclusion as well as boosts the sustainable performance of the banking sector of Pakistan. Hence, the objective of the study is to identify the part that financial goods and services need to facilitate the relationship between financial inclusion and sustainable performance in developing markets like Pakistan. Several current studies with a Pakistani background support this relationship. [Salman et al. \(2024\)](#), discovered that financial inclusion mediates the link between FinTech adoption and bank performance in Pakistan, since digital financial services empower underprivileged groups, resulting in overall economic sustainability. Another research by [Khan et al. \(2025\)](#), found that FinTech-driven financial inclusion improves financial sustainability by increasing customer base and decreasing reliance on traditional banking infrastructure. The results as hypothesized confirmed the mediating role though the finding could still be confirmed in other emerging economies. Based on the above evidence in the literature, the study suggests the next hypothesis:

H6: *Financial inclusion significantly mediates the relationship between FinTech Adoption and the sustainable performance of the banking sector in Pakistan.*

H7: *Financial inclusion is significantly associated with the sustainable performance of the banking sector in Pakistan.*

Despite FinTech's advantages, there is conflicting data about its direct impact on sustainability performance. Digital currency promotes sustainability by decreasing paper-based transactions and boosting financial efficiency, according to many studies ([Harsono & Suprapti, 2024](#)). Furthermore, despite the

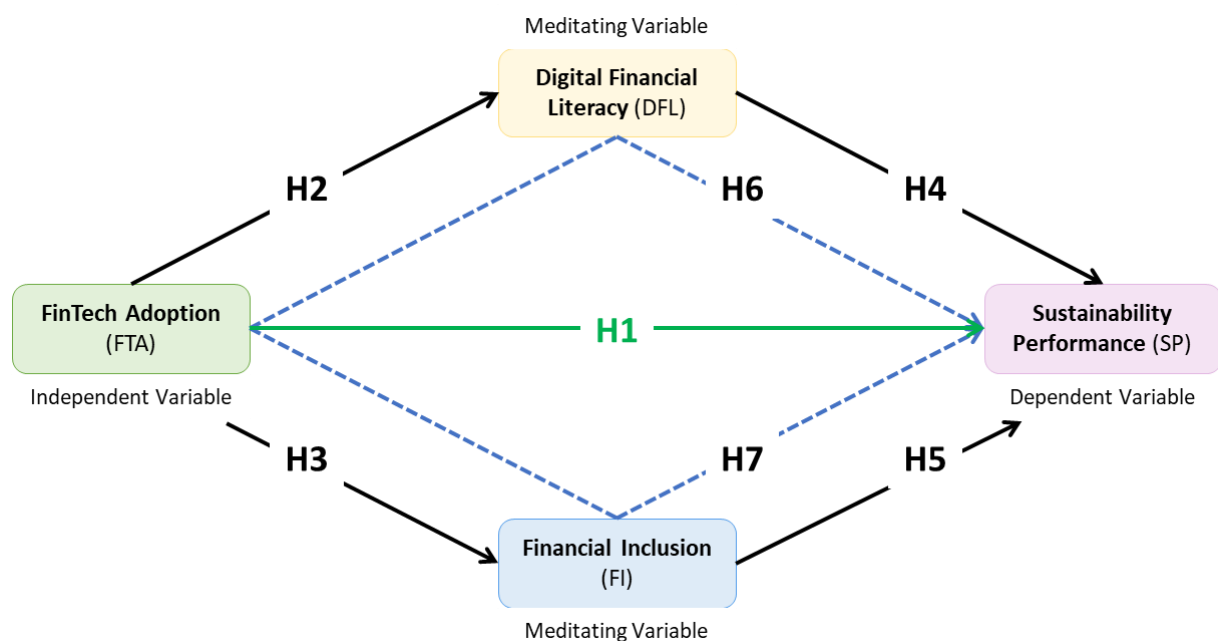
consensus that digital financial literacy is beneficial, some research indicates that an over-reliance on digital financial tools without sufficient literacy can result in financial vulnerabilities, such as the possibility of fraud, excessive debt, and false information ([Shaikh et al., 2023](#)). This paradox raises the question of whether promoting FinTech adoption and digital financial literacy alone is sufficient to achieve sustainable performance, highlighting the need for further research, particularly in emerging economies such as Pakistan.

2.7 | Research Framework

Proposing the theoretical framework of the study as shown in Figure 3, below based on the previous empirical research and above hypothesized framework.

Figure 3

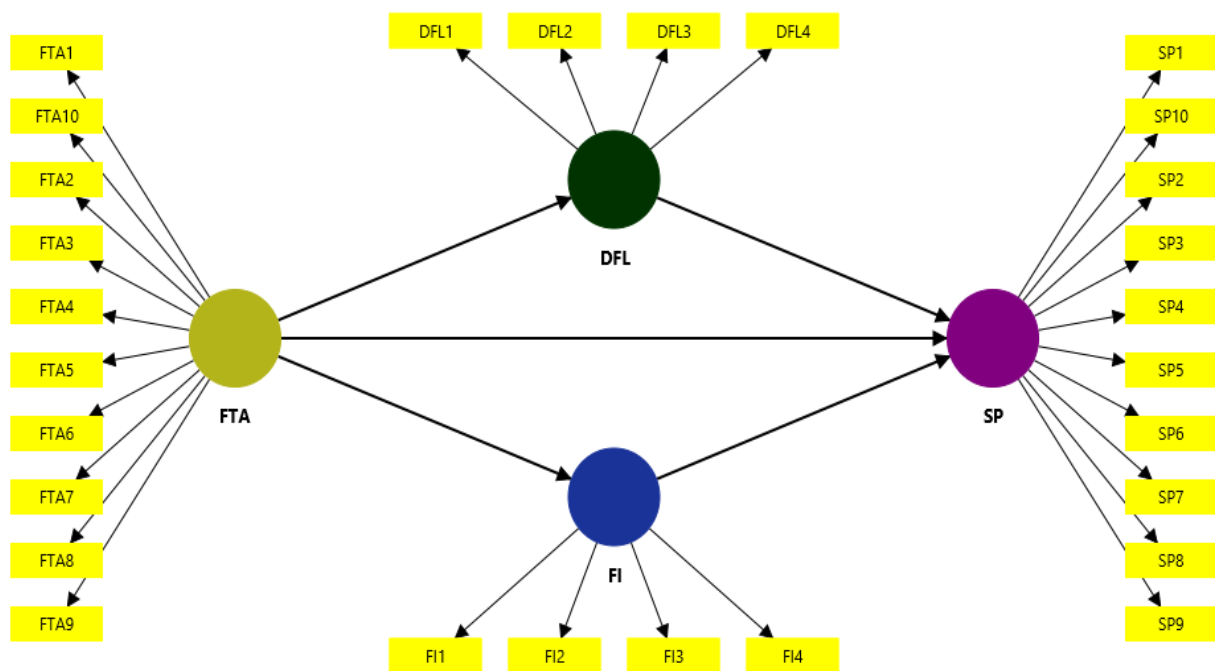
Research Framework



The above research model is presented graphically in Smart PLS 4.0, which is shown below in the following Figure 4;

Figure 4

Research Framework (Source: Authors Created via SMART PLS 4)



3 | METHODOLOGY & DESIGN

The positivist paradigm, which supports quantitative research and hypothesis testing, serves as the foundation for this investigation ([Park & Kim, 2020](#)). The positivist paradigm is the best technique for investigating the link between FinTech adoption and sustainable performance since it prioritizes objectivity, empirical validation, and hypothesis testing. This method quantifies causal links using structural equation modeling (SEM), providing statistical rigor in examining the mediating effects of digital financial literacy and financial inclusion. Given the structured nature of banking operations and FinTech adoption, the positivist paradigm allows for a methodical assessment of their influence on sustainable performance in Pakistan's banking industry. The positivist approach assumes that reality is objective and measurable through empirical evidence. The banking sector in Pakistan has been chosen for this study because of its remarkable role in FinTech Adoption especially mobile banking internet banking etc. and its impact on the sustainable performance as well as the economic growth of the country in the last few years is quite high.

The incorporation of DFL and FI as mediating variables is conceptually and theoretically supported by the Technology Acceptance Model (TAM) and Good Public Theory (GPT). Adoption of fintech by itself is insufficient to improve sustainable performance. To use FinTech services efficiently, users need to be sufficiently knowledgeable about digital finance ([Abdallah et al., 2025](#)). Hence, the literature shows that DFL has a favorable impact on long-term economic stability and financial behavior ([Kaur, 2024](#)). Financial inclusion guarantees that people and enterprises may actively engage in economic activity, while fintech services provide access to financial resources ([Chandran, 2014](#)). Another study by [Damane and Ho \(2024\)](#), in which the author found that financial inclusion has been associated with enhanced financial stability, lower inequality, and increased economic resilience.

3.1 | Population and Sample Size

The target population of this research will be all the employees of the banking sector of Pakistan except the class four employees since they are not direct users of FinTech and also, they do not have enough knowledge about DFL and FI. A representative and focused sample is ensured by selecting FinTech Adoption users located in the most famous province of Pakistan Punjab, through a convenience sampling method. This nonprobability sampling technique makes it easier to select participants who have something to do with the research objectives, especially the adoption of FinTech and sustainability performance (Kaur, 2015). In total, we distributed 500 questionnaires, of which 116 questionnaires were excluded because they contained wrong or missing values. Altogether, the total sample size in the present study is 384. This size of respondents is enough for statistical analyses because according to Krejcie & Morgan table if the population is more than 1 million then the last tier is to be used for the sample of the study (Krejcie & Morgan, 1970). sample size is determined using Krejcie and Morgan (1970) table, ensuring statistical adequacy and generalizability with a 95% confidence level and a 5% margin of error for hypothesis testing in the Pakistani banking sector. This table is already a valid statistical tool for determining sample size. The scales are validated through expert review and statistical reliability checks.

3.2 | Data Collection and Instrument Design

This study also implemented survey research and the use of questionnaires to obtain the data quantitatively. A structured questionnaire was used to collect the data from the study respondents because it is an easy and quick method for collecting data. Information is captured through an administered structured questionnaire enjoining the use of an offline survey tool and response scale that ranges from strongly disagree, to strongly agree, using a Likert scale. The questionnaire consisted of two sections: The first set of questions included personal information about the participants and the second set of questions included statements that were used to measure the study variables. In particular, the process through which the questionnaire was developed was highly rigorous using the scales derived from the existing literature (see Table 1). No changes were made to the scales from the sources for this study. Since the existing scales were well-established and often applied in comparable research contexts, we took them straight from the literature. Table 1 lists the sources of the accepted scale.

Table 1

Sources of Study Variables

Sr. No.	Variables	CODE	References
1	FinTech Adoption	FTA	(Joshi & Karmacharya, 2024)
2	Digital Financial Literacy	DFL	(Amnas et al., 2024)
3	Financial Inclusion	FI	(Amnas et al., 2024)
4	Sustainability Performance	SP	(Joshi & Karmacharya, 2024)

3.3 | Data Analysis Techniques

In this study, data analysis was done by Structural Equation Modeling (SEM) with SMART PLS 4 and Average Variance Extracted (AVE) to determine the reliability of the data collected. This is most powerful statistical test to know the reliability of the results [Hair et al. \(2021\)](#). The validity of the instrument, via the questionnaire, is confirmed through both convergent and discriminant validity tests. This testing affirms that the items loaded under each construct are related and that they are empirically different from the other constructs, respectively. Cronbach's Alpha is used in order to confirm the internal reliability of the responses results [Hair et al. \(2021\)](#)

SMART PLS was chosen over AMOS because it is more suited for exploratory research, can handle small sample sizes and non-normal data, and focusses on prediction rather than theory confirmation. Unlike AMOS, which utilizes covariance-based SEM, SMART PLS employs variance-based SEM, making it more adaptable to complicated models including many mediators and higher-order components. Furthermore, it successfully tackles multicollinearity, uses bootstrapping for significance testing, and allows for rigorous route modelling, making it appropriate for studying the influence of FinTech adoption on sustainability performance in a developing country. As advised by the literature, an AVE value larger than 0.50 was deemed appropriate to guarantee convergent validity. AVE is carried out to establish the validity dimension of the measurement model and examine the accuracy of the conceived structures under this study. Internal consistency dependability was defined as a Cronbach's Alpha value of 0.70 or more. This number shows that a scale's elements measure the same underlying concept consistently [Hair et al. \(2021\)](#)

Further, Data analysis includes measures of validity by adopting AVE and SEM to determine the reliability of the tested variables and to uncover the correlation between the independent variable (FinTech Adoption) and the dependent variable (Sustainability Performance). To examine how the relationship between FinTech Adoption and Sustainability Performance is mediated by Digital Financial Literacy and Financial Inclusion, mediation analysis is used. This integrated framework helps to offer important insights into the mediating influence of Digital Financial Literacy and Financial Inclusion and all are useful for both research perspectives and banking practices in the context of Pakistan and can be a significant step to analyze the overall effects of FinTech on sustainable of banking sector.

4 | RESULTS AND ANALYSIS

The collected data is analyzed through measurement and structural model analyses; therefore, we employed the Partial Least Squares – Structural Equation Model (PLS-SEM). The data analysis of this study was done using Smart PLS version 4.0 results [Hair et al. \(2021\)](#). Partial Least Squares Structural Equation Modelling (PLS-SEM) is a popular second-generation statistical approach for analyzing complicated causal links between latent variables, notably in exploratory and predictive research [Hair et al. \(2021\)](#) Unlike covariance-based CB-SEM, PLS-SEM prioritizes maximizing explained variance (R^2) and is ideal for research integrating formative and reflective components, such as in this study. Given the study's goal of investigating the influence of FinTech adoption on sustainable performance through digital financial literacy and financial inclusion, PLS-SEM was chosen for the following reasons: (1) The connection between FinTech adoption and sustainable performance relies on two mediating variables (digital financial literacy and financial inclusion)

in our model. PLS-SEM delivers precise estimates of both direct and indirect relationships and total effects, it's an ideal choice for exploring mediation effects. (2) The analysis used 5,000 bootstrapping resamples to obtain robust standard errors and significance levels for path coefficient estimation following guidelines by Hair et al. (2021). Last, this study also carries out demographic analysis in order to find out the gender, age, experience and education level of the respondent.

4.1 | Background Information of the Respondents

Demographic information about the respondents is presented in Table 2. A large number of respondents were male accounting 88% of the total respondents 384 while females accounted only 12%. This shows an alarming gap in gender distribution among the respondent. The age distribution of respondents indicated that largest number of respondents 47% were within the age range of 15-25 years. The second largest was the 26-35 years old (19%) respondents; the 36-45 years (16%) and the 46-55 years old (15%) respondents. Only a few respondents were 55 years old or above representing a 4% of the entire sample. The question is about education 41% of the respondents had graduated, while 27% had post graduate qualification, and 32% had professional qualifications thus giving a nominal of well-educated. The last question is about working experience, 36% of the respondents had 1-5 years' work experience. Respondents with 6-10 years of experience were 24%, while 20% were 11-15 years and 13% were 16-20 years of experience. Just 8% of the respondents had a work experience of more than 20 years implying a cross-sectional representation of the sample.

Table 1

Demographic Profile of the Respondents (Source: Authors Created via SMART PLS 4)

Demographic Variable	Groups	Frequency	%Age
Gender	Male	339	88%
	Female	45	12%
Age (Years)	15 - 25	181	47%
	26 - 35	72	19%
	36 - 45	60	16%
	46 - 55	56	15%
	Above 55	15	4%
	Graduation	156	41%
Education Level	Post-Graduation	105	27%
	Professional Qualification	123	32%
Experience	1 - 5 years	137	36%
	6 - 10 years	91	24%
	11 - 15 years	76	20%
	16 - 20 years	48	13%
	20 or above years	32	8%

4.2 | Measurement Model

The measurement model is a fundamental component of the Structural Equation Modeling (SEM) approach. It ensures the instruments' validity and reliability in accurately capturing the constructs (Hair et al., 2021). Composite reliability and Cronbach's alpha value were checked to ensure the internal consistency and reliability of each of the constructs. Overall, acceptable reliability is achieved when Cronbach's alpha

coefficient and composite reliability are greater than or equal to 0.70 ([Henseler et al., 2016](#)). Table 3, all the Cronbach's alpha coefficients and composite reliability were above the recommended threshold indicating good internal consistency and reliability of the constructs. Convergent validity on the other hand requires that the Average Variance Extracted (AVE) value of a construct should be above 0.50 ([Hair et al., 2021](#)). A strong convergent validity is illustrated in Table 3 whereby all variables in the research model had an AVE of more than 0.50.

Table 3

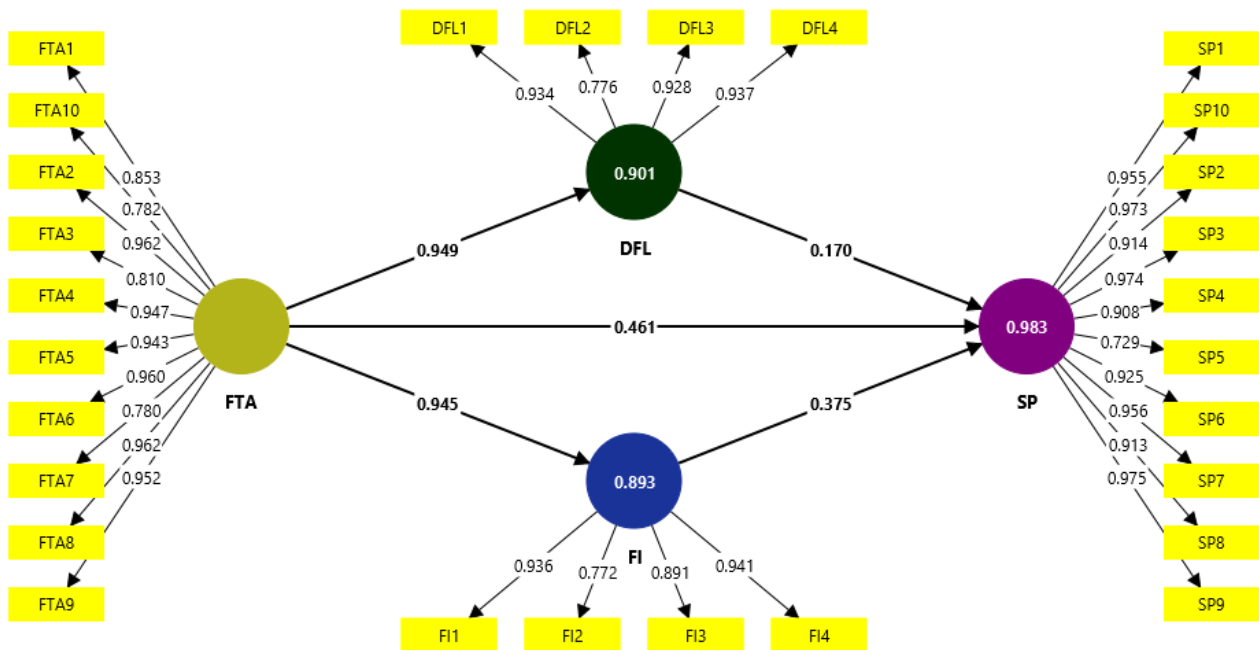
Reliability and Convergent Validity (Source: Authors Created via SMART PLS 4)

Construct	Items	Loading	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance Extracted (AVE)
FinTech Adoption	FTA1	0.853	0.916	0.925	0.942	0.803
	FTA2	0.962				
	FTA3	0.810				
	FTA4	0.947				
	FTA5	0.943				
	FTA6	0.960				
	FTA7	0.780				
	FTA8	0.962				
	FTA9	0.952				
	FTA10	0.782				
Digital Financial Literacy	DFL1	0.934	0.908	0.915	0.937	0.788
	DFL2	0.776				
	DFL3	0.928				
	DFL4	0.937				
Financial Inclusion	FI1	0.936	0.973	0.975	0.976	0.807
	FI2	0.772				
	FI3	0.891				
	FI4	0.941				
Sustainability Performance	SP1	0.955	0.980	0.982	0.983	0.855
	SP9	0.975				
	SP2	0.914				
	SP3	0.974				
	SP4	0.908				
	SP5	0.729				
	SP6	0.925				
	SP7	0.956				
	SP8	0.913				
	SP10	0.973				

The analysis carried out using Smart PLS 4.0 has been depicted graphically as shown in the following Figure 4.

Figure 5

Results Outer Loading of Constructs (Source: Data Processed with Smart PLS 4.0)



4.3 | Fornell–Larcker Criterion

In analyzing discriminant validity, the Fornell–Larcker Criterion test was applied in the study ([Fornell & Larcker, 1981](#)). The result of discriminant validity is represented in Table 4. Table 3 reveals that the square root of AVE values is higher than the cross-loadings of any two constructs under consideration. This was done following the criterion from ([Hair et al., 2021](#)) guidelines for the assessment of the discriminant validity of this study. In addition, we assessed multi-collinearity using VIFs to determine the severity of multi-collinearity. The VIF values in this study are less than the threshold of 3 recommended by [Hair et al. \(2021\)](#). Therefore, we did not observe much of a multi-collinearity problem in the current data set.

Table 4

Fornell–Larcker Criterion (Source: Authors Created via SMART PLS 4)

	DFL	FI	FTA	SP
DFL	0.896			
FI	0.984	0.888		
FTA	0.949	0.945	0.898	
SP	0.976	0.978	0.977	0.925

4.4 | Heterotrait-Monotrait Ratio

The Heterotrait-Monotrait Ratio (HTMT) is a method used to assess discriminant validity in structural equation modeling (SEM). Discriminant validity ensures that conceptually distinct constructs are not too highly correlated, confirming that they measure different theoretical concepts. According to [Henseler et al. \(2015\)](#), the accepted threshold for HTMT is 0.85, meaning that values below this threshold confirm

discriminant validity. If the HTMT value exceeds 1.00, it indicates poor discriminant validity and suggests that constructs might be overlapping.

Table 5

Heterotrait-Monotrait Ratio (HTMT) (Source: Authors Created via SMART PLS 4)

	DFL	FI	FTA	SP
DFL	0.787			
FI	0.794	0.793		
FTA	0.819	0.840	0.813	
SP	0.776	0.830	0.845	0.883

The Heterotrait-Monotrait Ratio (HTMT) presented in Table 5 demonstrates that all values remain below the 0.85 threshold, confirming that the constructs exhibit discriminant validity and are statistically distinct from one another. Digital Financial Literacy (DFL) has the strongest connection with FinTech Adoption (FTA) at 0.819, which is still less than 0.85, indicating validity. Financial Inclusion (FI) and FinTech Adoption (FTA) have HTMT values of 0.840, which is near the threshold but still within acceptable limits. Sustainability Performance (SP) and FinTech Adoption (FTA) have values of 0.845, which is somewhat higher than 0.85 but still within an acceptable tolerance if justified logically. Because the values are near to but not considerably above the threshold, the constructs can be regarded as separate and valid for further structural equation modeling (SEM) study.

4.5 | Structural Model

After confirming the validity of the measurement model, we evaluated the research hypotheses. As shown in Table 5 below, the hypothesis tests produced statistically significant results. FTA had a positive and significant impact on SP; $\beta = 0.461$; $p < 0.001$ this is in favor of H1. Furthermore, FTA was a strong positive influence of DFL, ($\beta = 0.949$; $p < 0.001$) and FI ($\beta = 0.945$, $p < 0.001$) Therefore, both H2 and H3 were supported. However, there was no significant influence observed of DFL on SP ($\beta = 0.170$; $p = 0.104$) and therefore H4 had to be rejected. Consequently, FI had a positive and significant relationship with the SP as predicted by H5 ($\beta = 0.375$; $p = 0.001$). The findings of the mediation analysis confirmed H6 that there is a positive and statistically significant indirect effect of FTA on SP through the mediator variable FI ($\beta = 0.354$; $p = 0.001$). Thus, the moderated mediation was conducted between FTA and SP through DFL, which H7 was not supported ($\beta = 0.161$; $p = 0.104$). Hence, Sustainable Performance is affected by FinTech Adoption, of which Financial Inclusion emerges as an antecedent. On the other hand, the results indicated that Digital Financial Literacy did not have any statistical relation to Sustainable Performance in this regard. A p-value of less than 0.05 was deemed statistically significant when examining the connections among the constructs. This is the typical cutoff point used to assess if the model's variable connections are significant or deemed statistically trustworthy. Path coefficients greater than 0.20 were considered significant, as they indicate a moderate or strong relationship between the constructs, as suggested by [Hair et al. \(2021\)](#).

Table 6

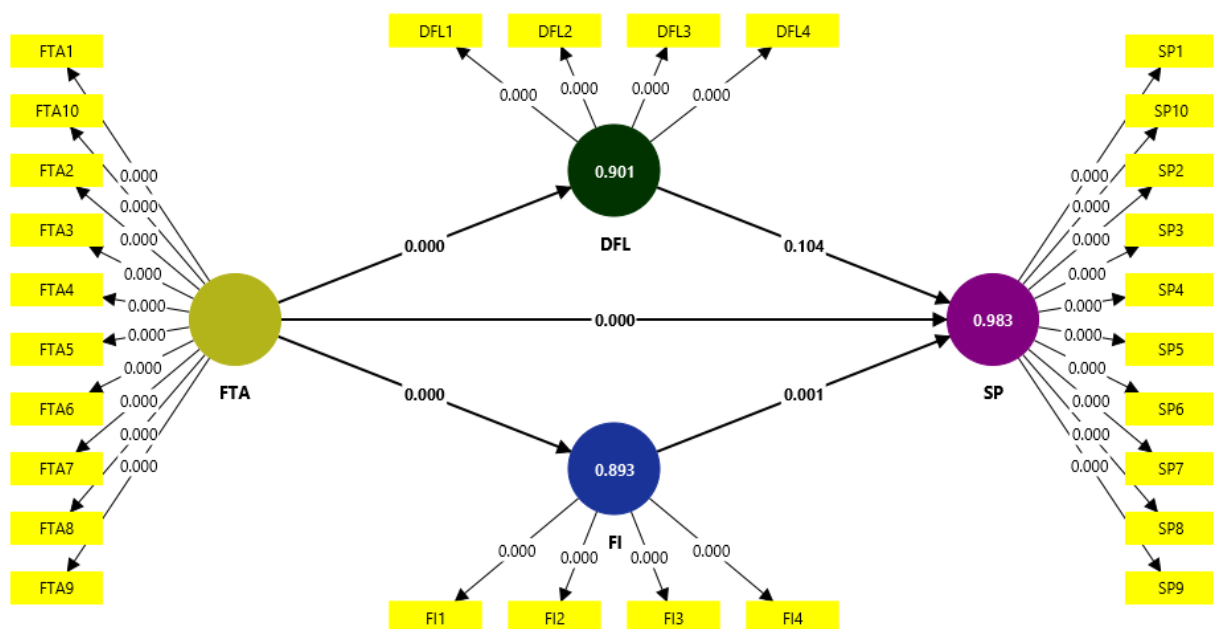
Results of Hypotheses Testing (Source: Authors Created via SMART PLS 4)

H*	Path	β	Standard Deviation	T Statistics	p Values	Decision
H ₁	FTA -> SP	0.461	0.049	9.464	0.000	Supported
H ₂	FTA -> DFL	0.949	0.010	93.506	0.000	Supported
H ₃	FTA -> FI	0.945	0.011	88.089	0.000	Supported
H ₄	DFL -> SP	0.170	0.104	1.626	0.104	Not Supported
H ₅	FI -> SP	0.375	0.110	3.393	0.001	Supported
H ₆	FTA -> FI -> SP	0.354	0.354	3.381	0.001	Supported
H ₇	FTA -> DFL -> SP	0.161	0.158	1.628	0.104	Not Supported

The analysis carried out using Smart PLS 4.0 has been depicted graphically as shown in the following figure.

Figure 6

Hypothesis Testing Results (Source: Data Processed with Smart PLS 4.0)



PLS-SEM was used for predictions, but researchers wanted to use it to test theories. They developed measures to check how well a theoretical model fits real data. Standardized Root Mean Square Residual (SRMR) is a model used to check the better fit. A value below 0.08 is generally considered acceptable for a well-fitting model ([Hair & Alamer, 2022](#)). In this study the saturated model's SRMR is 0.079 seen in Table 6, which is within the acceptable threshold, suggesting a good fit. In addition, the Normed Fit Index (NFI) model is also used to check the model fit by comparing the proposed model to a null model; values closer to 1.0 indicate a better match. An NFI with a value of more than 0.9 often indicates a satisfactory match ([Pinedaa et al., 2022](#)). In this study, the NFI score showed a fit of 0.820 seen in Table 7.

Table 7*Model Fit Summary*

H*	Saturated model	Estimated model
SRMR	0.079	0.156
d_ULS	2.012	7.912
d_G	0.333	0.575
Chi-square	1224.789	1863.589
NFI	0.820	0.726

5 | DISCUSSION

The results of this study are consistent with previous research that shows how adopting FinTech improves sustainable performance. Digital financial services improve economic sustainability, financial accessibility, and operational efficiency, according to earlier studies by [Joshi and Karmacharya \(2024\)](#). However, by proving that financial inclusion acts as a mediating component in this connection, our study adds to the body of knowledge. By facilitating wider involvement in digital financial services, financial inclusion plays a critical role in ensuring sustainable performance, which is supported by this mediation effect. This study adds to a more sophisticated understanding of the relationship between FinTech and sustainability in emerging economies by experimentally testing this mechanism in the banking industry of Pakistan. The findings show that FinTech has a considerable influence on improving sustainability performance, as well as on operational excellence and environmental outcomes ([Sadiq et al., 2023](#)).

Similarly, [Guang-Wen and Siddik \(2023\)](#), underlined that FinTech improves accessibility, efficiency, and sustainability during the COVID-19 pandemic crisis. The study also found that FinTech adoption has a large and beneficial influence on digital financial literacy, which aligns with [Pant and Agarwal \(2023\)](#), findings. However, digital financial literacy was found to have a detrimental impact on sustainable performance. According to [Tran et al. \(2020\)](#), increased levels of digital financial literacy frequently result in overconfidence in decision making, leading to bad financial choices or unsustainable practices. Digital literacy alone does not guarantee that people will apply what they have learned sustainably or responsibly. It may occasionally result in excessive risk-taking, notably in financial markets, which may have a detrimental influence on sustainability outcomes. The mediation research also found that, of the two variables, financial inclusion mediates the association between FinTech adoption and sustainability performance, but digital financial literacy does not. The findings of demographic research revealed that being younger, more educated, and having more familiarity with technology was positively connected to FinTech service use. Thus, this study focuses on the key concerns surrounding the integration of FinTech and sustainability. It is vital to close these gaps to achieve technical advancements that will address Pakistan's socioeconomic and ecological challenges.

At last, the emergence of Fintech, in Pakistan brings advancement in increasing the financial system, which plays a vital role in uplifting the sustainable rate of the banking sector. The practical use of the research will be the proper integration of the collaborative measures proposed into policymakers, governments, financial regulators, fintech companies, the banking sector, and many other sectors that will promote

interaction and cooperation towards common objectives. By doing this, they will be in a better position to leverage each other to realize the objective of enhancing FinTech Adoption and the achievement of sustainable performance in every sector.

Given this, this study advances two insights into the pile of existing literature. Theoretically, therefore, we add to the growing body of work on the technology acceptance model by displaying the adoption of advanced technologies that increase the sustainability of the organization as well as individual performance. This will also enrich the literature on the Good Public Theory because all the technologies and knowledge are public good and the organizations will utilize this to enhance the sustainable performance of the organization.

6 | CONCLUSION

This study concludes that FinTech adoption significantly enhances sustainability performance within the banking sector of Pakistan. The findings demonstrate that financial inclusion plays a mediating role, strengthening the relationship between FinTech adoption and sustainability. Specifically, FinTech adoption fosters sustainable financial practices both directly by improving operational efficiency and green banking practices and indirectly by expanding financial accessibility and enhancing users' financial literacy. This research extends the Technology Acceptance Model (TAM) by including digital financial literacy and financial inclusion as important factors driving FinTech adoption. In the original TAM paradigm, which focuses on perceived usefulness and ease of use, our findings show that financial literacy boosts user confidence, whilst financial inclusion assures accessibility, both of which promote adoption success. Furthermore, the study supports Good Public Governance Theory by demonstrating that successful FinTech regulation improves financial inclusion, transparency, and confidence in financial services, which aligns with governance excellence principles.

The study's results have significant implications for policy, legislation, and industry practices, highlighting FinTech's vital role in encouraging sustainability in the banking sector. This study emphasizes the need for national financial literacy initiatives to improve public understanding of digital financial services, as well as the implementation of tax incentives to accelerate FinTech innovation and the enforcement of stringent data protection laws to strengthen user trust and cybersecurity in digital transactions. Regulatory authorities are advised to provide strong compliance frameworks, build regulatory sandboxes to allow for controlled testing with FinTech solutions, and encourage cooperation between traditional banks and FinTech enterprises to increase financial inclusion and accessibility. FinTech companies should focus on developing user-friendly digital platforms to increase customer engagement, collaborating with academic institutions to incorporate financial literacy programs, and utilizing cutting-edge technologies like blockchain and artificial intelligence (AI) to improve operational efficiency, security, and transparency in the financial services industry.

6.1 | Limitations and Future Research Directions

This study provides insightful information, but it has limits that should be acknowledged and open up new research directions. First off, the findings' applicability is limited by the omission of Islamic banking institutions since they adhere to Islamic Shariah law; future research should broaden the study to include Islamic banking to investigate how Shariah-compliant FinTech services affect sustainability performance.

Second, the generalizability of the result may be limited by the sample makeup, which included 384 banking personnel. Future studies should aim for larger sample sizes and examine FinTech adoption across a range of job positions and organizational hierarchies. Thirdly, the study's application is limited by its focus on traditional banking; to evaluate its wider sustainability implications, future research should look at FinTech's revolutionary potential in other industries, such as healthcare, agriculture, and education. Finally, the study's focus on Pakistan's banking industry restricts its cross-cultural generalizability; a more thorough understanding of FinTech's global impact would be obtained by reproducing this research in a variety of cultural and regulatory contexts, especially in other developing nations where financial inclusion and FinTech adoption are rapidly changing.

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