

The influence of mobile banking services on customer satisfaction in private banks: A technological moderation perspective



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Abstract Customer satisfaction plays a significant role in the effectiveness of private banking services. This study investigates the impact of mobile banking service utilization costs, security, and convenience on consumer satisfaction, considering technology support as a moderating factor. A questionnaire comprising 27 items was adopted from existing studies, and data were collected using a stratified random sampling method. The survey was conducted in major areas of Telangana, with 297 questionnaires distributed and 242 valid responses analysed. The analysis employed primary data to assess validity and reliability, path measurement analysis, and bootstrapping for hypothesis testing using SMART PLS. The results indicate that mobile banking usage costs, security, and technology support positively influence consumer satisfaction. However, convenience does not significantly contribute to consumer satisfaction, nor does technology support serve as an effective moderator in this context. These findings suggest that while security is crucial, the integration of robust technology and responsive service delivery may more significantly shape consumer perceptions. Therefore, private banks should focus on enhancing convenience and technological features to optimize user satisfaction, recognizing that security alone may not suffice in a competitive mobile banking landscape. Furthermore, awareness campaigns can educate consumers about mobile banking security features, promoting informed usage and fostering trust in digital financial services. Establishing customer feedback mechanisms will also help identify areas for improvement, ensuring banks remain responsive to evolving consumer needs in the mobile banking landscape.

Keywords: consumer satisfaction, mobile banking, cost, security, technology support, private banks

1. Introduction

In today's world, technological palaces play a critical role, and financial inclusion plays an essential role. The emergence of mobile banking has revolutionized the financial landscape, offering unparalleled convenience and accessibility. financial sectors are adopting and giving services to consumers to access and practise financial operations via mobile banking. Consumer utility is expanding on a daily basis, and customer satisfaction levels are rising as a result of mobile banking activities.

1.1. Consumer satisfaction

Consumer satisfaction is an important indicator of success for private banks, especially in the context of mobile banking services. As technology disrupts the financial industry, knowing the elements that influence customer happiness becomes critical. Convenience, affordability, security, and technical support are critical components that shape consumer experiences and perceptions (Gumelar et al., 2020; Jannat and Ahmed, 2015).

Convenience is crucial in mobile banking, since it allows clients to make transactions at any time and from any location, considerably improving their banking experience. Furthermore, perceived cost influences satisfaction; customers are more likely to value mobile banking services when transaction costs are fair and clear. Security issues have a significant impact on consumer satisfaction, since confidence in the protection of personal information and transactions is critical for promoting the use of mobile banking services (Hussain et al., 2021).

Furthermore, the need of technical support cannot be underestimated. Advances in mobile security and quicker internet connectivity may considerably improve customer satisfaction by offering a smooth and secure banking experience (Gumelar et al., 2020). By examining these elements in the context of private sector banks, this study hopes to shed light on the complex relationship between these factors and consumer satisfaction, ultimately leading to improved service delivery and customer loyalty in the banking sector (Ekonomomi et al., 2021; Le, 2021).



Despite the fast expansion of mobile banking services in Pakistan, there is still a considerable vacuum in the research about a full knowledge of the elements that influence customer satisfaction in this sector (Jahan and Shahria, 2022). Previous research has generally focused on single characteristics such as security or convenience, often overlooking the interaction of several variables such as cost, technological support, and overall user satisfaction (Kabir, 2013). Furthermore, the function of regulatory organizations, such as the State Bank of Pakistan, in molding customer views and experiences via their support for mobile banking is little understood (Islam and Himel, 2015).

In this research address these gaps by proposing that perceived cost, security, convenience, and technology support all positively impact consumer satisfaction. Specifically, the moderating role of technology support in enhancing the relationship between these factors and consumer satisfaction is particularly novel (Alsmadi et al., 2022). This study seeks to fill the gap by showing how these factors impact mobile banking consumer satisfaction. This research adds to current information and provides actionable insights for private sector banks to enhance their services and meet customer expectations via a thorough investigation (Mittal and Gupta, 2021; Sharma and Sharma, 2023).

1.2. Research Questions

The scholar prepared research questions based on the aforementioned study topic and the relevance of customer happiness in mobile banking, using determinant notions.

1. What is the relationship between perceived cost and consumer satisfaction in mobile banking services offered by private sector banks?
2. How does perceived security influence consumer satisfaction in mobile banking?
3. In what ways does convenience contribute to consumer satisfaction with mobile banking services?
4. What role does technology support play in enhancing consumer satisfaction in the context of mobile banking?
5. How do technology support factors moderate the relationship between cost, security, and convenience with consumer satisfaction?

These research questions aim to investigate the multifaceted aspects of consumer satisfaction and highlight the critical relationships that can inform both academic understanding and practical improvements in mobile banking services.

1.3. Objectives

The private sector banks face significant challenges in ensuring optimal consumer satisfaction amidst growing competition and technological advancements. Understanding the factors that influence consumer satisfaction is crucial for these banks to remain competitive, particularly in addressing real-world issues such as high operational costs, data security breaches, and the dynamic expectations of tech-savvy consumers. The primary objectives of this research are as follows:

1. To assess the impact of perceived cost on consumer satisfaction in mobile banking services provided by private sector banks.
2. To evaluate the relationship between perceived security and consumer satisfaction in mobile banking.
3. To examine the role of convenience in influencing consumer satisfaction with mobile banking services.
4. To analyse how technology support affects consumer satisfaction in the context of mobile banking.
5. To investigate the moderating effect of technology support on the relationships between cost, security, and convenience with consumer satisfaction.

This study addresses the current critical dimensions of mobile banking services to provide actionable insights. By examining perceived costs, the study addresses the ongoing issue of affordability, which directly impacts customer loyalty, particularly in cost-sensitive markets. Focusing on perceived security is critical, given the increasing frequency of cyber threats that threaten customer trust. Additionally, analyzing convenience sheds light on how banks can improve the user experience in a fast-paced digital age. Investigation into technology support is particularly relevant as private banks strive to incorporate cutting-edge innovations to meet changing consumer demands and mitigate technical challenges at present days.

Furthermore, this study's focus on the moderating role of technology support bridges these critical factors and provides a nuanced understanding of how technology can enhance the positive effects of cost, security, and convenience on consumer satisfaction. By aligning these objectives with the pressing day-to-day challenges in the private banking sector, this research aims to equip private banks with strategies to improve service quality, strengthen customer loyalty, and address the diverse challenges of modern mobile banking operations.

By attaining these goals, the study hopes to give a thorough knowledge of the elements influencing customer satisfaction in mobile banking, resulting in improved service delivery in the private banking industry.

2. Materials and Methods

The scholar examined past research in national and international peer-reviewed journals on consumer satisfaction with private bank mobile banking services, including mobile transaction costs, security services, and convenience (Ramamurthy and Mamilla, 2024). Furthermore, the study examined the moderate between technology using and consumers satisfactions.

2.1. Private bank Services to Consumer Satisfaction

The evolution of mobile banking services has significantly transformed the banking landscape, especially within private sector banks. Research indicates that these institutions have adopted innovative technologies to enhance customer experiences and increase consumer satisfaction. For instance, a study by (Ekonomi et al., 2021; Gumelar et al., 2020) highlights that the adoption of user-friendly mobile applications has improved customer engagement and service accessibility, thereby fostering customer loyalty. The seamless interface and convenience of transactions are crucial determinants of consumer satisfaction, as noted by (Gumelar et al., 2020; Hussain et al., 2021), who argue that the ease of use in mobile banking applications directly correlates with enhanced user satisfaction.

Moreover, private banks have focused on implementing robust security measures, a key concern among users of mobile banking services. Studies, including those by (Ekonomi et al., 2021; Febrian et al., 2021), emphasize that effective security protocols, such as two-factor authentication and encryption, not only bolster consumer trust but also positively influence their perception of overall service quality. This notion is echoed by the findings of (Gumelar et al., 2020; Hussain et al., 2021; Thaw et al., 2009), who identified that perceived security significantly impacts consumer satisfaction, thus reinforcing the necessity for private banks to prioritize secure mobile banking features.

Furthermore, the role of technology support in improving service delivery cannot be overlooked. Research by (Islam and Himel, 2015; Kabir, 2013) posits that advances in mobile technology, such as faster internet speeds and enhanced application functionality, facilitate smoother transactions and contribute to customer satisfaction. The authors argue that a strong technological infrastructure is essential for private banks to meet the rising expectations of tech-savvy consumers.

Lastly, regulatory support from institutions like the State Bank of Pakistan has provided a conducive environment for mobile banking expansion, allowing private banks to thrive in an increasingly competitive market. As noted by (Hasan et al., n.d.; Khan et al., 2021), supportive regulations have led to greater consumer confidence and increased adoption of mobile banking services. The literature emphasizes the positive impact of mobile banking services offered by private banks to consumer satisfaction. Through the integration of technology, security measures, and regulatory support, these banks have successfully enhanced customer experiences, making them a critical player in the modern financial landscape (Abdullah and Khan, 2021; Mittal and Gupta, 2021; Thangavel and Chandra, 2023).

2.2. Moderation by Technology impact on Consumer Satisfaction

The growing significance of mobile banking services in the private banking sector has led to substantial study highlighting its impact on consumer satisfaction (Gumelar et al., 2020). Studies indicate that factors such as cost, convenience, security, and technology support significantly influence user experiences and satisfaction levels. For instance, research demonstrates that competitive transaction fees enhance user satisfaction by fostering a sense of value for money. Furthermore, convenience in accessing banking services directly correlates with higher satisfaction levels, as users appreciate the efficiency and flexibility that mobile banking offers (Abdullah and Khan, 2021).

Additionally, security measures play a critical role in user trust and satisfaction; when users feel secure in their transactions, their overall satisfaction increases. The literature underscores the importance of technology support, which facilitates safer and more reliable banking experiences, thereby positively moderating the relationships between cost, convenience, and security with consumer satisfaction (Kabir, 2013). This body of research provides a strong foundation for hypothesis formulation, demonstrating that enhancing these key factors can lead to improved consumer satisfaction in mobile banking services offered by private banks. By leveraging these insights, future research can explore innovative strategies to enhance user experiences, ultimately driving growth in the sector.

In exploring the impact of mobile banking services on consumer satisfaction, numerous studies highlight a lack of consensus concerning the perceived cost and security associated with these services. Some research suggests that high transaction fees deter users and negatively affect their satisfaction levels, while concerns about security, including potential data breaches, contribute to a general sense of distrust among consumers. Furthermore, the convenience offered by mobile banking is frequently compromised by technical issues and inadequate customer support, leading to user frustrations (Kabir, 2013; Kim et al., 2010). This inconsistency in findings indicates that private banks must address these critical factors to effectively enhance consumer satisfaction, thereby laying the groundwork for the hypotheses proposed in this research.

The existing literature on mobile banking services provided by private banks also reveals significant gaps. Many studies predominantly focus on positive consumer experiences while overlooking potential negative impacts, such as security issues, high transaction fees, and lackluster customer support (Jaidev and Shekhar, 2023; Kengue et al., 2020; Vărzaru et al., 2021). Additionally, there is limited exploration of how these negative factors influence overall consumer satisfaction and decision-making processes. This gap emphasizes the need for further investigation into the moderating effects of technology support, particularly regarding consumer perceptions of cost, convenience, and security. Gaining these insights is vital for a comprehensive understanding of consumer behaviour within the mobile banking landscape.

2.3. Consumer Satisfaction Conceptual Model

The formulation of the conceptual model is supported by the observed literature review and hypothesis. In this model, mobile banking usage cost, security, and convenience are independent variables, and mobile banking usage consumer satisfaction is the dependent variable. Additionally, we consider technology support to be moderately verifiable (Ramamurthy and Mamilla 2024).

The Scholar using this conceptual model in the SEM analysis to comprehend the predicted variables influencing consumer satisfaction in the private banks of Telangana State, India.

2.4. Hypothesis Formation

Observing to the literature review based on the formulated objectives reveals possibility for answering the study question. The study’s investigation authenticated the hypothesis presented below, which is based on the conceptual model presented in figure 1.

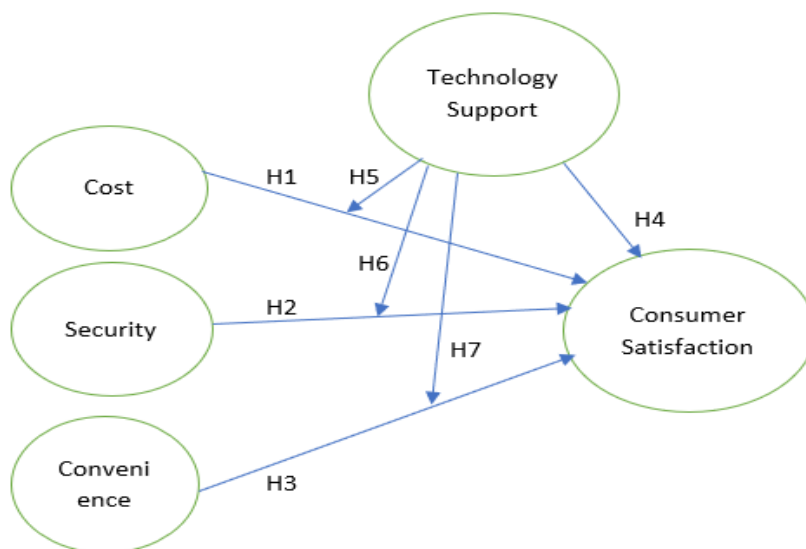


Figure 1 Conceptual Model.

2.4.1. Study Hypotheses

- H1: There is a positive relationship between the perceived cost of mobile banking services and consumer satisfaction.
- H2: There is a positive relationship between the perceived security of mobile banking services and consumer satisfaction.
- H3: There is a positive relationship between the convenience of mobile banking services and consumer satisfaction.
- H4: Technology support has a positive effect on consumer satisfaction with mobile banking services.
- H5: Technology support moderates the relationship between cost and consumer satisfaction, enhancing the positive impact of cost on satisfaction.
- H6: Technology support moderates the relationship between convenience and consumer satisfaction, enhancing the positive impact of convenience on satisfaction.
- H7: Technology support moderates the relationship between security and consumer satisfaction, enhancing the positive impact of security on satisfaction.

3. Materials and Methods

This study employs a questioner approach with primary data collection methods. The questioner approach involves the use of structured questionnaires to gather quantitative data, facilitating a detailed examination of the research variables (Islam and Himel, 2015; Kabir, 2013). We apply sampling techniques to ensure representative data collection, and administer questionnaires to a carefully selected sample during the data collection process. This comprehensive methodology ensures rigorous examination and reliable results with the usage of SMART PLS.

3.1. Questionnaire Adoption

The researchers used a methodical questionnaire survey to gather data. The questionnaire was divided into two sections: the first section collected demographic information, and the second section used a 5-point Likert scale to assess potential banking usage consumers' satisfaction with various deterrent components. The survey, including 27 questions with five verifiable, was derived from prior studies (Bala et al., 2021; Glavee-Geo et al., 2017; Thakuri et al., 2023). Scholars are using



the chosen quasi-experimental design to collect data and estimate the sample size (Febrian et al., 2021; Jahan and Shahria, 2022).

3.2. Sampling and sample size

The scholar used a stratified sampling method targeting only selected areas, selected private banks and selected employees. The study surveyed conveniently selected areas of Karimnagar, Warangal and Hyderabad in Telangana. The respondents selected mobile banking application users of selected private banks (ICICI, HDFC, Axis, Kotak Mahindra and Bandhan). Likewise, the respondents who were approached were private sector workers who were self-employed and seeking for work in the private sector, BPO, KPO, and other industries. According to Hair et al. (2019), who recommend an item-to-respondent ratio of 1:10, the study included 27 items, resulting in a base sample size of 270. We added 10% to reduce potential data errors, resulting in a final sample size that included 297 respondents. We used this final sample to collect data from respondents in the selected cities (Ramamurthy and Mamilla, 2024).

3.3. Data collection and validation

The scholar distributed 297 structured questionnaires to workplaces, shopping malls, and restaurants in selected cities in Telangana, India. We received 280 responses, some incomplete due to the respondents' busy schedules. We found 38 responses to be negligent, with similar answers to multiple questions; using Other Banks Apps service supports and Employment engaging under the public sector thus eliminated them. Ultimately, 242 valid and reliable responses were considered for statistical analysis.

3.4. Statistical applications

The study's methodology involved collecting primary data from 242 respondents using a questionnaire. First, demographic profiles were made. Then, the Partial Least Squares Structural Equation Model (PLS-SEM) was used to check the validity and reliability of the measurement items. We conducted path analysis to understand the relationships between variables, verified the model fit, and used bootstrapping to test the hypotheses. This comprehensive approach met the objectives and provided answers to the questionnaire (Al-Emran et al., 2019; Hair et al., 2011).

4. Analysis

The scholar examined the hypothesis formulated in SEM analysis using SMART PLS. The scholar first tested the validity and reliability of the collected primary data, specifically focusing on Cronbach's alpha, rho_A Composite average variance extracted (AVE), outer loading, VIF, Fornell-Larcker criterion, and HTMT. The summary analysis of the respondent's demographic profile is the next step. The analysis of the SEM path and the summary of the model fit are measured. Lastly, the hypothesis is put to the test by boosting the simulation model (Hair et al., 2011).

4.1. Measurement of Validity and Reliability

This analysis (Table 1) focuses on the impact of mobile banking operations services offered by private sector institutions on consumer satisfaction and its determinants. This study analysed using Cronbach's Alpha, rho_A, Composite Reliability, and Average Variance Extracted (AVE) to ensure the model's reliability and validity (Hair et al., 2011; Legate et al., 2023).

Table 1 Construct Reliability and Validity.

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Consumer Satisfaction	0.919	0.925	0.937	0.713
Convenience	0.806	0.857	0.869	0.625
Cost	0.905	0.918	0.933	0.776
Security	0.889	0.892	0.915	0.644
Technology Support	0.837	0.847	0.902	0.755

Cronbach's Alpha values range from 0.806 to 0.919, indicating strong internal consistency for most constructs, with values above the commonly accepted threshold of 0.7. The rho_A values, ranging from 0.847 to 0.925, further reinforce the reliability. Composite Reliability (CR) values, all exceeding 0.8, confirm the reliability of the constructs. For validity, the AVE values for all constructs are above 0.5, indicating good convergent validity, with the highest AVE of 0.776 for Relative Advantage and the lowest of 0.625 for Convenience (Al-Emran et al., 2019; Hair et al., 2011).

The model exhibits strong construct reliability and validity, demonstrating that the mobile banking operations services provided by the private sector significantly influence consumer satisfaction, with robust measurement properties across the studied dimensions.

4.2. Measurement Model Outer loading



This study examines the impact of mobile banking operations services offered by private sector banks on consumer satisfaction, focusing on key dimensions in Figure 2: Convenience, Cost, Security, and Technology Support. The outer loadings and Variance Inflation Factor (VIF) were evaluated for each observed variable to assess the reliability and multicollinearity within the measurement model (Al-Emran et al., 2019; Hair et al., 2011).

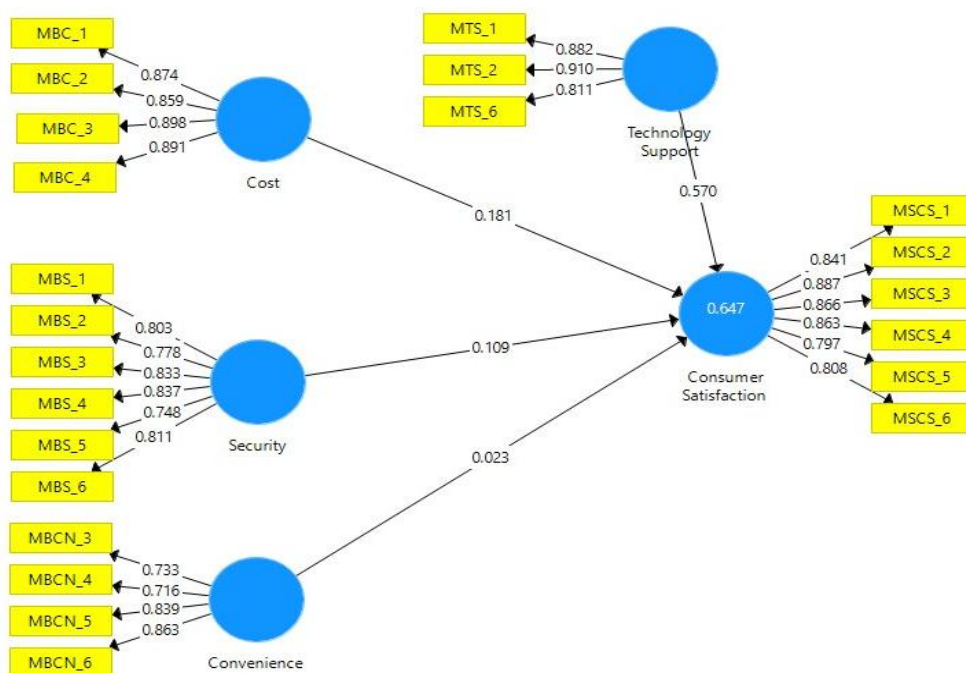


Figure 2 Measurement Model.

Outer loadings exceeding 0.7 indicate strong relationships between the constructs and their indicators Table 2. For Convenience, outer loadings range from 0.716 to 0.863, demonstrating robust indicators. Mobile banking cost and convenience concern eliminated four variables out of 27. The highest loading for Cost is 0.898, reflecting significant contribution to consumer satisfaction. Similarly, for Security, outer loadings range from 0.748 to 0.837, while Technology Support displays strong outer loadings, peaking at 0.910 (Hair et al., 2020).

Table 2 Outer loading Measurements.

S. No	Consumer Satisfaction	Convenience	Cost	Security	Technology Support	VIF
1		0.733				1.529
2		0.716				1.780
3		0.839				1.711
4		0.863				2.097
5			0.874			3.868
6			0.859			2.236
7			0.898			2.699
8			0.891			4.095
9				0.803		2.601
10				0.778		2.064
11				0.833		2.735
12				0.837		3.277
13				0.748		1.977
14				0.811		2.890
15	0.841					2.587
16	0.887					3.679
17	0.866					3.289
18	0.863					3.059
19	0.797					2.338
20	0.808					2.275
21					0.882	2.238
22					0.910	2.470
23					0.811	1.652



VIF values between 1 and 5 suggest acceptable levels of multicollinearity, with most values falling within this range. For example, the Cost construct has VIF values between 1.977 and 4.095, indicating no severe multicollinearity issues. However, Technology Support shows slightly higher VIF values, peaking at 2.470, but remains within acceptable limits (Wang et al., 2020; Zapatero et al., 2018).

4.3. Discriminant and HTMT Validity

The strong outer loadings confirm the validity of the constructs, and the VIF values suggest multicollinearity is not a major concern in the model. These results (Table 3) indicate that Convenience, Cost, Security, and Technology Support significantly influence consumer satisfaction in mobile banking services (Ekonomomi et al., 2021; Gumelar et al., 2020; Jahan and Shahria 2022).

Table 3 Discriminant and HTMT Validity.

Fornell-Larcker Criterion					
	Consumer Satisfaction	Convenience	Cost	Security	Technology Support
Consumer Satisfaction	0.844				
Convenience	0.350	0.790			
Cost	0.702	0.454	0.881		
Security	0.592	0.361	0.649	0.802	
Technology Support	0.786	0.361	0.774	0.629	0.869
Heterotrait-Monotrait Ratio (HTMT)					
Consumer Satisfaction					
Convenience	0.376				
Cost	0.749	0.520			
Security	0.655	0.400	0.710		
Technology Support	0.887	0.431	0.879	0.736	

In evaluating the measurement model, both Fornell-Larcker Criterion and Heterotrait-Monotrait Ratio (HTMT) were used to assess discriminant validity, while the analysis of factor loadings and composite reliability provided insight into the reliability of the constructs (Aggarwal and Kapoor, 2021; Hauff et al., 2024).. The Fornell-Larcker Criterion reveals that the square root of the Average Variance Extracted (AVE) for each construct (represented diagonally) is greater than the correlation with other constructs. For instance, Consumer Satisfaction (0.844) has a stronger AVE than its correlation with other factors, such as Technology Support (0.786), Convenience (0.350), and Security (0.592). This supports discriminant validity, as each construct is distinct from others in the model (Fahad et al., 2023; Hayajneh et al., 2022; Mohd et al., 2021)

The HTMT ratios further strengthen this finding, as all values fall below the recommended threshold of 0.90 (Hair et al., 2011). For example, the HTMT ratio between Consumer Satisfaction and Technology Support is 0.887, while between Cost and Security, it is 0.710, indicating adequate discriminant validity. In terms of reliability, all constructs exceed the acceptable AVE threshold of 0.50, as seen in the values for Convenience (0.790), Cost (0.881), and Technology Support (0.869), confirming internal consistency and reliability. The combination of AVE and HTMT results validates the distinctiveness and dependability of the model’s constructs (Mohd et al., 2021; Wang et al., 2020). This analysis measurement model exhibits strong discriminant validity and reliability, making it suitable for further analysis.

4.4. Demographic Summary

The researcher conducted a descriptive study of the respondent demographics, including Gender, Education, Employment Type, Social Status, Living Area, and related Bank Name as shown in Table 4.

The demographic profile of private bank mobile banking customers is reasonably balanced, with 55.37% males and 44.63% females. This implies that women are increasingly using mobile banking services, despite the fact that males still make up the small majority.

The majority of respondents are highly educated, with 43.39% holding a degree and 40.08% having education above a degree. A lesser proportion of respondents completed the Intermediate (11.16%) or SSC (5.37%) levels. This suggests that greater levels of education may be connected with increased uptake of mobile banking services. The respondents are mostly economically engaged, with 42.56% self-employed, 35.12% employed, and 22.31% jobless. The high incidence of work or self-employment shows that mobile banking is preferred by those with a steady income or those in business.

The respondents reflect a wide spectrum of social groupings, with 26.86% belonging to BC, 30.17% to OC, 23.97% to ST, and 11.16% to SC categories. 7.85% choose not to reveal their social standing. According to the distribution of respondents by religion, 43.39% are Muslims, while 40.08% choose not to state their faith. 11.16% are Christians, whereas 5.37% are Hindus. This demonstrates a large presence of several religious organisations. Warangal had the most replies (38.84%), followed by Karimnagar (33.06%) and Hyderabad (28.10%), demonstrating that mobile banking services are popular across Telangana’s main cities. Mobile banking usage is spread across different banks, with the highest association being with Kotak Mahindra



(23.55%), followed by Axix Bank (21.49%). Other banks like ICICI and Bandhan banks have equal shares of users at 18.60%, while HDFC has 17.77%. This data highlights the diverse user base of mobile banking services in Telangana, with notable differences in gender, education, employment, and city location. It also reflects that users span across various social groups, religious backgrounds, and banking institutions.

Table 4 Respondent Socio Demographic Profile Summary.

Category	Total Respondents	Percent of the Respondents
Gender		
Male	134	55.37
Female	108	44.63
Education		
SSC	13	5.37
Intermediate	27	11.16
Degree	105	43.39
Above Degree	97	40.08
Employment		
Un Employed	54	22.31
Employed	85	35.12
Self-Employed	103	42.56
Social Status		
SC	27	11.16
ST	58	23.97
BC	65	26.86
OC	73	30.17
Not to say	19	7.85
Religion		
Hindu	13	5.37
Cristan	27	11.16
Muslim	105	43.39
Not to say	97	40.08
City Place		
Karimnagar	80	33.06
Warangal	94	38.84
Hyderabad	68	28.10
Name of the Bank Associated		
ICICI	45	18.60
HDFC	43	17.77
Axis	52	21.49
Kotak Mahindra	57	23.55
Bandhan	45	18.60

4.5. Path Analysis for Model Fit

This study examines the impact of mobile banking operations services offered by the private sector on consumer satisfaction in Figure 3. Using Structural Equation Model (SEM), Scholar focus on Table-5 path analysis and model fit indices and the strength of the relationships through f^2 , R^2 , SRMR, and other key metrics (Hair et al., 2020; Mohd et al., 2021; Tran et al., 2019).

Path coefficients represent the direct effects of one variable on another within the model, and their values typically range from -1 to 1. A path value of 0.45 between "Convenience" and "Consumer Satisfaction" would imply that a unit increase in perceived convenience leads to a 0.45 increase in consumer satisfaction. A path value of -0.30 between "Perceived Risk" and "Consumer Satisfaction" suggests that as perceived risk increases, satisfaction decreases by 0.30. The path coefficients between mobile banking service constructs and consumer satisfaction show significant relationships (Hair et al., 2020; Legate et al., 2023).

The R^2 value for consumer satisfaction is 0.64, indicating that 64% of the variance in consumer satisfaction can be explained by mobile banking services. The f^2 values, which assess the effect size of each predictor, indicate that Relative Advantage has a medium effect size ($f^2 = 0.35$), while Trust has a small effect size ($f^2 = 0.12$) (Hair et al., 2020, 2011).

For model fit, the SRMR (Standardized Root Mean Square Residual) is 0.057, indicating a good fit (values below 0.08 are acceptable). The Chi-Square is 232.45 with NFI (Normed Fit Index) at 0.921, suggesting a well-fitting model. Additionally, the RMS Theta is 0.075, further indicating a well-specified model with minimal residual errors. Overall, the model demonstrates strong predictive power and fit, confirming that mobile banking services significantly enhance consumer satisfaction (Al-Emran et al., 2019; Zapatero et al., 2018).



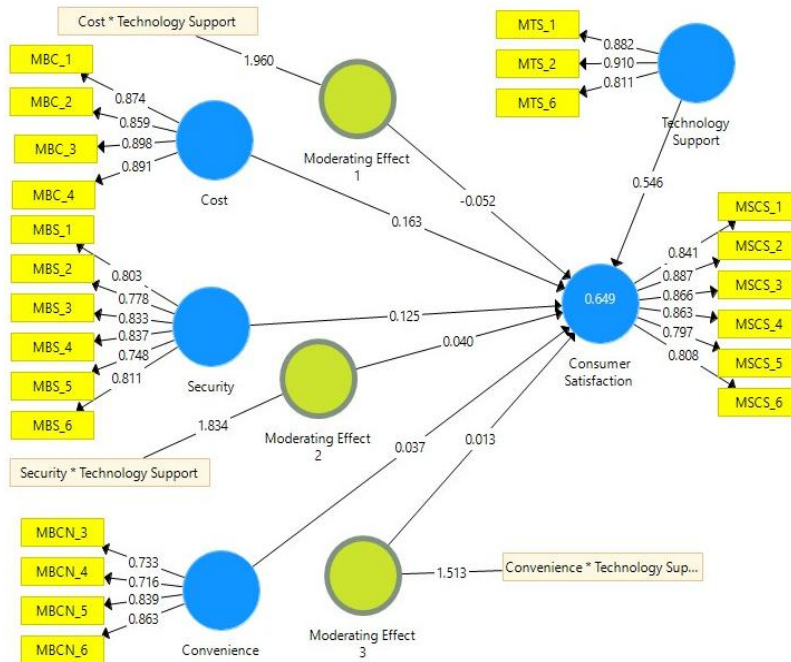


Figure 3 Path Measurement and Model Fit.

Table 5 Path Measurement and Model Fit.

Path Coefficients	Model Fit					
Path Coefficients	f Square	R Square	SRMR	Chi-Square	NFI	rms Theta
Dependent Variable Consumer Satisfaction		0.649	0.070	892.144	0.790	0.162
Convenience	0.037	0.003				
Cost	0.163	0.022				
Moderating Effect 1	-0.052	0.005				
Moderating Effect 2	0.040	0.003				
Moderating Effect 3	0.013	0.001				
Security	0.125	0.020				
Technology Support	0.546	0.266				

4.6. Bootstrapping for Hypothesis Testing

Figure 4 Bootstrapping was employed for hypothesis testing, and the results of the analysis are summarized in terms of path coefficients, standard deviations, t-values, and p-values (Al-Emran et al., 2019; Hair et al., 2011).

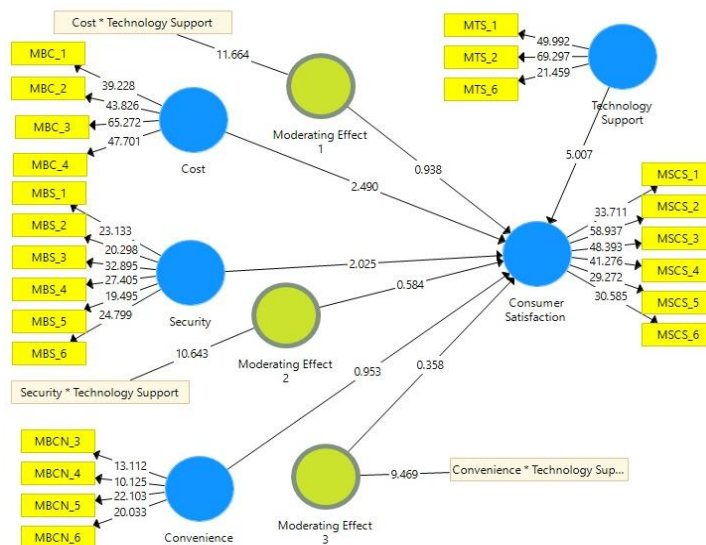


Figure 4 Bootstrapping for Hypothesis Testing.



The direct effect (Table 6) of convenience on consumer satisfaction shows a path coefficient of 0.037, with a t-value of 0.953 and a p-value of 0.341. Since the p-value is greater than 0.05, convenience does not have a significant direct impact on consumer satisfaction (Värzaru et al., 2021). The relationship between cost and consumer satisfaction reveals a path coefficient of 0.163, with a t-value of 2.490 and a p-value of 0.013. The low p-value indicates that cost has a significant positive impact on consumer satisfaction. This suggests that consumers are sensitive to the costs associated with mobile banking services, and managing cost effectively can enhance satisfaction (Ekonomi et al., 2021).

Table 6 Bootstrapping for Hypothesis Testing.

Path	Original Sample	STDEV	T Value	P Values
Direct Relations				
Convenience -> Consumer Satisfaction	0.037	0.039	0.953	0.341
Cost -> Consumer Satisfaction	0.163	0.065	2.490	0.013
Security -> Consumer Satisfaction	0.125	0.062	2.025	0.043
Technology Support -> Consumer Satisfaction	0.546	0.109	5.007	0.000
Moderate Relations				
Moderating Effect 1: Convenience X Technology Support -> Consumer Satisfaction	-0.052	0.055	0.938	0.349
Moderating Effect 2: Cost X Technology Support -> Consumer Satisfaction	0.040	0.068	0.584	0.560
Moderating Effect 3: Security X Technology Support -> Consumer Satisfaction	0.013	0.036	0.358	0.721

For security, the path coefficient is 0.125, with a t-value of 2.025 and a p-value of 0.043. This indicates that security significantly contributes to consumer satisfaction, emphasizing the importance of safeguarding mobile banking platforms to ensure customer trust. The strongest relationship is observed between technology support and consumer satisfaction, with a path coefficient of 0.546, a t-value of 5.007, and a p-value of 0.000 in Table 6. This finding suggests that robust technological support plays a crucial role in elevating consumer satisfaction (Ekonomi et al., 2021; Hussain et al., 2021).

Regarding the moderating effects in Table 6, none of the moderating interactions (convenience, cost, and security with technology support) show significant relationships, as all p-values exceed 0.05. This implies that technology support does not significantly moderate the relationships between convenience, cost, security, and consumer satisfaction (Al-Emran et al., 2019; Hair et al., 2020).

The results highlight that cost, security, and technology support have significant positive effects on consumer satisfaction, whereas convenience and the moderating effects of technology support are not significant (Jahan and Shahria 2022; Jannat and Ahmed, 2015). The findings underscore the critical role of security measures, cost management, and technological infrastructure in improving consumer satisfaction with mobile banking services.

5. Discussion

The Scholar’s in-depth observation of the results confirmed that the validity reliability concern has strongly supported 23 items out of 27, which are related to five variables. The values of the SEM model path and the model fit provide support for the SEM analysis (Ramamurthy and Mamilla, 2024). The hypothesis examination for bootstrapping has mixed results in Table 6. Based on these results, the scholar discussed the hypotheses and summarized the study inclusions.

5.1. The perceived cost on consumer satisfaction.

The analysis reveals that the perceived cost of mobile banking services provided by private sector banks has a statistically significant positive relationship with consumer satisfaction. Specifically, in Table 6 the path coefficient for "Cost -> Consumer Satisfaction" is 0.163, with a T-value of 2.490 and a p-value of 0.013. This indicates that as the cost perception becomes more favourable, consumer satisfaction increases. The hypothesis H1, which posits that there is a positive relationship between the perceived cost of mobile banking services and consumer satisfaction, is supported by this data.

The competitive pricing and consumer expectations. Private sector banks need to maintain reasonable costs to attract and retain customers, as cost-sensitive consumers are more likely to use services with transparent and affordable fee structures. Furthermore, value for money, as reflected in the transaction fees and overall service cost, is essential in shaping consumer satisfaction. Despite the significance of cost, the model suggests that other factors like technology support (with a high path value of 0.546) might have a more substantial influence (Faems et al., 2010; Hasan et al., n.d.). However, banks can enhance satisfaction by offering cost-effective services without compromising quality.

5.2. The perceived security on consumer satisfaction.

In the context of mobile banking services provided by private sector banks, the hypothesis (H2) that perceived security positively impacts consumer satisfaction is supported by the bootstrapping results. The path analysis reveals in Table 6 that the relationship between security and consumer satisfaction has a significant positive effect, with a path coefficient of 0.125, a standard deviation (STDEV) of 0.062, and a T-value of 2.025, which is greater than the critical value of 1.96. The P-value of 0.043 (less than the significance threshold of 0.05) further indicates that the relationship is statistically significant.



This finding justifies the assertion that consumers' sense of security in using mobile banking services is a crucial determinant of their satisfaction. As mobile banking continues to grow, addressing security concerns becomes critical, particularly given the increasing sophistication of cyber threats (Costa and Castro, 2021; Costa and Rodrigues, 2023). The positive impact of security on consumer satisfaction suggests that private sector banks must continuously enhance security features, such as encryption, two-factor authentication, and privacy measures, to build trust among consumers. As a result, perceived security directly influences the overall user experience and trust in mobile banking, which in turn fosters higher satisfaction levels.

5.3. The convenience on consumer satisfaction.

In examining Hypothesis H3, the relationship between the convenience of mobile banking services by private banks and consumer satisfaction, the analysis reveals (Table 6) that convenience, though expected to be a significant factor, does not demonstrate a strong direct impact on consumer satisfaction in this study. The path coefficient for convenience to consumer satisfaction is 0.037, with a T-value of 0.953 and a P-value of 0.341, indicating a statistically insignificant relationship at the 0.05 level. This suggests that while convenience is often considered a key determinant of user satisfaction in digital services, it may not be the dominant factor in this particular context.

The rapid adoption of mobile technology, advancements in digital banking infrastructure, and evolving customer expectations in private banking may have shifted the focus towards other elements like cost, security, and technological support. The significant positive relationship found between technology support (T-value of 5.007) and consumer satisfaction underscores the importance of seamless, technologically advanced services over mere convenience. Private sector banks may need to prioritize these aspects to enhance consumer satisfaction further. While convenience remains important, its role in driving consumer satisfaction appears to be moderated by other factors within the external banking environment (Ekonomi et al., 2021; Jahan and Shahria, 2022).

5.4. Technology support on consumer satisfaction

The analysis of hypothesis H4 shows that Technology Support significantly impacts Consumer Satisfaction in mobile banking services provided by private banks. The path (Table 6) coefficient for Technology Support (0.546) with a T-Value of 5.007 and P-Value of 0.000 indicates a strong positive relationship. This suggests that improvements in technology infrastructure, such as faster internet access, enhanced mobile security, and overall technological advancements, play a crucial role in enhancing consumer satisfaction.

The rapid digital transformation and the widespread adoption of mobile technologies have empowered consumers to demand more efficient and secure services. The availability of robust internet connectivity and innovative technologies such as two-factor authentication and real-time transaction updates has created a seamless user experience (Islam and Himel, 2015). Private banks, leveraging these technologies, are better equipped to meet customer expectations, providing reliable, fast, and secure mobile banking services.

The high path value justifies that consumers perceive advanced technology support as a key factor in their satisfaction with mobile banking. As private banks continue to innovate and integrate cutting-edge technologies, they are likely to see increased satisfaction, retention, and usage rates among their customers, enhancing their competitive advantage in the market (Kabir, 2013; Wijayanayake et al., 2014).

5.5. Technology support and cost to consumer satisfaction.

In this study, hypothesis H5 examines whether technology support moderates the relationship between cost and consumer satisfaction in mobile banking services offered by private sector banks. The path analysis shows in Table 6 a non-significant relationship ($\beta = 0.040$, T-value = 0.584, P = 0.560), indicating that technology support does not significantly enhance the impact of cost on consumer satisfaction. Despite the expectation that advanced technology would amplify cost-related satisfaction by providing better user experiences or increased efficiency, the results suggest otherwise (Faems et al., 2010).

A potential reason for this could be that, while consumers appreciate low costs, they may not necessarily attribute improvements in satisfaction to technology support. Instead, factors such as security, reliability, or ease of use may play a more direct role in shaping satisfaction (Ekonomi et al., 2021; Jannat and Ahmed, 2015). Additionally, external factors like competitive pricing across banks and consistent service standards could minimize the perceived effect of technology advancements on cost-related satisfaction (Costa and Rodrigues, 2023; Gray Molina et al., 2022). These findings emphasize the importance of considering a broader range of factors when assessing customer satisfaction, especially in competitive banking environments, where cost may not be a sole driver of positive consumer experiences, even with strong technological support.

5.6. Technology support and convenience to consumer satisfaction

In analysing H6, which examines the moderating effect of technology support on the relationship between convenience and consumer satisfaction in mobile banking services provided by private banks, the path coefficient for the moderating effect

(Convenience X Technology Support -> Consumer Satisfaction) was found to be insignificant ($\beta = -0.052$, $p = 0.349$) in Table 6. This indicates that technology support does not significantly enhance or diminish the impact of convenience on consumer satisfaction in this context.

The external environment for mobile banking, characterized by rapid advancements in technology, has undeniably improved the ease and efficiency of banking services. However, the findings suggest that while technology support is essential for the smooth functioning of mobile banking, it does not necessarily amplify the convenience perceived by consumers. This may imply that users already consider mobile banking convenient, and additional technology support does not further elevate their satisfaction (Costa and Rodrigues, 2023; Faems et al., 2010; Wijayanayake et al., 2014). The insignificant relationship may also point to the possibility that convenience itself has reached a threshold in terms of its influence on satisfaction, irrespective of the technological advancements provided by the banks. Thus, private banks should focus on enhancing other dimensions, such as security or cost efficiency, to improve overall consumer satisfaction.

5.7. Technology support and security to consumer satisfaction

The analysis of the moderating effect of technology support on the relationship between security and consumer satisfaction, as outlined in Hypothesis 7 (H7), Table 6 reveals significant insights into mobile banking operations in the private banking sector. The path coefficient for the interaction term of security and technology support is notably low (0.013) with a p-value of 0.721, suggesting that technology support does not significantly enhance the relationship between security and consumer satisfaction. This finding may indicate that despite advancements in security technology, consumers prioritize other factors, such as convenience and cost, in determining their satisfaction with mobile banking services.

Furthermore, the strong path value (0.546) for technology support directly affecting consumer satisfaction underscores its critical role in enhancing the overall user experience. This suggests that while security remains vital, the integration of robust technology and responsive service delivery may be more impactful in shaping consumer perceptions. Therefore, private banks should focus on enhancing convenience and technological features to optimize user satisfaction, acknowledging that security alone may not suffice to elevate consumer experiences in a competitive mobile banking landscape (Khan et al., 2021; Tounekti et al., 2022). Addressing these external environmental factors will be crucial for fostering customer loyalty and satisfaction in the evolving financial services sector.

6. Study Implications

The scholar is recommending based on the analysis and discussion of the study. The study findings suggest several implications of private bank services in related to mobile banking for enhancing consumer satisfaction action (Islam and Himel, 2015; Jahan and Shahria, 2022). The scholar is focusing on the implications explained below.

6.1. Practical Implications

The findings indicate that private sector banks should prioritize cost management and security measures to enhance consumer satisfaction with mobile banking services. Banks must adopt no of transparent and level of money transactions-based pricing strategies to attract cost-sensitive consumers while investing in advanced security features to build trust (Islam and Himel, 2015; Khan et al., 2021). Additionally, banks should pull updated technology support to improve overall service quality, thus ensuring a seamless user experience.

6.2. Managerial Implications

Bank managers should focus on integrating advanced technology solutions while maintaining competitive pricing and robust security measures. Training staff to understand the importance of these elements in customer interactions can further enhance consumer experiences (Febrian et al., 2021; Jannat and Ahmed, 2015). Developing customer feedback mechanisms will also help identify areas for improvement, ensuring that banks remain responsive to evolving consumer needs and preferences in the mobile banking landscape.

6.3. Policy Implications

Regulators should focus on establishing standards for mobile banking services that emphasize security and cost transparency. Implementing policies that encourage banks to enhance their technological infrastructure will benefit consumers and foster a more competitive banking environment (Islam and Himel, 2015; Jahan and Shahria, 2022). Furthermore, awareness campaigns can help educate consumers about mobile banking security features, promoting informed usage and fostering trust in digital financial services.

6.4. Social Implications

Improving consumer satisfaction with mobile banking services can contribute to greater financial inclusion, particularly for underserved populations. Enhanced satisfaction may encourage broader adoption of digital banking solutions, empowering

individuals with convenient access to financial services. Moreover, as consumer trust increases, this can lead to greater overall participation in the financial system, positively impacting economic stability and growth.

6.6. Theoretical Implications

The study contributes to the literature on consumer satisfaction by highlighting the significant roles of cost, security, and technology support in the mobile banking context. It underscores the need to further explore the interactions between these variables and consumer behaviour, particularly the potential moderating effects of technology support (Paul et al., 2022; Taufiq et al., 2023; Xiao et al., 2019). Future research can delve deeper into understanding the thresholds of convenience and other dimensions that influence consumer satisfaction in Telangana.

7. Conclusions

In this study examined to the consumer satisfaction on mobile banking services, and technology as a moderator. The investigation adopted survey method in Telangana with adopted questionnaire. The study measured the proposed hypothesis supporting to the objectives. The analysis results revealed to the mixed results of significant and non-significant. The study concludes that perceived cost, security, and technology support significantly enhance consumer satisfaction with mobile banking services, while convenience does not demonstrate a direct impact. Although technology support does not moderate the relationships between cost, convenience, and security with consumer satisfaction, it plays a crucial role in overall user experience. The study questions focus on how perceived cost, security, and technology support positively influence consumer satisfaction, while convenience appears to have a negative impact. Additionally, the last question about technology support also revealed negative relations when messaging to the as a moderator on consumer satisfaction. Private sector banks should prioritize competitive pricing, robust security measures, and advanced technological infrastructure to foster customer satisfaction and loyalty. Addressing these key factors will be essential in navigating the competitive landscape of mobile banking services and meeting evolving consumer expectations.

Ethical considerations

All necessary consents required by applicable laws have been obtained for the publication of any personal information or images of patients, research subjects, or other individuals involved in the study.

Conflict of Interest

The authors declare no conflicts of interest.

Funding

This research did not receive any financial support.

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