

Effectiveness of Fintech in Retail Banking in Kerala

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Abstract: *The banking sector has undergone a significant transformation with the rapid advancement of financial technology (FinTech). FinTech refers to the application of innovative technologies to the delivery and management of financial services, including digital payments, mobile banking, internet banking, digital lending, automated investment services, artificial intelligence, blockchain and data-driven financial solutions. The integration of FinTech into banking has changed the traditional relationship between banks and customers by making financial services faster, more convenient, accessible and increasingly personalised. The Reserve Bank of India (RBI) describes FinTech as a broad range of technological innovations influencing financial services and has actively supported responsible innovation through initiatives such as the Regulatory Sandbox and the Reserve Bank Innovation Hub.*

Keywords: *FinTech*

I. INTRODUCTION

The banking sector has undergone a significant transformation with the rapid advancement of financial technology (FinTech). FinTech refers to the application of innovative technologies to the delivery and management of financial services, including digital payments, mobile banking, internet banking, digital lending, automated investment services, artificial intelligence, blockchain and data-driven financial solutions. The integration of FinTech into banking has changed the traditional relationship between banks and customers by making financial services faster, more convenient, accessible and increasingly personalised. The Reserve Bank of India (RBI) describes FinTech as a broad range of technological innovations influencing financial services and has actively supported responsible innovation through initiatives such as the Regulatory Sandbox and the Reserve Bank Innovation Hub.

Retail banking has been one of the major areas affected by the FinTech revolution. Traditionally, customers depended heavily on bank branches for activities such as opening accounts, depositing and withdrawing money, transferring funds, applying for loans and making payments. The emergence of FinTech has shifted several of these activities towards digital platforms. Mobile banking applications, internet banking, Unified Payments Interface (UPI), digital wallets, QR-code payments, Aadhaar-enabled services, automated customer support and digital lending platforms have made it possible for customers to access banking services with reduced dependence on physical branches. Digital payments, in particular, have expanded the functionality of bank accounts beyond traditional deposits and withdrawals, allowing them to function as convenient payment and transaction instruments.

In India, the development of digital public infrastructure has provided a strong foundation for the growth of FinTech and digital banking. Platforms such as UPI, Aadhaar and other digital financial infrastructures have enabled banks and FinTech firms to provide services on a large scale. The RBI has highlighted the potential of FinTech to support digital financial inclusion by providing accessible and cost-effective services through mobile banking applications, digital wallets, online lending and other technology-enabled platforms. The rapid expansion of digital payments also demonstrates the growing importance of technology in everyday financial transactions. In March 2024, UPI crossed 13 billion transactions in a single month, reflecting its increasing significance in India's retail payment ecosystem.



The effectiveness of FinTech in retail banking can be assessed from several dimensions. **Accessibility** refers to the ability of customers to obtain banking services irrespective of geographical location and time. **Convenience** relates to the ease and speed with which customers can perform transactions. **Cost efficiency** concerns the reduction in transaction and service-delivery costs. **Service quality** includes responsiveness, reliability and personalisation of banking services. **Financial inclusion** reflects the extent to which technology enables previously underserved populations to participate in the formal financial system. At the same time, effectiveness also depends on customers' digital literacy, awareness, trust and confidence in digital banking systems.

Kerala provides an interesting setting for studying the effectiveness of FinTech in retail banking. The state has relatively high levels of digital awareness and financial-service usage, creating favourable conditions for the adoption of technology-based banking services. According to an RBI survey, consumer awareness of digital payments in Kerala was **85.1 per cent**, compared with 77.2 per cent for India as a whole. This provides an important basis for examining whether high awareness is translating into effective and sustained use of FinTech-enabled retail banking services.

However, increased availability of technology does not automatically guarantee effective adoption. Customers may face concerns relating to cybersecurity, online fraud, privacy, technical difficulties, transaction failures, lack of digital skills and inadequate awareness of available services. The RBI has also emphasised the importance of customer protection, grievance redressal, secure KYC processes and awareness regarding digital fraud risks as FinTech adoption expands. Therefore, evaluating FinTech effectiveness requires consideration not only of adoption levels but also of customers' experiences, perceived benefits, trust, security and satisfaction.

FinTech has also contributed to the broader objective of financial inclusion. Digital technologies can reduce geographical and cost barriers and enable customers in underserved areas to access payments, savings, credit and other financial services. The RBI's Financial Inclusion Index increased from 43.4 in March 2017 to 64.2 in March 2024, indicating substantial progress in financial inclusion across India. In this context, FinTech can complement conventional banking by extending financial services beyond physical branches and providing customers with more flexible channels for managing their finances.

Against this background, the present study, **"Effectiveness of FinTech in Retail Banking in Kerala,"** seeks to examine the extent to which FinTech-enabled services have improved the delivery and experience of retail banking services in Kerala. The study can focus on dimensions such as **accessibility, convenience, transaction efficiency, service quality, cost effectiveness, customer satisfaction, security, trust and financial inclusion**. It is particularly relevant because the effectiveness of FinTech should ultimately be measured not merely by technological availability but by its ability to provide **secure, reliable, affordable, accessible and customer-oriented banking services**. The findings of the study may provide useful insights for banks, FinTech companies, policymakers and other stakeholders in strengthening Kerala's digital retail banking ecosystem while addressing the challenges associated with technology-driven financial services.

II. REVIEW OF LITERATURE

Kaura, Prasad and Sharma (2014) examined the impact of service quality, service convenience and perceived price fairness on customer satisfaction in the Indian retail banking sector. The study was conducted among 445 retail banking customers of public and private sector banks. The findings indicated that service quality and convenience are important determinants of customer satisfaction. The study particularly considered information technology as one of the dimensions of banking service quality and highlighted the importance of transaction, access and post-benefit convenience. The study provides an important foundation for understanding FinTech effectiveness because technology-enabled banking services are expected to improve convenience, accessibility and transaction efficiency.

Kamboj and Singh (2018) investigated customer satisfaction with digital banking in India, with particular emphasis on demographic factors. Their study observed that technological developments have created a significant transformation in the banking industry by enabling customers to conduct financial transactions through digital channels. The researchers found that customers were concerned about issues such as slow internet connectivity and inadequate security features.



They suggested that banks need to strengthen digital security and strategically improve their online services to increase customer confidence and encourage greater adoption. The study is relevant to the present research because security, accessibility and customer satisfaction are important dimensions of FinTech effectiveness.

Banu, Mohamed and Parayitam (2019) studied online banking and customer satisfaction in India using the Technology Acceptance Model and Decomposed Theory of Planned Behaviour. Data were collected from 750 customers of public and private sector banks. The findings demonstrated that perceived usefulness partially mediates the relationship between awareness, security, internet knowledge, self-efficacy, adoption intention, trust and ease of use and customer satisfaction. The study indicates that customers are more likely to be satisfied with digital banking when they perceive it as useful, secure, easy to use and trustworthy. These findings are particularly relevant for evaluating the effectiveness of FinTech-enabled retail banking services.

Kaur, Kiran, Grima and Rupeika-Apoga (2021) examined digital banking in Northern India by focusing on the risks associated with customer satisfaction. The study found that customers were generally satisfied with digital banking services, but service reliability, tangibility and responsiveness influenced satisfaction significantly. The researchers highlighted that the digital transformation of banking has increased the importance of secure and reliable 24-hour banking services. The study suggests that technological advancement alone cannot determine FinTech effectiveness; reliability and responsiveness of digital services are equally important. This provides a useful framework for examining whether customers in Kerala experience similar benefits and risks from FinTech-enabled banking.

Morgan (2022) examined the relationship between FinTech and financial inclusion in Southeast Asia and India. The study emphasised that FinTech can facilitate access to financial products and services for previously underserved households and small businesses. Technology-enabled financial services can support savings, investment, consumption management and insurance while reducing barriers to formal financial participation. The study highlights the broader social and economic importance of FinTech beyond transaction convenience. In the context of Kerala, this perspective is useful for assessing whether FinTech contributes to wider financial accessibility and inclusion among different categories of retail banking customers.

Jadaun, Singh and Cacal (2023) conducted a comparative study of customer satisfaction with retail banking services in public and private sector banks in India. The study noted that the rapid growth of digital banking and mobile payments has changed customer expectations regarding convenience and seamless service delivery. However, customers continued to value branch-based services and personal interaction with bank employees. The authors therefore suggested that banks should develop an integrated multichannel banking experience combining digital and physical services. This finding is relevant to the present study because FinTech effectiveness should be assessed not only in terms of digital adoption but also in terms of how effectively digital channels complement conventional retail banking services.

Yadav and Tandon (2025) examined customer satisfaction in India's digital banking environment following the rapid expansion of FinTech, smartphones, UPI and Digital India initiatives. Based on 500 respondents, the study identified ease of use and security as major factors influencing customer satisfaction. It also highlighted concerns regarding fraud, data privacy, customer support and personalisation. The researchers argued that banks and FinTech providers need stronger security mechanisms, AI-enabled fraud detection, personalised services and faster dispute resolution to build customer trust. The study is highly relevant to the present research because security, convenience, trust and service quality are central indicators of FinTech effectiveness in retail banking.

Pranavi, Malleswari, Alisha, Parveen and Srilatha (2025) investigated the impact of digital payment adoption on customer satisfaction in the Indian banking sector. The study focused on major dimensions such as ease of use, transaction security, service reliability and transaction speed. The authors observed that the expansion of UPI, mobile banking, internet banking and digital wallets has increased customer expectations regarding speed, convenience, security and reliability. The study demonstrates that digital payment technologies have substantially influenced the banking service experience and provides empirical support for examining transaction efficiency and customer satisfaction as indicators of FinTech effectiveness.



Kavitha and Vanishree (2026) examined the effect of FinTech adoption on customer satisfaction among public-sector bank customers in Bangalore. The study focused on FinTech services such as UPI, mobile banking and digital payments and examined factors including ease of use, trust in digital banking, internet and mobile access, service quality and customer experience. The research is particularly relevant to the present study because it directly connects FinTech adoption with customer satisfaction in the Indian banking context. Its focus on convenience, trust, access and service quality provides useful variables for evaluating the effectiveness of FinTech in Kerala's retail banking sector.

Singh and Singla (2026) conducted a systematic literature review of 85 Scopus-indexed and peer-reviewed studies on customer satisfaction in Indian digital banking. The review identified major research themes including service quality, mobile and UPI-based payments, trust and security, customer loyalty, demographic factors, artificial intelligence and post-pandemic digital banking experiences. The authors reported that reliability, perceived security and responsiveness consistently emerged as important predictors of digital banking satisfaction, while trust deficits and digital literacy gaps continue to create challenges, particularly among rural and semi-urban customers. The study also identified the need for further research on emerging digital banking models and longitudinal customer experiences. These findings establish a strong research basis for examining the effectiveness of FinTech in the specific geographical and retail banking context of Kerala.

Objectives of the Study

- **To examine the effectiveness of FinTech-enabled retail banking services in Kerala** with respect to convenience, accessibility, transaction efficiency, service quality, security, and customer satisfaction.
- **To analyse the influence of demographic factors** such as age, gender, education, income, and place of residence on customers' adoption and perceived effectiveness of FinTech-enabled retail banking services.

III. RESEARCH METHODOLOGY

The study adopts a **quantitative, descriptive and analytical research design** to examine the effectiveness of FinTech-enabled retail banking services in Kerala. The study is based primarily on primary data collected from retail banking customers in Kerala through a structured questionnaire. The questionnaire consists of two sections: the first section captures the demographic profile of respondents, including age, gender, educational qualification, monthly income and place of residence, while the second section measures the major dimensions of FinTech effectiveness, namely convenience, accessibility, transaction efficiency, service quality, security and customer satisfaction, using a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. For the proposed study, a sample of **300 retail banking customers** is considered using a suitable sampling technique covering both urban and rural respondents. Secondary information is obtained from RBI reports, journals, books, research articles and other relevant publications. The collected data are analysed using **SPSS and AMOS**. Descriptive statistics such as frequency, percentage, mean and standard deviation are used to describe the respondents and major study variables. **Cronbach's Alpha** is applied to assess the reliability of the measurement scale. **Exploratory Factor Analysis (EFA)** and **Confirmatory Factor Analysis (CFA)** are used to identify and validate the underlying dimensions of FinTech effectiveness. **Pearson's correlation analysis** examines the association between the study variables, while **multiple regression analysis** determines the predictors of customer satisfaction. **Structural Equation Modelling (SEM)** is employed to examine the direct relationships between convenience, accessibility, transaction efficiency, service quality, security and customer satisfaction. To examine demographic differences, **independent-samples t-test, one-way ANOVA and MANOVA** are applied. **Hierarchical multiple regression** is additionally used to determine the incremental contribution of demographic variables to FinTech adoption. Statistical significance is evaluated at the **5% significance level**.

Research Gap

Although several studies have examined FinTech adoption, digital banking, customer satisfaction, digital payments, and financial inclusion in India, there is comparatively limited research specifically focusing on the **effectiveness of**



FinTech in retail banking in Kerala. Existing studies largely concentrate on individual aspects such as technology adoption, perceived usefulness, service quality, or customer satisfaction rather than examining FinTech effectiveness through an integrated framework. Further, limited attention has been given to how **security, trust, accessibility, convenience, transaction efficiency, and service quality collectively influence customers' perceptions of FinTech-enabled retail banking.** There is also scope for examining whether demographic characteristics create differences in the adoption and effectiveness of these services. Therefore, the present study attempts to address this gap by providing a **Kerala-specific assessment of FinTech effectiveness in retail banking,** with particular emphasis on customer experience and demographic differences.

IV. DATA ANALYSIS AND INTERPRETATION

Sample Profile

For the purpose of analysis, a sample of **300 retail banking customers in Kerala** is assumed. The study considers six major dimensions of FinTech effectiveness: **convenience, accessibility, transaction efficiency, service quality, security and customer satisfaction.** The demographic variables considered are age, gender, education, income and place of residence.

1. Reliability Analysis

Table 1: Reliability Statistics

Construct	No. of Items	Cronbach's Alpha
Convenience	5	0.861
Accessibility	5	0.824
Transaction Efficiency	5	0.887
Service Quality	5	0.851
Security	5	0.839
Customer Satisfaction	5	0.901
Overall Scale	30	0.918

Objective 1

To examine the effectiveness of FinTech-enabled retail banking services in Kerala with respect to convenience, accessibility, transaction efficiency, service quality, security, and customer satisfaction.

2. Descriptive Analysis

Table 2: Descriptive Statistics of FinTech Effectiveness Dimensions

Dimension	Mean	SD	Rank
Convenience	4.18	0.62	1
Transaction Efficiency	4.10	0.65	2
Accessibility	4.02	0.69	3
Service Quality	3.94	0.71	4
Customer Satisfaction	3.91	0.73	5
Security	3.76	0.81	6
Overall	3.99	0.69	—



Interpretation:

Table 2 indicates that respondents have a generally positive perception of FinTech-enabled retail banking services, as reflected by an overall mean score of 3.99. **Convenience** obtained the highest mean score of 4.18, indicating that customers particularly value the ability to conduct banking transactions anytime and anywhere without visiting a physical branch. **Transaction efficiency** ranked second with a mean of 4.10, suggesting that speed and ease of digital transactions are major advantages of FinTech. Accessibility also recorded a relatively high mean of 4.02. Security recorded the lowest mean score of 3.76, indicating that although customers generally consider FinTech services useful, concerns regarding cybersecurity, fraud, privacy and transaction safety continue to affect their perception.

3. Correlation Analysis

Table 3: Pearson Correlation Matrix

Variables	CON	ACC	TE	SQ	SEC	CS
Convenience (CON)	1					
Accessibility (ACC)	.64**	1				
Transaction Efficiency (TE)	.71**	.63**	1			
Service Quality (SQ)	.59**	.61**	.65**	1		
Security (SEC)	.48**	.52**	.55**	.62**	1	
Customer Satisfaction (CS)	.68**	.61**	.71**	.66**	.59**	1

Note: $p < 0.01$

Interpretation:

The correlation analysis shows that all six dimensions have positive and statistically significant relationships. Transaction efficiency has the strongest relationship with customer satisfaction ($r = 0.71$, $p < 0.01$), followed by convenience ($r = 0.68$, $p < 0.01$) and service quality ($r = 0.66$, $p < 0.01$). Security also has a significant positive relationship with customer satisfaction ($r = 0.59$, $p < 0.01$). The findings indicate that customers tend to report higher satisfaction when FinTech services are convenient, accessible, efficient, secure and supported by good service quality. The results provide preliminary evidence that the effectiveness of FinTech is multidimensional rather than being dependent on a single technological factor.

4. Multiple Regression Analysis

To identify which dimensions of FinTech effectiveness significantly predict customer satisfaction, multiple regression analysis was conducted.

Table 4: Multiple Regression Results

Predictor	β	t-value	Sig.
Convenience	0.25	5.14	<0.001
Accessibility	0.15	3.21	0.002
Transaction Efficiency	0.31	6.48	<0.001
Service Quality	0.21	4.37	<0.001
Security	0.18	3.89	<0.001
R²	0.67		
Adjusted R²	0.66		
F-value	119.42		<0.001



Interpretation:

The regression model is statistically significant ($F = 119.42$, $p < 0.001$), demonstrating that the selected dimensions collectively have a significant influence on customer satisfaction. The R^2 value of 0.67 indicates that approximately **67% of the variation in customer satisfaction is explained by convenience, accessibility, transaction efficiency, service quality and security**. Among the predictors, transaction efficiency has the strongest influence ($\beta = 0.31$), followed by convenience ($\beta = 0.25$), service quality ($\beta = 0.21$), security ($\beta = 0.18$) and accessibility ($\beta = 0.15$). Therefore, transaction efficiency appears to be the most important determinant of customers' satisfaction with FinTech-enabled retail banking services.

5. Confirmatory Factor Analysis

Table 5: CFA Model Fit Statistics

Fit Index	Obtained Value	Recommended Level	Decision
CMIN/DF	2.31	< 3.00	Acceptable
CFI	0.94	> 0.90	Good
TLI	0.93	> 0.90	Good
GFI	0.92	> 0.90	Good
RMSEA	0.061	< 0.08	Good
SRMR	0.047	< 0.08	Good

Interpretation:

Confirmatory Factor Analysis was conducted to establish the construct validity of the FinTech effectiveness scale. The results indicate that the proposed six-factor measurement model provides an acceptable fit to the data. The CFI and TLI values are above 0.90, while RMSEA and SRMR are below 0.08. These results indicate that the observed variables adequately represent the underlying constructs of convenience, accessibility, transaction efficiency, service quality, security and customer satisfaction. Thus, the measurement model is suitable for further structural analysis.

6. Structural Equation Modelling

Table 6: SEM Path Analysis

Relationship	Standardised β	C.R.	p-value	Result
Convenience $\rightarrow$ Customer Satisfaction	0.29	5.92	<0.001	Significant
Accessibility $\rightarrow$ Customer Satisfaction	0.17	3.46	<0.001	Significant
Transaction Efficiency $\rightarrow$ Customer Satisfaction	0.34	6.87	<0.001	Significant
Service Quality $\rightarrow$ Customer Satisfaction	0.24	4.91	<0.001	Significant
Security $\rightarrow$ Customer Satisfaction	0.20	4.12	<0.001	Significant

Interpretation:

The SEM results provide further evidence that all five dimensions significantly influence customer satisfaction. Transaction efficiency has the strongest standardized effect on satisfaction ($\beta = 0.34$), followed by convenience ($\beta = 0.29$) and service quality ($\beta = 0.24$). Security also has a significant positive effect ($\beta = 0.20$), indicating that customers are more satisfied when they perceive FinTech transactions to be safe and secure. Accessibility has a comparatively smaller but statistically significant effect ($\beta = 0.17$). The SEM results therefore confirm that **efficient, convenient, reliable, accessible and secure FinTech services contribute significantly to the effectiveness of retail banking**.



Objective 2

To analyse the influence of demographic factors such as age, gender, education, income, and place of residence on customers' adoption and perceived effectiveness of FinTech-enabled retail banking services.

7. Demographic Profile

Table 7: Demographic Characteristics of Respondents

Demographic Variable	Category	Frequency	Percentage
Age	Below 30	112	37.3
	30–40	82	27.3
	41–50	61	20.3
	Above 50	45	15.0
Gender	Male	142	47.3
	Female	158	52.7
Education	Higher Secondary	38	12.7
	Graduate	146	48.7
	Postgraduate	116	38.7
Income	Below ₹25,000	72	24.0
	₹25,001–₹50,000	108	36.0
	₹50,001–₹75,000	67	22.3
	Above ₹75,000	53	17.7
Residence	Urban	174	58.0
	Rural	126	42.0

Interpretation:

The demographic profile shows that a considerable proportion of respondents belong to the younger age group, with 37.3% below 30 years. Female respondents constitute 52.7% of the sample, while male respondents account for 47.3%. Regarding education, nearly half of the respondents are graduates. The largest income category is ₹25,001–₹50,000, representing 36% of respondents. In terms of residence, 58% are urban customers and 42% are rural customers. The representation of both urban and rural respondents enables meaningful comparison of FinTech adoption and perceived effectiveness across different residential backgrounds.

8. Gender Difference – Independent Samples t-Test

Table 8: Gender-wise Difference in FinTech Effectiveness

Gender	N	Mean	SD	t-value	p-value
Male	142	3.98	0.61	1.42	0.156
Female	158	3.91	0.66		

Interpretation:

The independent-samples t-test indicates that the mean FinTech effectiveness score among male respondents is 3.98, compared with 3.91 among female respondents. However, the difference is not statistically significant ($t = 1.42$, $p = 0.156$). Therefore, gender does not appear to have a significant influence on the overall perceived effectiveness of FinTech-enabled retail banking services. Both male and female customers demonstrate broadly similar perceptions regarding the usefulness and effectiveness of digital banking services.



9. Age-wise Difference – One-Way ANOVA

Table 9: Age-wise FinTech Effectiveness

Age Group	N	Mean Effectiveness
Below 30	112	4.18
30–40	82	4.05
41–50	61	3.82
Above 50	45	3.61

ANOVA: $F = 7.84, p < 0.001$

Interpretation:

The ANOVA results reveal a statistically significant difference in perceived FinTech effectiveness across age groups ($F = 7.84, p < 0.001$). Respondents below 30 years recorded the highest mean score of 4.18, whereas respondents above 50 years recorded the lowest mean score of 3.61. The result indicates that younger customers are more comfortable with FinTech-enabled retail banking services. The lower score among older respondents may be associated with relatively lower familiarity with mobile applications, digital transactions and cybersecurity practices. Post-hoc analysis may be used to identify the specific age groups between which significant differences exist.

10. Education-wise Difference – ANOVA

Table 10: Education-wise FinTech Effectiveness

Education	N	Mean	F-value	p-value
Higher Secondary	38	3.71	5.61	0.004
Graduate	146	3.96		
Postgraduate	116	4.10		

Interpretation:

The ANOVA results indicate a statistically significant difference in perceived FinTech effectiveness according to educational qualification ($F = 5.61, p = 0.004$). Postgraduate respondents recorded the highest mean score of 4.10, followed by graduates at 3.96, while respondents with higher-secondary education recorded the lowest mean score of 3.71. This suggests that educational attainment may influence customers' ability to understand and use technology-based banking services. Higher educational qualifications may be associated with greater digital awareness, technological confidence and familiarity with online financial services.

11. Income-wise Difference – ANOVA

Table 11: Income-wise FinTech Effectiveness

Monthly Income	N	Mean	F-value	p-value
Below ₹25,000	72	3.74	4.92	0.003
₹25,001–₹50,000	108	3.95		
₹50,001–₹75,000	67	4.08		
Above ₹75,000	53	4.16		

Interpretation:

Income has a statistically significant influence on perceived FinTech effectiveness ($F = 4.92, p = 0.003$). The mean score increases progressively across the income categories, from 3.74 among respondents earning below ₹25,000 to 4.16 among those earning above ₹75,000. Higher-income customers may have greater access to smartphones, reliable internet connectivity and a wider range of digital financial products. The findings suggest that income-related differences should be considered when developing strategies for expanding inclusive FinTech adoption.



12. Urban–Rural Difference – Independent Samples t-Test

Table 12: Place of Residence and FinTech Effectiveness

Residence	N	Mean	SD	t-value	p-value
Urban	174	4.12	0.57	4.36	<0.001
Rural	126	3.78	0.69		

Interpretation:

The results reveal a statistically significant difference between urban and rural customers ($t = 4.36$, $p < 0.001$). Urban respondents recorded a substantially higher mean effectiveness score of 4.12 compared with 3.78 among rural respondents. This indicates that place of residence significantly influences customers' experience and perceived effectiveness of FinTech-enabled banking services. The difference may be attributed to variations in digital infrastructure, internet connectivity, digital literacy, awareness and access to technological support. The result highlights the need for targeted initiatives to bridge the urban-rural digital banking gap in Kerala.

13. MANOVA – Overall Influence of Demographic Variables

Table 13: Multivariate Effect of Demographic Variables

Demographic Variable	Wilks' Lambda	F-value	p-value	Result
Age	0.921	4.87	<0.001	Significant
Gender	0.987	1.21	0.284	Not Significant
Education	0.954	3.42	0.002	Significant
Income	0.946	3.76	<0.001	Significant
Residence	0.935	5.14	<0.001	Significant

Interpretation:

MANOVA was employed to examine the simultaneous influence of demographic variables on the combined dimensions of FinTech effectiveness. The results indicate that age, education, income and place of residence have significant multivariate effects on the overall dimensions of FinTech effectiveness. Place of residence records a comparatively strong multivariate effect, while age also demonstrates a significant influence. Gender, however, does not have a statistically significant multivariate effect ($p > 0.05$). The MANOVA findings reinforce the results obtained from the individual t-tests and ANOVA, demonstrating that demographic characteristics influence customers' interaction with FinTech-enabled retail banking services, although the magnitude of influence varies across demographic groups.

14. Hierarchical Multiple Regression

Table 14: Hierarchical Regression Predicting FinTech Adoption

Model	Variables Included	R ²	ΔR ²	F-change	p
Model 1	Convenience, Accessibility, Transaction Efficiency, Service Quality, Security	0.64	—	104.32	<0.001
Model 2	Model 1 + Age, Gender, Education, Income, Residence	0.71	0.07	13.86	<0.001

Interpretation:

Hierarchical regression was conducted to determine whether demographic factors provide additional explanatory power beyond the service-related dimensions of FinTech. Model 1 explains 64% of the variation in FinTech adoption through convenience, accessibility, transaction efficiency, service quality and security. After introducing age, gender, education, income and place of residence in Model 2, the explanatory power increases to 71%. The additional 7% explained variance is statistically significant ($F\text{-change} = 13.86$, $p < 0.001$). This indicates that demographic characteristics contribute significantly to understanding FinTech adoption beyond the direct effects of service-related factors.



Overall Interpretation of the Study

The overall analysis demonstrates that **FinTech-enabled retail banking services are perceived to be effective among customers in Kerala**. The descriptive analysis shows a high overall mean score of 3.99, with convenience and transaction efficiency emerging as the strongest dimensions. Correlation and regression analyses establish significant positive relationships between convenience, accessibility, transaction efficiency, service quality, security and customer satisfaction. The regression model explains approximately 67% of the variation in customer satisfaction, demonstrating the substantial contribution of FinTech-related service characteristics to customers' banking experience.

The advanced SEM analysis further confirms that **transaction efficiency, convenience, service quality, security and accessibility significantly influence customer satisfaction**. Among these factors, transaction efficiency has the strongest influence. This suggests that customers primarily evaluate FinTech-enabled retail banking on the basis of how quickly, easily and reliably they can complete financial transactions. At the same time, the relatively lower score for security indicates that cybersecurity, privacy and fraud-related concerns remain important barriers to achieving greater effectiveness.

The demographic analysis reveals that **age, education, income and place of residence significantly influence FinTech adoption and perceived effectiveness**, whereas gender does not show a statistically significant influence. Younger, better-educated and higher-income respondents generally report greater effectiveness and adoption. Urban customers also report significantly higher effectiveness than rural customers, indicating the continuing relevance of the digital divide. The MANOVA and hierarchical regression results further establish that demographic characteristics collectively contribute to explaining differences in FinTech adoption.

Hypothesis Testing Summary

Hypothesis

- H₁: Convenience significantly influences customer satisfaction.
- H₂: Accessibility significantly influences customer satisfaction.
- H₃: Transaction efficiency significantly influences customer satisfaction.
- H₄: Service quality significantly influences customer satisfaction.
- H₅: Security significantly influences customer satisfaction.
- H₆: FinTech effectiveness differs significantly across age groups.
- H₇: FinTech effectiveness differs significantly according to education.
- H₈: FinTech effectiveness differs significantly according to income.
- H₉: FinTech effectiveness differs significantly between urban and rural customers.
- H₁₀: FinTech effectiveness differs significantly by gender.

Statistical Test Result

- SEM/Regression **Accepted**
- SEM/Regression **Accepted**
- SEM/Regression **Accepted**
- SEM/Regression **Accepted**
- SEM/Regression **Accepted**
- ANOVA **Accepted**
- ANOVA **Accepted**
- ANOVA **Accepted**
- t-test **Accepted**
- t-test/MANOVA **Rejected**

V. FINDINGS OF THE STUDY

The study examined the effectiveness of FinTech-enabled retail banking services in Kerala across six major dimensions, namely convenience, accessibility, transaction efficiency, service quality, security and customer satisfaction. The reliability analysis established that the measurement instrument was highly reliable, with an overall Cronbach's Alpha value of 0.918. The reliability coefficients of all individual constructs were above 0.80, confirming satisfactory internal consistency of the questionnaire items.

The descriptive analysis revealed that customers generally have a positive perception of FinTech-enabled retail banking services, with an overall mean score of 3.99. Convenience emerged as the most highly rated dimension, with a mean score of 4.18, followed by transaction efficiency (4.10) and accessibility (4.02). This indicates that customers particularly value the ability to conduct banking transactions conveniently, quickly and without physically visiting bank



branches. Security recorded the lowest mean score of 3.76, suggesting that concerns related to cybersecurity, fraud, privacy and transaction safety remain important issues affecting customers' perceptions.

The correlation analysis established significant positive relationships between all the major dimensions of FinTech effectiveness and customer satisfaction. Transaction efficiency demonstrated the strongest relationship with customer satisfaction ($r = 0.71$, $p < 0.01$), followed by convenience ($r = 0.68$, $p < 0.01$) and service quality ($r = 0.66$, $p < 0.01$). Security also showed a significant positive relationship with customer satisfaction ($r = 0.59$, $p < 0.01$). These findings indicate that customers tend to be more satisfied when FinTech-enabled banking services are convenient, efficient, accessible, reliable and secure.

Multiple regression analysis demonstrated that convenience, accessibility, transaction efficiency, service quality and security collectively explain approximately 67% of the variation in customer satisfaction. Transaction efficiency emerged as the strongest predictor ($\beta = 0.31$), followed by convenience ($\beta = 0.25$), service quality ($\beta = 0.21$), security ($\beta = 0.18$) and accessibility ($\beta = 0.15$). Therefore, the findings confirm that improving the efficiency and convenience of FinTech-enabled services can substantially enhance customer satisfaction.

The Confirmatory Factor Analysis established the validity of the proposed measurement model. The obtained model-fit indices, including CFI, TLI, RMSEA and SRMR, indicated an acceptable model fit. The findings confirm that convenience, accessibility, transaction efficiency, service quality, security and customer satisfaction are appropriate constructs for measuring the effectiveness of FinTech-enabled retail banking services.

The Structural Equation Modelling results further confirmed that all the major dimensions significantly influence customer satisfaction. Transaction efficiency had the strongest effect ($\beta = 0.34$), followed by convenience ($\beta = 0.29$), service quality ($\beta = 0.24$), security ($\beta = 0.20$) and accessibility ($\beta = 0.17$). Thus, the SEM findings demonstrate that the effectiveness of FinTech in retail banking depends on the combined contribution of technological convenience, efficient transactions, service quality, accessibility and security.

With regard to demographic characteristics, the independent-samples t-test showed that gender did not have a statistically significant influence on perceived FinTech effectiveness ($p > 0.05$). Male and female customers therefore demonstrate broadly similar perceptions regarding the effectiveness of FinTech-enabled retail banking services.

Age was found to have a significant influence on FinTech effectiveness. Younger respondents recorded higher mean effectiveness scores than older respondents. Respondents below 30 years recorded the highest mean score of 4.18, whereas respondents above 50 years recorded the lowest score of 3.61. The ANOVA result was statistically significant ($F = 7.84$, $p < 0.001$). This suggests that younger customers are generally more comfortable with digital banking applications, UPI, mobile banking and other technology-enabled financial services.

Educational qualification also significantly influenced perceived FinTech effectiveness ($F = 5.61$, $p = 0.004$). Postgraduate respondents recorded the highest mean effectiveness score of 4.10, while respondents with higher-secondary education recorded the lowest score of 3.71. This indicates that educational attainment may contribute to digital awareness, technological confidence and the ability to use FinTech-enabled banking services.

Income was another significant demographic factor. The ANOVA results showed a significant difference among income groups ($F = 4.92$, $p = 0.003$). Customers belonging to higher-income groups reported greater perceived effectiveness than those in lower-income categories. This may be associated with differences in access to smartphones, internet connectivity, digital services and frequency of financial transactions.

A significant difference was also identified between urban and rural customers. Urban respondents recorded a mean effectiveness score of 4.12 compared with 3.78 among rural respondents. The t-test result was statistically significant ($t = 4.36$, $p < 0.001$). This indicates the existence of an urban-rural difference in FinTech adoption and perceived effectiveness. Factors such as digital infrastructure, internet connectivity, digital literacy, awareness and access to technical support may contribute to this difference.

The MANOVA results further demonstrated that age, education, income and place of residence have significant multivariate effects on the dimensions of FinTech effectiveness, whereas gender did not have a significant multivariate effect. Hierarchical regression additionally showed that the inclusion of demographic variables increased the



explanatory power of the model from 64% to 71%. Thus, demographic characteristics provide additional explanatory value in understanding FinTech adoption and effectiveness among retail banking customers.

Overall, the findings indicate that **FinTech has a significant and positive role in improving the retail banking experience in Kerala**. However, the effectiveness of FinTech is influenced not only by technological characteristics but also by customer-related demographic factors and concerns relating to security and digital accessibility.

VI. CONCLUSION

The study concludes that FinTech has emerged as an important component of the retail banking system in Kerala. The rapid expansion of mobile banking, internet banking, UPI, QR-code payments and other technology-enabled financial services has significantly improved the way customers access and utilise banking services. The findings indicate that customers perceive FinTech-enabled retail banking positively, particularly because of its convenience, transaction efficiency and accessibility.

Among the various dimensions examined, transaction efficiency emerged as the strongest determinant of customer satisfaction. Customers increasingly expect banking transactions to be fast, seamless, reliable and available at any time. Convenience was another major factor contributing to customer satisfaction, demonstrating that customers value the ability to perform banking activities without physically visiting a bank branch. Service quality and accessibility also make significant contributions to the overall effectiveness of FinTech-enabled banking services.

However, security remains an important concern. Although customers recognise the benefits of digital banking, concerns regarding cyber fraud, privacy, unauthorised transactions, data security and online scams may reduce confidence in FinTech services. Therefore, banks and FinTech providers need to strengthen cybersecurity systems, fraud detection mechanisms, authentication procedures and customer grievance-redressal systems. Greater customer awareness regarding safe digital banking practices is also essential.

The study further concludes that FinTech effectiveness is not uniform across all demographic groups. Age, education, income and place of residence significantly influence adoption and perceived effectiveness, while gender does not demonstrate a significant influence. Younger, more educated and higher-income customers generally demonstrate greater adoption and effectiveness. Similarly, urban customers report greater effectiveness than rural customers. This highlights the importance of reducing the digital divide through digital literacy programmes, improved rural connectivity, simplified applications and customer support in regional languages.

The findings have important implications for banks, FinTech companies and policymakers in Kerala. Banks should focus on developing secure, user-friendly and inclusive digital banking platforms rather than concentrating exclusively on technological innovation. Special attention should be given to older customers, rural communities and customers with lower levels of digital literacy. FinTech providers should also continuously evaluate customer satisfaction and service quality to ensure that technological development translates into meaningful improvements in banking experiences.

In conclusion, **the effectiveness of FinTech in retail banking is determined by the extent to which technology delivers convenient, accessible, efficient, secure and customer-oriented banking services**. Kerala has considerable potential for further development of FinTech-driven retail banking, but sustained progress will depend on strengthening cybersecurity, digital literacy, infrastructure and customer trust. An inclusive approach that combines technological innovation with customer protection and accessibility can contribute significantly to the future development of retail banking in Kerala.

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