

-RESEARCH ARTICLE-

STRATEGIES FOR FINTECH ADOPTION AND FINANCIAL INCLUSION: EXAMINING THE MODERATING ROLE OF TECHNOLOGICAL INFRASTRUCTURE

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—Abstract—

The study aimed to examine the influence of fintech adoption on financial inclusion, considering the moderating effect of information technology infrastructure among banking users in Saudi Arabia. A cross-sectional research design was used to collect data from 300 internet banking users. The data was gathered through a self-administered survey instrument using convenient sampling. The PLS-SEM technique reveals that trust, perceived security, service quality, and perceived benefits have a positive and significant impact on the use of financial services. The use of financial services also has a positive and significant impact on financial inclusion. Trust, perceived security, service quality, and perceived benefits all have a positive and significant impact on financial inclusion, with the mediating effect of using financial services. The information technology infrastructure plays an essential role in enhancing the relationship between financial services usage and financial inclusion. The study with this mediating moderated model provided valuable research findings that added to the existing body of literature. The study also highlights the importance of policy makers and regulators investing in information technology infrastructure to enhance users' Fintech intention and ensure the long-term sustainability of financial institutions.

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INTRODUCTION

Financial inclusion continues to be a significant concern for businesses on a global scale, despite the ongoing economic progress being made worldwide. Many individuals encounter challenges when trying to access formal financial services (Senyo & Osabutey, 2020). Thus, the disparity in access to financial services underscores the necessity for an innovative solution to address these variations (Demirgüç-Kunt et al., 2022). Thus, fintech emerges as a crucial technological solution for enhancing the availability of financial services, especially for marginalised communities (Aleemi et al., 2023; Senyo & Osabutey, 2020). In other words, The emergence of fintech has revolutionised the way people handle their finances, allowing for convenient and accessible financial transactions at any time and from any location (Yang & Zhang, 2022). Using technology, fintech organisations are revolutionising the way financial services are accessed, especially in areas where traditional banking infrastructure is lacking. This has enabled individuals to conveniently carry out transactions using their smartphones (George & Sunny, 2023). Simply put, fintech services offer consumers greater economic advantages compared to traditional banking services (Shaikh et al., 2023), ultimately enhancing financial inclusion.

Ensuring access to financial services is of utmost importance in emerging markets like Saudi Arabia. Prior research has acknowledged the importance of trust, perceived security, service quality, and perceived benefits in enhancing financial services usage (Amnas et al., 2024; Yan et al., 2022). Building trust is crucial for ensuring reliability and integrity in financial interactions (Shahzad et al., 2022). Similarly, instilling a sense of security helps boost confidence by protecting assets and information (Abrahams et al., 2023). The perceived benefits highlight the importance and usefulness of financial services, which motivates individuals to participate by providing cost savings, convenience, and enhanced financial management capabilities (Ali et al., 2021; Hassan et al., 2022). The studies indicate that factors such as perceived benefits, service quality, perceived security, and trust contribute to creating an environment that encourages active utilisation of financial services, thereby promoting financial inclusion. Regarding this matter, research has been conducted on the utilisation of financial services to promote greater financial inclusion.

Furthermore, the integration of information technology infrastructure is crucial in expanding access to financial services and promoting financial inclusion. This argument is backed by existing literature that suggests that by investing in robust IT infrastructure, such as internet connectivity, mobile phone penetration, and digital literacy initiatives, financial institutions and policymakers can narrow the digital divide and provide

financial services to underserved populations (Quresh et al., 2023). An effective IT infrastructure fosters the creation of cutting-edge financial solutions like mobile banking, digital payments, and online lending platforms that address the unique requirements of individuals and businesses in remote areas (Chung et al., 2023). Moreover, the use of digital infrastructure enables the effective implementation of government programmes for financial inclusion, such as social benefits and subsidies, by simplifying procedures and lowering operational expenses (Chen et al., 2023; Danladi et al., 2023). The enhancement of financial access and participation, as well as the promotion of inclusive economic growth and empowerment of marginalised communities, can be achieved by focusing on information technology infrastructure (Almaqtari, 2024; Mamonov, 2020). Therefore, this study examines the role of information technology as a moderating variable in the relationship between the use of financial services and financial inclusion.

The existing literature has identified gaps in understanding the relationship between trust, perceived security, perceived benefits, financial services use, and financial inclusion. Prior studies on FinTech have primarily focused on its direct impact on financial inclusion (Amnas et al., 2024; Shaikh et al., 2023). Previous studies have examined the impact of trust, perceived benefits, perceived security, and service quality on financial inclusion and Fintech adoption. However, there has been limited research on the moderating effect of these factors (Gupta et al., 2023; Jafri et al., 2024; Purnama et al., 2023). Prior research has paid limited attention to the moderating effect of information technology infrastructure on the relationship between FinTech usage and financial inclusion. Prior research has predominantly examined the direct impact of information technology infrastructure on the adoption of financial technology (Amnas et al., 2024); (Nugraha et al., 2024). The current study focuses on the moderating role of information technology infrastructure in the relationship between Fintech usage and financial inclusion in Saudi Arabian financial institutions.

This study aims to provide three important contributions to the existing literature. The study emphasised the potential of Fintech in enhancing financial inclusion. However, there are additional factors that could further enhance this relationship. This study made significant contributions by examining the mediating effect of Fintech use on perceived security, service quality, trust, perceived benefits, and financial inclusion. This study found that information technology infrastructure plays a significant role as a moderating variable in the relationship between Fintech use and financial inclusion. This study contributes to increasing the confidence level of consumers who believe that an effective IT infrastructure is more likely to use FinTech services to meet their financial needs. Furthermore, the research findings offer assistance to policymakers and industry stakeholders by providing valuable recommendations and enhancing comprehension of the application of FinTech and its impact on financial inclusion. The paper was divided

into four sections: literature review, research methods, data analysis, and discussion and conclusion.

LITERATURE REVIEW

Theoretical Foundation

The research framework comprises two theories: the "Unified Theory of Acceptance and Use of Technology (UTAUT2)" (Fleury & Chaniaud, 2024) and the Value-based Adoption Model (VAM) (Kim et al., 2007). Two previous theories have shown that technology has an impact on individual behavioral intentions. The UTAUT2 theory offers a comprehensive perspective on technology adoption, applicable to various industries including information systems, mobile apps, and Fintech (Gansser & Reich, 2021). This study utilizes UTAUT2 to comprehensively analyze the factors influencing FinTech adoption. On the other hand, Individuals' perceptions of new technology's benefits and drawbacks influence its adoption, with value being a key factor (Jun et al., 2018). Trust, service quality, and perceived security influence the perceived value of adopting FinTech. In this context, the VAM framework is a suitable tool for understanding individuals' intentions and adoption behaviours (Lee et al., 2015). Perceived regulatory support and digital financial literacy reinforce the perceived benefits of adopting FinTech. The study by Hasan et al. (2021) utilised VAM to analyse adoption patterns in the fintech industry. The present research incorporates both the UTAUT2 and VAM models to gain a comprehensive understanding of FinTech adoption dynamics and examine the complex interplay of factors influencing adoption decisions. Figure 1 below depicts the conceptual model.

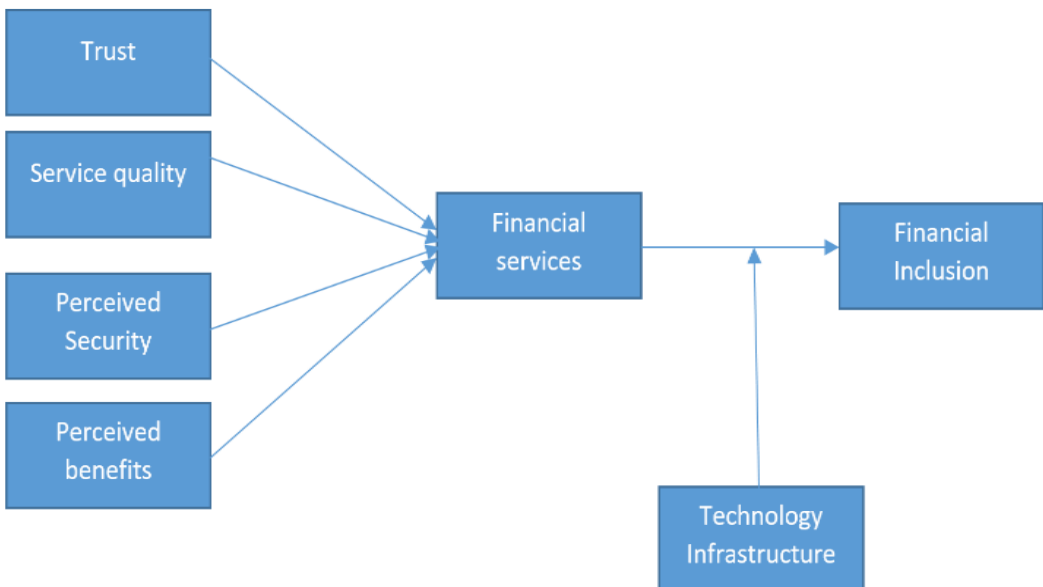


Figure.1: Conceptual Framework

Hypothesis Development

Trust and FinTech Use

Trust in financial technology systems is based on users' beliefs and ethical conduct, which contributes to the enhancement of financial technology utilisation. Several studies have demonstrated a positive and significant relationship between trust and individuals' inclination to use fintech (George & Sunny, 2023). This is particularly relevant in the payment service sector, where a high level of customer trust is critical due to the presence of fraudulent activities that pose financial risks to organizations (Kilani et al., 2023). Users' trust in a FinTech platform has a positive impact on their financial adoption and utilization. According to (W. Zhang et al., 2023), trust in FinTech platforms is associated with increased confidence in the security, privacy, and reliability of digital products. Users who have trust in a platform perceive reduced risks associated with its use (Shahzad et al., 2022), and are more inclined to demonstrate loyalty by using the services repeatedly and possibly recommending them to others. The level of trust consumers has in FinTech services significantly influences their attitudes and behaviours. In addition, it reduces perceived risk, encourages positive word-of-mouth, instills confidence, and improves reputation (George & Sunny, 2023). Therefore, building on the previous discussion, the study has developed the following research hypothesis:

H1: *Financial services use significantly affected by trust.*

H2: *Fintech services mediate in the relationship of trust and financial inclusion.*

Service Quality and Fintech Services Use

Service quality is an important factor that contributes to the increased usage of Fintech services. Several studies have explored the correlation between service quality and the utilisation of Fintech. A study by (Ahmed et al., 2021) examined individuals' perception of service quality and their adoption and usage of fintech platforms. The research findings indicate that customers' adoption and utilisation of FinTech services are significantly influenced by positive experiences with service quality, encompassing dependability, efficiency, and contentment. (George & Sunny, 2023) conducted a comprehensive investigation on the impact of service quality on consumers' perceptions of FinTech platforms. Their study revealed that service quality has a significant influence on fintech use. (Patnaik et al., 2023) conducted a study to examine the influence of service quality on fintech services. Their findings suggest that customers perceive FinTech platforms as offering excellent value when they receive high-quality services. This, in turn, enhances user satisfaction and loyalty. Additionally, (Gautam & Sah, 2023) examined the impact of service quality in the FinTech industry on client attention towards fintech services. The researchers found that satisfied customers tend

to be more loyal, leading to higher retention rates and increased usage of FinTech services. Prior research has demonstrated the significance of service quality in enhancing the adoption of internet banking Fintech services. The study formulates the following research hypothesis:

H3: *Financial services use significantly affected by service quality.*

H4: *Fintech services mediate in the relationship of service quality and financial inclusion.*

Perceived Security and Fintech Services use

Perceived security, among other factors, contributed significantly to the increased adoption of Fintech services (Lim et al., 2019). Several studies have suggested that perceived security plays a crucial role in promoting the adoption of Fintech services (Aribake & Mat Aji, 2020; Huang et al., 2011; Wang et al., 2014). Multiple studies have examined the impact of perceived security on customers' adoption intentions of FinTech developments, such as mobile banking apps and payment systems for mobile devices (Kim et al., 2007; Nangin et al., 2020). The study revealed that perceived quality plays a crucial role in driving the adoption of Fintech across various sectors. (Nwaiwu et al., 2020) and (Yuliati et al., 2020) emphasise the significance of understanding how consumers' perceptions of security impact their trust in and adoption of new technology, particularly in the context of Fintech services. Perceived security positively and significantly influences Fintech service adoption (Al Karim et al., 2023). The authors further argued that perceived security is an important indicator for companies that prioritise financial services. Therefore, the following hypothesis is formulated based on previous studies:

H5: *FinTech services significantly effect by perceived security.*

H6: *Fintech services mediate in the relationship of perceived security and financial inclusion.*

Perceived benefits and Fintech services use

The acceptance and usage of FinTech services by consumers are primarily influenced by their perceptions of the benefits. People argue that perceived benefits play a significant role in drawing individuals' attention to the use of financial technology (Gupta et al., 2023). Empirical studies have consistently shown that customers' adoption of FinTech solutions, such as online banking platforms and mobile payment services, is strongly influenced by perceived benefits (Ali et al., 2021; Hassan et al., 2022). In other study, the study also found that perceived benefits have a positive and significant impact on the usage of Fintech services. (Mascarenhas et al., 2021) study reveals that motivating users with economic benefits positively influences the sustainability of financial institutions. To promote widespread adoption and continued involvement in

FinTech services, it is necessary to enhance perceived benefits through user-centric design and transparent value proposition communication. Therefore, the following hypothesis is proposed based on previous studies:

H7: *Fintech services significantly affected by perceived benefits.*

H8: *Fintech services mediate in the relationship of perceived benefits and financial inclusion.*

FinTech Use and Financial Inclusion

FinTech provides digital platforms that replace traditional bank branches, enhancing accessibility to financial services, especially for individuals in underdeveloped or rural regions (Shaikh et al., 2023). Thomas and Hedrick-Wong, (2019) found that FinTech enhances the convenience and affordability of banking services, while reducing the costs associated with traditional banking operations. FinTech democratizes financial services, making them accessible to a broader audience beyond tech-savvy consumers (Okello Candiya Bongomin & Munene, 2021). The adoption of fintech services increases financial inclusion and enhances organisational sustainability (Björkegren & Grissen, 2018; Yue et al., 2022). Furthermore, by engaging in peer-to-peer lending and offering microfinance services, companies can effectively enhance their financial inclusion efforts. In addition, through peer-to-peer lending and microfinance services, FinTech simplifies the process of obtaining financial assistance for individuals and small businesses who may not qualify for traditional loans. This fosters entrepreneurship and stimulates economic activity in disadvantaged regions (Björkegren & Grissen, 2018; Yue et al., 2022). Collaboration between governments and FinTech companies is enhancing financial inclusion programmes, enabling faster delivery of social benefits and subsidies to those who require them. Fintech has successfully reduced barriers to entry for traditional financial institutions by utilizing technological advancements, resulting in increased accessibility to financial services for individuals from all walks of life (Aleemi et al., 2023; Yeyouomo et al., 2023). The findings have led to the formulation of the following research hypothesis:

H9. *Financial inclusion significantly effect by financial services uses.*

Financial Services, information technology infrastructure and financial inclusion

Past research has indicated that the connection between the use of Fintech services and financial inclusion is still uncertain. If companies or individuals do not prioritise their information technology infrastructure, the adoption of Fintech structures may be limited. Therefore, we cannot disregard the significance of information technology, given its crucial role in enhancing FinTech services and promoting financial inclusion (Asif, 2022). Financial institutions have the ability to optimize processes, decrease operational expenses, and improve service delivery by utilizing cutting-edge IT systems

and digital platforms (Masnawati & Kurniawan, 2023) For example, the incorporation of mobile banking applications, online payment gateways, and digital wallets allows individuals to conveniently and affordably access a diverse array of financial services (Chhaidar et al., 2023). In addition, advancements in technologies like blockchain and artificial intelligence have made it possible to ensure secure transactions, automate decision-making processes, and offer personalised financial solutions. This has effectively eliminated conventional access barriers (X. Zhang et al., 2023). The enhanced efficiency, accessibility, and affordability of FinTech services play a crucial role in promoting financial inclusion. By providing formal financial services to underserved populations, these services empower individuals with greater economic opportunities and financial resilience (W. Zhang et al., 2023). Therefore, drawing from prior research, the following research hypothesis was formulated:

H10: *Fintech financial services use has significant influence on financial inclusion with moderating effect of information technology infrastructure.*

Research methodology

The study sought to examine the role of Saudi Arabia's technology infrastructure in relation to the adoption of fintech and its impact on financial inclusion. The study utilised a quantitative research approach to accomplish this objective. This research approach enables the collection of quantitative data, facilitating statistical analysis to identify patterns and correlations across various sample sizes. (Sardana et al., 2023) presented additional evidence to bolster the research endeavour and highlighted the value of quantitative methodologies in producing dependable measurements and statistical analysis. Thus, the study employed a quantitative research approach to examine the study objective. To test the study objective, a cross-sectional research design was used. The cross-sectional design was chosen for its ability to gather a significant amount of data at once and provide valuable insights into the current state of variables without the need for long-term monitoring. The cross-sectional research design is well-suited for studying the connections between variables, making it ideal for explanatory investigations that aim to identify causal relationships (Wang & Cheng, 2020). Thus, the researcher utilised a cross-sectional research design.

Questionnaire Development and Data Collection Procedure

This study adapted the survey instrument from previous studies that have demonstrated higher construct reliability. (Singh & Srivastava, 2018) derived the four questions on trust from their study. Perceived security was assessed using a four-item scale developed by (Singh & Srivastava, 2018). Service quality is measured by four items, according to (Zhou, 2013), while the use of Fintech is measured by three items, according to (Venkatesh et al., 2003). The benefits identified in this study were derived from four items extracted from the work of (Ramadhan & Wibowo, 2021).(Okello

Candiya Bongomin & Ntayi, 2020) measure financial inclusion using four items. The technology infrastructure is characterised by three components (Panda & Rath, 2018). The adopted items were ranked on a scale of 1 to 5, with 1 representing strongly disagree and 5 representing strongly agree. The instrument was distributed to 400 users of internet banking. Data from online banking users was collected using a simple non-probability sampling technique. Convenient sampling is advantageous for studying internet banking users due to its ability to select participants based on their availability and willingness to participate (Alvi, 2016). The method described enables researchers to collect data from a large sample size without the constraints of time or resources, which are limitations of random sampling techniques (Speak et al., 2018). Therefore, researchers employed the convenient sampling technique. Out of the 400 distributed questionnaires, 300 were returned, indicating a response rate of 75%. The response rate is considered satisfactory (Wu et al., 2022).

Demographics

The demographic analysis indicates a diverse sample in terms of gender, with a slight majority of male participants (50.66%) compared to females (49.34%). The age distribution reveals a higher proportion of younger individuals, particularly in the 15–25 age group (41.28%), followed by those aged 26–35 (10.03%). In contrast, older age groups exhibit progressively lower representation. The education levels of the sample vary, with a significant proportion having completed a bachelor's degree (37.17%) or obtained postgraduate qualifications (30.59%), suggesting a relatively high level of education among the participants. Most participants (60.69%) live in urban areas, while the remaining participants (39.31%) reside in rural areas. A substantial portion of individuals (49.84%) have been utilising FinTech for more than five years, suggesting a notable degree of familiarity and potential expertise. The frequency of FinTech usage varies, with a significant proportion of people using it either always (47.2%) or often (28.45%). This indicates a significant integration of FinTech into the financial activities of participants, emphasising its widespread presence and significance in their lives. Table 1 presents the predicted results.

MEASUREMENT MODEL

Convergent validity

In assessing convergent validity through “factor loadings, alpha, composite reliability, and average extracted variance”, researchers aim to ensure the measurement model's accuracy by reflecting the underlying constructs. The factor loadings demonstrate the increased correlation between latent variables and their observed constructs. The higher loadings indicate more convergent validity. Values greater than 0.7 are commonly considered excellent and indicate a consistent assessment of the same underlying

concept among the items within each construct. Alpha and composite reliability coefficients are used to assess the scale's internal consistency.

Table.1: Demographics Statistics

Demographic Variable	Groups	Percentage
Gender	Male	50.66
	Female	49.34
Age (in years)	15–25	41.28
	26–35	10.03
	36–45	33.72
	46–55	9.22
	Above 55	5.76
Education level	Primary	2.8
	Secondary	15.13
	Graduation	37.17
	Post-graduation	30.59
	Professional qualification	14.31
Place of residence	Rural	60.69
	Urban	39.31
FinTech use Experience	<1 year	7.73
	2 to 3 years	19.57
	4 to 5 years	22.86
	Always	47.2

Source: Authors Estimation

The average extracted variance is a measure of the proportion of variance explained by the latent variables. Values above 0.5 indicate satisfactory convergent validity. The comprehensive evaluation enhances confidence in the study's findings and ensures that the measurement model accurately captures the intended constructs. (Edeh et al., 2023) and (Hair et al., 2017) proposed the suggested values. Table 2 displays the results of the convergent validity analysis.

Table.2: Convergent Validity

Constructs	Alpha	Composite Reliability	AVE
Trust	0.851	0.873	0.672
Perceived Security	0.812	0.845	0.624
Perceived Benefits	0.783	0.813	0.632
Service Quality	0.874	0.894	0.742
FinTech Use	0.834	0.853	0.642
Information Technology Infrastructure	0.793	0.824	0.582
Financial Inclusion	0.864	0.883	0.682

Source: Author's Estimation

Discriminant Validity

Discriminant validity refers to the variation in correlation between constructs. The assessment of this can be done using the "Heterotrait-Monotrait (HTMT) ratio, cross-loadings, and the Fornell and Larcker" method (Edeh et al., 2023; Hair et al., 2017). The Fornell and Larcker criterion evaluates discriminant validity by comparing the square root of the average variance extracted (AVE) to the correlations among the constructs. For each construct, the square roots of the average variance extracted (AVE) should exceed the correlations with other constructs. Cross-loadings examine the extent to which objects load more strongly on their intended constructs than on other constructs, providing insight into the uniqueness of constructs. The HTMT ratio evaluates correlations within and across components and indicates discriminant validity when values are below 0.85 (Henseler et al., 2015). The multimodal approach provided a comprehensive examination, leading the researchers to anticipate the results of Fornell and Larcker regarding discriminant validity. This approach assesses the degree to which constructs measure distinct attributes, thereby enhancing confidence in the validity of the measurement model. Table 3 contains the anticipated discriminant validity findings.

Table.3: Discriminant Validity

	TRU	SRQ	PRS	PRB	FSU	ITF	FI
TRU	0.82						
SRQ	0.63	0.79					
PRS	0.58	0.56	0.77				
PRF	0.71	0.66	0.63	0.84			
FSU	0.65	0.6	0.57	0.68	0.8		
ITF	0.55	0.51	0.49	0.59	0.54	0.76	
FI	0.67	0.62	0.59	0.72	0.66	0.57	0.82

Source: Author's Estimation

R Square and Q square

PLS-SEM R-square (R^2) and Q-square (Q^2) are important metrics for assessing the model's fit and prediction accuracy. R^2 represents the proportion of variance in the endogenous constructs that can be explained by the exogenous constructs in the model. Higher values, ranging from 0 to 1, indicate greater explanatory capacity. Q^2 represents the model's ability to predict the variance in the endogenous constructs and serves as an indicator of the model's predictive relevance. Positive Q^2 values often indicate strong predictive significance (Hair et al., 2017).

Hypothesis results

The trust ($\beta = 0.322$) has a positive and significant impact on the use of financial services. The significant positive correlation indicates that trust significantly influences

customers' adoption of Fintech services in Saudi Arabia. Individuals are more likely to use Fintech platforms for various financial activities when they have a greater level of confidence in them. Furthermore, service quality positively influences the utilization of financial services ($\beta = 0.336$). The correlation indicates that the quality of services provided significantly influences customers' adoption of Fintech services in Saudi Arabia. Furthermore, the study found that perceived security has a positive and significant impact ($\beta = 0.286$) on the usage of Fintech services. This study demonstrates that perceived security is a significant factor in influencing the usage of Fintech services in Saudi Arabia. It suggests that users who perceive Fintech platforms as secure and trustworthy are more inclined to use them for their financial needs. The perceived benefits have a positive and significant impact ($\beta = 0.377$) on Fintech service usage. Individuals are more inclined to use fintech platforms when they perceive tangible advantages such as cost savings, convenience, access to innovative services, and improved financial management abilities. The use of Fintech services has a positive and significant impact ($\beta = 0.483$) on financial inclusion. The relationship suggests that individuals from disadvantaged backgrounds may have greater accessibility to financial products and services by utilising Fintech services such as online lending, digital banking, or mobile payments. This promotes financial inclusion and economic empowerment. The infrastructure for information technology plays a crucial role in shaping the use of Fintech services and financial inclusion, with a significant and positive influence ($\beta = 0.249$). This indicates that a well-functioning IT infrastructure, including internet connectivity, widespread mobile phone usage, and digital literacy, enables individuals from various demographic groups in Saudi Arabia to conveniently access and utilise Fintech services. This, in turn, helps to facilitate the transformation of Fintech usage into outcomes related to broader financial inclusion.

Table.4: Hypothesis Results

Path	Beta	Standard Deviation	T Statistics	Decision
TRU -> FSU	0.322	0.077	4.181***	Supported
SRQ -> FSU	0.336	0.088	3.818***	Supported
PRS -> FSU	0.286	0.063	4.537***	Supported
PRF -> FSU	0.377	0.073	5.164***	Supported
FSU -> FI	0.483	0.072	6.706***	Supported
TRU -> FSU->FI	0.293	0.075	3.931**	Supported
SRQ -> FSU->FI	0.272	0.052	5.201***	Supported
PRS -> FSU->FI	0.363	0.071	5.141***	Supported
ITFx FSU -> FI	0.249	0.064	3.891***	Supported

Note: TRU-trust, FSU-fintech used, SRQ-service quality, PRS-perceived security, PRF-perceived benefits, fi-financial inclusion, ITF-information technology infrastructure.

Source: Author's Estimation

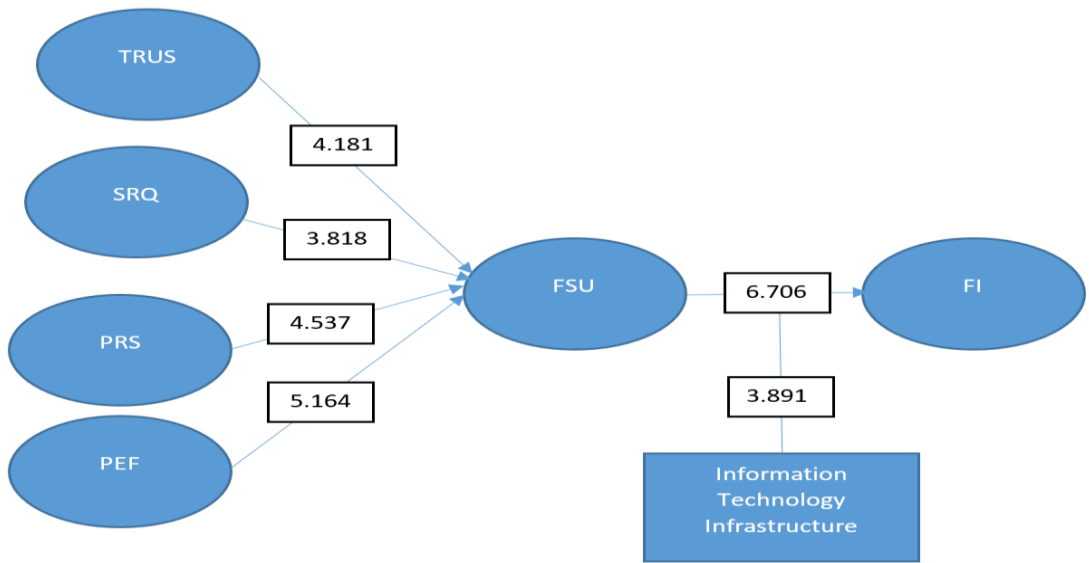


Figure.2: T Statistics Values

DISCUSSION AND CONCLUSION

The study sought to examine the role of Saudi Arabia's technology infrastructure in relation to the adoption of Fintech and its impact on financial inclusion. The study was conducted on internet banking users in Saudi Arabia, with the objective of testing nine hypotheses. The PLS-SEM analysis reveals that trust has a strong and meaningful influence on individuals who utilise financial services. These findings demonstrate the significant impact of trust on consumer behaviour and their willingness to adopt and use Fintech services within the sector (Ali et al., 2021). Ensuring secure transaction procedures, reliable and transparent service delivery, and providing satisfactory customer experiences all play a crucial role in building trust and boosting the growth of financial services in the Fintech industry (Haghjooye Javanmard et al., 2022). Thus, it can be contended that in order to enhance the adoption of financial services in Saudi Arabia, it is crucial to prioritise the level of trust that customers have in Fintech platforms. Additionally, the quality of service has a positive and significant impact on financial services. The findings indicate that the financial sectors in Saudi Arabia prioritise providing high-quality service to their employees, with the aim of increasing their interest in Fintech services. This highlights the importance of financial companies offering exceptional services in order to attract and retain Fintech customers. These findings are consistent with those from other studies (Haghjooye Javanmard et al., 2022; Singh et al., 2021). In the realm of service quality, factors such as user-friendliness, promptness, and dependability have been found to have a positive influence on consumers' perceptions and willingness to utilise Fintech platforms. According to these findings, it is suggested that Fintech companies in the Saudi Arabian

market can improve customer acceptance and usage by enhancing the quality of their services.

Furthermore, Perceived security plays a crucial role in influencing the Fintech services of internet banking users in Saudi Arabia. The findings emphasise the importance of security perceptions in promoting the use of Fintech in Saudi Arabia's financial institutions, as investors feel confident that their investments are secure. The results align with previous studies conducted by (Nangin et al., 2020) and (W. Zhang et al., 2023). Thus, it can be deduced that by improving the sense of security, the adoption of Fintech services could be boosted, ultimately contributing to the long-term stability of the financial sector in Saudi Arabia. However, the positive and significant impact of perceived benefits on the use of internet banking by financial services users in Saudi Arabia cannot be overlooked. The impact of perceived benefits on the use of Fintech services underscores the importance of perceived value in driving consumer acceptance of Fintech solutions. The findings align with previous studies (Durai & Stella, 2019; Purnama et al., 2023), which suggest that users are more inclined to adopt Fintech services when they perceive tangible benefits such as cost savings, user-friendliness, and access to innovative financial products and services (Durai & Stella, 2019). It would be advantageous to emphasise the advantages and value propositions of Fintech solutions to ensure customer retention in the Saudi Arabian Fintech market. Therefore, these findings highlight the importance of perceived benefits in capturing users' attention towards the use of financial services. Thus, it is imperative for the banking sector in Saudi Arabia to prioritise the well-being of consumers by embracing Fintech innovation. This will lead to an expansion of the financial services offered by financial institutions.

Simply stated, Fintech services have a positive and significant impact on the financial inclusion of financial institutions in Saudi Arabia. It is evident that as financial services usage increases, Saudi Arabia's financial institutions' financial inclusion also grows. Relevant studies (Danladi et al., 2023) support the findings. Thus, in the Saudi Arabian context, the increasing popularity of FinTech services, such as mobile banking apps and digital payment platforms, has greatly improved financial inclusion. These services offer straightforward access to formal financial services, especially for segments of the population that were previously underserved. The growing popularity of innovative FinTech models, including Sharia-compliant financial products, reflects the increasing demand for tailored solutions that cater to the unique needs and preferences of Saudi consumers (Aloulou et al., 2024). Thus, it is recommended that the improvement of financial inclusion through the effective use of Fintech services underscores the importance of promoting Fintech acceptance and utilisation to achieve broader socio-economic development objectives in the region. In other words, the impact of information technology infrastructure on the relationship between Fintech services and financial inclusion in Saudi Arabia is both positive and significant. An efficient

information technology infrastructure is crucial for fostering widespread acceptance and usage of Fintech among various demographic groups. This includes factors such as internet access, mobile phone penetration, and digital literacy, which in turn contribute to enhancing financial inclusion (Aloulou et al., 2024). Thus, one could make the case that Saudi Arabia's financial institutions are making significant investments in their information technology infrastructure to enhance their financial services, ultimately resulting in improved financial inclusion (Gerlach & Lutz, 2019). Relevant studies (Almaqtari et al., 2023) further support the findings by finding a positive and significant moderating effect of information technology infrastructure. Information technology infrastructure plays a crucial role in enhancing the impact of Fintech service usage on the outcomes of financial inclusion.

The use of financial services further demonstrates the significant mediating effect between trust and financial inclusion. The findings in Saudi Arabia emphasize the critical role of financial services as a mediating factor between trust and financial inclusion. Thus, in the banking sector of Saudi Arabia, trust plays a crucial role in instilling confidence in the reliability, security, and effectiveness of financial products and institutions. This, in turn, promotes a higher level of acceptance and utilisation of formal financial services. The mediating effect demonstrates the significance of trust in the financial system, acting as a crucial catalyst in fostering financial inclusion and enhancing economic empowerment in Saudi Arabia. The results are in line with the consistent findings from previous research (Amnas et al., 2024). Additional research findings indicate that the quality of service has a beneficial and noteworthy influence on financial inclusion, with the added factor of financial service use acting as a mediator. The findings in Saudi Arabia suggest that the quality of service in financial institutions has a positive impact on financial inclusion, as it helps to build trust and confidence among consumers. Thus, one could make the case that the quality of service has a significant impact on promoting financial inclusion, as it enables individuals to actively participate in financial activities and markets. Contextual studies bolster the validity of these findings (Amnas et al., 2024). Furthermore, perceived security and perceived benefits have a positive and significant impact on financial inclusion, with financial service use serving as a mediating effect. The findings indicate that financial services play a crucial role in connecting perceived security and perceived benefits with financial inclusion. When individuals perceive greater benefits and security, their use of financial services increases, ultimately enhancing financial inclusion (Purnama et al., 2023). Therefore, it can be inferred from the previous discussion that factors such as perceived security, service quality, perceived benefits, and trust play a crucial role in enhancing the experience of Fintech users, ultimately contributing to the sustainability of financial inclusion. Similarly, the role of information technology infrastructure was crucial in moderating the situation. Therefore, it is imperative for financial institutions to prioritize the enhancement of their information technology infrastructure in order to promote the financial sector's sustainability.

THEORETICAL AND PRACTICAL IMPLICATIONS

Theoretical Implications

The study different theoretical contributions which have been addressed in the current study. At first, previous studies were mainly concerned on other countries while Saudi Arabian fintech adoption scenario has not received much attention in the literature up to this point. Therefore, this study contributed a significant finding in the context of Saudi Arabia with an examination of the ways in which perceived security, trust, service quality, and benefits influence fintech usage patterns to our knowledge of consumer behavior in developing fintech marketplaces. At second, previous research was mainly focused on direct effect of trust, service quality, perceived security, and perceived benefits on financial inclusion while there was little attention on mediating and moderating effects. This study introduced a mediated moderated model that includes the mediating effect of financial services use and the moderating effect of information technology infrastructure. This study contributes to our understanding of the contextual factors that influence the relationship between fintech adoption and the effects on financial inclusion. The findings expand our theoretical comprehension of fintech adoption and establish a basis for future research on the complex dynamics of fintech ecosystems in different foreign contexts. The use of study models can assist researchers in conducting future research by expanding existing models and contributing to the current literature.

Practical Implications

The study has practical implications for financial institutions and Fintech enterprises in Saudi Arabia, as it could promote the use of fintech inclusion. The study suggests that policy makers should prioritise initiatives to enhance perceived security, service quality, perceived benefits, and trust in financial institutions in order to promote financial inclusion. Moreover, promoting the adoption of FinTech and integrating information technology is crucial as it influences the relationship between these factors and financial inclusion. Policymakers can promote cybersecurity, ensure high service standards, incentivize innovation, and foster partnerships between traditional financial institutions and fintech organisations to achieve this goal. Fintech organisations should prioritise the development of secure, user-friendly, and beneficial financial products and services. Fintech organisations can contribute to broader financial inclusion goals by effectively leveraging information technology infrastructure to enhance service delivery, build trust, and encourage greater adoption of their offerings. Moreover, collaborating with policy makers to improve the regulatory framework and support further innovation could enhance the ability of Fintech organisations to effectively increase the advantages of financial inclusion.

LIMITATIONS AND FUTURE DIRECTIONS

The study had several limitations that restricted its scope. Saudi Arabia, a developing nation, conducted an empirical study that could have implications for developed economies with different work cultures. Hence, further investigation in other developed economies could expand the research scope. Furthermore, the study primarily employed a cross-sectional research design, which involved collecting data at a single point in time. Therefore, future research could utilise a longitudinal research design to examine variations in the results over time. The study employed a quantitative research approach, gathering data via a self-administered survey instrument. Future research could explore a mixed-methods qualitative and quantitative research approach to examine potential variations in results.

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Appendix: Survey instrument

Trust		1	2	3	4	5
	<ol style="list-style-type: none"> 1. My bank is modern enough to conduct transactions online. My bank has access to the information needed to handle transactions appropriately. 2. My bank is open and receptive to customer needs 3. My bank takes extra efforts to address most customer concerns. 					
Perceived security						
	<ol style="list-style-type: none"> 1. I believe my mobile banking transaction information will not be lost during an online session. 2. I believe my mobile banking transaction information will only reach the target bank account. 3. The mobile device has enough safeguards to make me feel comfortable using it to conduct banking operations. 4. I am comfortable in conducting banking operations on the mobile. 					
Service Quality						
	<ol style="list-style-type: none"> 1. Mobile payment provides on-time services. 2. Mobile payment provides prompt responses. 3. Mobile payment provides professional services. 4. Mobile payment provides personalized services 					
Perceived Benefits						
	<ol style="list-style-type: none"> 1. Easily to access using smartphone and/or website 2. Transaction could be done anytime and anywhere 3. Sufficient Information about investment transaction 4. Saving money 					
Fintech USE						

	<ol style="list-style-type: none"> 1. I frequently employ FinTech for making payments and transferring funds. 2. I leverage FinTech investment platforms to oversee my investment portfolio. 3. I turn to FinTech services when I require financial assistance. 4. I actively engage with FinTech insurance services to purchase and oversee insurance policies. 						
Financial Inclusion							
	<ol style="list-style-type: none"> 1. FinTech services have expanded my access to financial products and services. 2. FinTech services have increased my ability to save and invest my money. 3. FinTech adoption has made it easier for me to send and receive money. 4. FinTech services have improved my ability to access credit and loans. 						
Information technology Infrastructure	<ol style="list-style-type: none"> 1. Effective management of technological fundamentals to create competitive advantage in Fintech adoption. 2. Ability to follow modern IT trends and use IT as a medium to attain organizational objective in fintech adoption. 3. Integrated planning, design, optimization and operation of technological products, services and processes with a focus on developing effective IT skills to improve fintech adoption. 						