
Role of Perceived Security, Trust, and Attitude on Continuation Intention for Mobile Banking Apps

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ABSTRACT

Stimulus-Organism-Response model is used to explore the effects of security, trust and attitude to analyse factors influencing users' continuation intention of mobile banking apps. Data was collected through a survey of 204 Gen Y millennials in Gujarat, India. Constructs such as perceived security, trust, attitude, and continuation intention were measured. PLS-SEM, a statistical technique suitable for complex models with small to medium sample sizes, was used. The findings show that perceived security positively impacts perceived trust, which in turn influences users' attitudes towards mobile banking apps. The factors trust and attitude influence security and continuation intention. Enhancing users' perception of security increases trust, fostering a positive attitude and increasing the likelihood of continued use. These findings have implications for mobile banking service providers. Addressing security concerns, building trust, and providing a positive user experience are crucial for user retention. Robust security measures, transparent communication about data protection, and a focus on user experience can contribute to sustaining user engagement and loyalty in the competitive mobile banking landscape. These findings also apply to broader strategies in digital banking, emphasizing the importance of security and trust in user retention.

Keywords: Mobile Banking, Perceived Security, Perceived Trust, User Attitude, Continuation Intention, PLS-SEM, Millennials, SOR theory

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1. Introduction

The world is influenced by new technologies every day and the banking sector also has changed drastically which involves mobile banking and internet, where the services are rendered out to the customers wholly through virtual assistance (Shaikh et al., 2015). The lifestyle of citizens of the current decade has changed due to increase in the use of digitalisation through internet, smartphones and online shopping, which as lead to the need of mobile wallets (Joshi & Chawla, 2024) Therefore, the need for mobile banking arises to enable online transactions, bill payments, balance enquiry etc., which can be accessed from anywhere and anytime. This flexibility causes enhanced use of mobile banking apps (Chen, 2012). Post the corona pandemic Indian government has made mandatory to use the mobile wallets for those who have vetted the know-your-customer (KYC) norms, from April 2022 and the QR codes (Quick response) to be interoperable (Wright, 2022). Consequently, the adoption of digital payment systems has also increased. Banking companies incur the high cost for the app development, and hence to cover the cost and sustained the business it is necessary to have loyal and regular users. As acquiring the new customers cost more than the retaining a customer. Despite the increase in the growth of using mobile banking applications, certain factors play a vital role to stick on to the particular mobile applications. The users must feel safe to use a particular mobile application, hence the service providers should make sure that their users have confidence, privacy, security and integrity while using their mobile banking services. As all the data of the users are stored in the smart phones, the users face several issues when their phone is lost or stolen. Any layman can

use or access the smartphones using forensic analysis techniques and various other software (Tsobdjou et al., 2024). This brings a big question mark for the users regarding the security, privacy and trust. Online shopping, educational institutions, hospitals, providers of digital wallets, government services and other commercials are the high-profile targets in India. Hence, increase in the use of mobile applications questions the security which leads to fluctuations in user's trust. Therefore, the trust influences the attitude of an individual towards continuation intention on a particular mobile banking application (Joshi & Chawla, 2024). This study focuses on the perceived security (PS), perceived trust (PT), attitude (ATT), and continuation intention(CI) of the mobile application users.

Various studies on technological adoption have been conducted that explored theoretical relationship between security, ATT, trust and intention & the influence of PS (S. Gupta et al., 2023; Mew & Millan, 2021; Trivedi & Yadav, 2020). Certain studies keep trust factor as a mediating factor to examine the intention variable through security and ATT. The gap arises as only trust acts as mediating variable and have direct connection to the outcome variable, whereas other variables are only interlinked (Banerji & Singh, 2021; Trivedi & Yadav, 2020). A study conducted by (Joshi & Chawla, 2024) focuses on PS, ATT, trust and CI regarding mobile wallets. The variables trust, ATT and gender play their roles as mediators and moderators. This paper sheds light on the research gap by focusing on the mobile banking applications by keeping both trust and ATT as a mediating variable. Nitzl (2014), states that most of the research focuses only on the direct relationship and does not give importance to the mediating effects which may give bias results. Hence, mediating role is given a vital role in this paper to analyse the CI.

This research aims to investigate the role of PS, PT, and ATT in influencing CI using SOR framework.

2. Literature review

“Theory of Reasoned Action (TRA)” postulates that “the attribute behaviour is evaluated by intention” (Vallerand, 1992). When an individual trusts and believes, that adopting a technology will bring their expected outcomes, then the ATT of an individual towards the technology would be positive in nature (Sinthiya, 2024). In addition to this intention was explained using “Theory of planned Behaviour(TPB)”. “Technology Acceptance Model (TAM)” and “unified theory of acceptance and use of technology (UTAUT)” model was used to explain the technological adoption in previously published literature. In terms of digital payment, Conti et al. (2018) states that there is a risk involved in real time online transaction which affects the trust and belief of the users that influence the ATT of the users which in turn results in the impact of CI. The behaviour of an individual is categorised in three stages as per SOR model. They are environmental stimuli perception (S), cognitive, emotional or mental states of an individual (O) and the response (R). it is stated that external stimuli (S) and cognition (O) of an individual influences the final response of an individual (R) (Molinillo 2022). This study concentrates on relationship between Trust and ATT factors, and therefore SOR model which illustrate the relationship between PS - PT and ATT – CI model is used.

Therefore, by integrating the above-mentioned theories, this study associates the mobile banking application user's behaviour and responses by considering the factor of PS as a stimuli (S) that pushes to final outcome. In the same way, the cognitive and emotional factors refer to the organism (O), where ATT and PT is taken as the factors of emotion and cognition. Finally, the response (R) is driven through the stimuli and organism, that denotes the CI (CI) in this study (Ming et al., 2021). In this research work, ATT and PT are treated as mediating variable between PS and the CI.

2.1 Perceived security (PS)

The confidence of the consumers in adopting new technologies relates to the PS, which brings a strong confidence that the individuals' personal information will not be seen, modified or transferred by illegal persons (Lai, 2017). In brief, security is the assumption of an individual, when there is a reduced risk on financial data (Sarkar, 2020).

2.2 Perceived trust (PT)

Trust may find expression as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trust, irrespective of the ability to monitor or control that other party” (Suh & Han, 2003). Singh et al. (2020) says that it is an emotional state motivating a person to trust another, which makes the customers to come out of risk and insecurity.

In the new age and the adoption of new technologies, PS includes digital signature, cryptography and certificates that protects the users from losing data, fraudster and hackers which automatically leads to trust (Ranganathan & Ganapathy, 2002; Kim, 2008). Flavián (2006) and Mukherjee & Ryan (2020) have proved that perceived risk and PS are related. An empirical study in mobile commerce revealed that PS and PT are related (Sarkar, 2020). Hence, this study put forth the hypothesis as,

H1: PS significantly influence PT

2.3 Attitude (ATT)

According to Vallerand et al. (1992) ATT may be postulated as “a disposition to respond favourably or unfavourably towards some psychological object.” This study considers ATT of an individual towards mobile banking applications adoption as it is determined by the belief and trust perception. Also, it can be stated that ATT is the preference of the individual over the alternatives (Amoroso & Lim, 2017). Generally, customers compare the mobile banking applications with other digital payment modes that is in existence, not only based on the cost but on many other advantages (Garrouch, 2021). Hassan (2016) states that belief determines ATT of acceptance and adoption.

A study revealed that mobile banking users in South Africa, developed knowledge-based trust that involves benevolence, integrity and perceived competence which results in their ATT (Shaikh et al., 2015). Therefore, trust is an important factor for the digital interactions, just like human interactions (D. H. Shin, 2010). Research on Korean internet users, revealed that trust factors influence the consumers ATT and their intention towards online banking Suh and Han, (2003). Similarly, a recent study on mobile application adoption finds that trust impacts ATT positively (Hajiheydaria & Ashkan, 2018). Literature on recent studies shows persistent positive link between trust and ATT (Fan et al., 2020; Mew & Millan, 2021; Moriuchi, 2021). Hence, this paper states,

H2: PT significantly positively influences ATT.

2.4 Continuation Intention (CI)

Continuation intention refers to the stick to the one product and services and continue using it. With regard to financial applications, it implies that the users show positive sign on PS and PT so their ATT towards sustaining on the mobile banking application will be positive (Hassan, 2016). Intention to continue can be

taken as a response to perceived value of users as a result of benefits obtained and risk undertaken (Dararuang et al., 2021). At an early-stage CI is used as a dependent variable to study the technological acceptance (Manuel, 2011)

CI and PT are related (Patel et al., 2020; Trivedi & Yadav, 2020). Studies on mobile banking applications, mobile shopping, online banking and e-healthcare records have been done by Cole et al. (2014; Garrouch (2021; K. Gupta & Arora (2019); Mew & Millan (2021) (Marriott & Williams, 2018); (Suh & Han, 2003) (Bashir & Madhavaiah, 2014). PT determines CI of an individual (Manuel, 2011). Other researchers have also found that PT influences the CI (Afshan et al., 2018; Bashir & Madhavaiah, 2014). Hence, this hypothesis is proposed.

H3: PT influences CI.

According to the TPB, ATT and CI have significant relationship (Vallerand et al., 1992). The ATT of Norwegian users on the mobile chat services shows positive influence on intention (Afshan et al., 2018). Previous articles on mobile payments (Ajina et al., 2023), digital shopping (Khalilzadeh, 2017) and technological adoption (Belanche, 2012; Manuel, 2011; Moriuchi, 2021; Y. H. Shin, 2017), have also shown positive influence on ATT and intention. Therefore, this can also be associated with the mobile banking applications, where similar results are expected with ATT and intention.

H4: ATT influences CI

Apart from finding the direct relationship among PS and CI, this study tests the impact of PT and ATT as a mediating variable. Therefore, the study puts forth these hypotheses:

H5: PT mediates between PS and CI

H6: ATT mediates between PS and CI

The influence of serial mediation of ATT and PT on PS and CI is also tested through the following hypothesis:

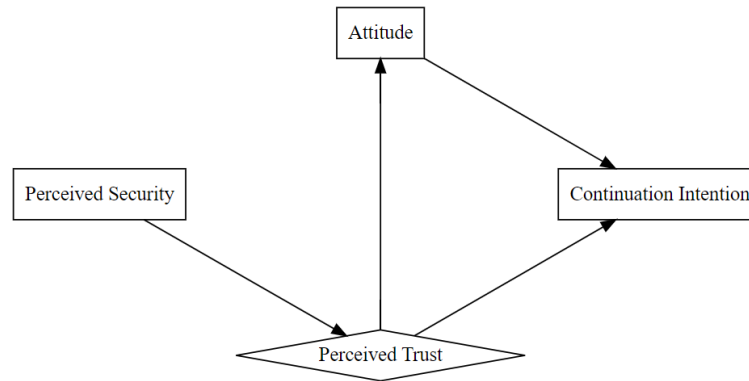
H7: PT and ATT mediate between PS and CI

3. Methodology

3.1 Measures

Variables PS, PT, ATT and CI are taken for the study. The scales were obtained from previous studies. Flavián et al. (2006) provided the scale of PS and was measured using eight item scales. PT was measured using six item scales (Shaw, 2014), (Belanche, 2012). ATT and CI were measured using four item scales each (Davis, 1989) and Venkatesh (2012) respectively. Demographic details such as name, marital status, level of education and digital shopping experience were collected.

Figure 1. Theoretical Framework



Source: Author's creation

3.2 Sample and data collection

A quantitative approach was pursued using “a cross-sectional design”. A systematic questionnaire was framed to collect data. The questionnaire was sent to the GEN Y millennials (1986 and 1996) (due to scope of this research work and due to reasons outlined in Van Deventer (2017)) in Gujarat through google form link. The details of the millennials were taken from the alumni records and other purchased database. Out of 1200 questionnaires that were sent via WhatsApp chat, WhatsApp status, text message and emails, 255 questionnaires were received back. After removing the unfilled and inappropriate questionnaire, 204 responses were determined as appropriate. Sample characteristics are tabulated below in table 1.

Table 1. Sample Characteristics (n = 204)

Characteristic	Count	Percentage (%)
Gender		
Female	67	32.84
Male	137	67.16
Education		
Graduation	50	24.51
Post-graduation	139	68.14
Other	24	11.76
Marital status		
Married	114	55.88
Unmarried	75	36.76
Other	6	2.94
Occupation		
Salaried employee	129	63.23
Self-employed / Business	31	15.19
Others	44	21.56

Characteristic	Count	Percentage (%)
Annual Income		
Less than Rs. 5,00,000	89	43.63
Rs 5,00,000 to Rs 10,00,000	106	51.96
More than Rs 10,00,000	18	8.82

Source: SPSS output

4. Data Analysis

PLS-SEM employing Smart PLS 4 software tested the proposed model. PLS-SEM is an efficient technique to determine relationship among the variables within the predictive power, and it can also be used to test small number of respondents. Therefore, this research uses PLS-SEM as the research is conducted using limited number of respondents and to reveal the direct and indirect relation between variables (Hair Jr, 2017).

4.1 Measurement model assessment

Model Reliability and validity was assessed using guidelines proposed by Hair et al. (2019). The outer factor loading check reliability of the indicator. The values in the table 2, satisfy the threshold values (>0.40 and >0.70) stated by Leguina, (2015), which shows good reliability of all constructs. Internal consistency is checked using values of Cronbach's alpha (CA), Composite reliability (CR). The value in the table satisfies the requirement of threshold value >0.7 (Hair, 2019) which shows greater variable internal consistency in the scales. The AVE values are used to determine the convergent validity of the model. The values of AVE in the table satisfies the threshold value (greater than 0.5), specified by Hair (2021).

Table 2. Factor Loadings, CR, CA and AVE

Construct / Indicator	Factor Loading	CR	CA	AVE
Attitude (ATT)		0.906	0.916	0.780
ATT1	0.893			
ATT2	0.905			
ATT3	0.864			
ATT4	0.870			
Continuation Intention (CI)		0.922	0.924	0.763
CI1	0.835			
CI2	0.863			
CI3	0.891			
CI4	0.895			
CI5	0.881			
Perceived Security (PS)		0.881	0.901	0.555
PS1	0.637			
PS2	0.636			
PS3	0.721			
PS4	0.572			

Construct / Indicator	Factor Loading	CR	CA	AVE
PS5	0.797			
PS6	0.893			
PS7	0.812			
PS8	0.831			
Perceived Trust (PT)		0.933	0.937	0.749
PT1	0.906			
PT2	0.798			
PT3	0.843			
PT4	0.902			
PT5	0.890			
PT6	0.850			

Source: Smart PLS-SEM output

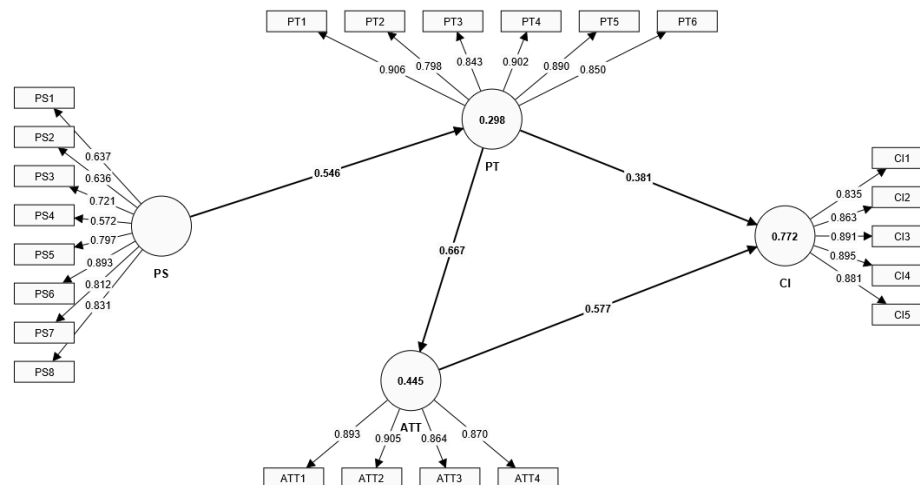


Figure 2. Measurement Model

Source: Author's creation

4.2 Discriminant validity

Model Evaluation needs to be done using convergent and divergent validation (Hair Jr, 2021). The “heterotrait–monotrait (HTMT) ratio of correlations” (Henseler, 2015) is used to assess the convergent and divergent validity of the model. The threshold value for HTMT ratio is less than 0.9 (Henseler, 2015). The values of the HTMT in the table satisfy the threshold value, hence all the correlations are retained in the model.

Table 3. Discriminant Validity — HTMT Ratios

	ATT	CI	PS	PT
ATT	0.883			
CI	0.831	0.873		
PS	0.600	0.594	0.745	

	ATT	CI	PS	PT
PT	0.667	0.766	0.546	0.866

SOURCE: Smart PLS-SEM output

4.3 Structural Model Assessment

Bootstrapping technique proposed by Hair and Alamer, (2022), is used to evaluate the model framed. It is utilized to test the significance and to predict path coefficient of the variables. The path outcome of the PLS SEM is given in table 4. The p values are significant as the values are below the threshold limit of 0.50 (Hair Jr, 2021).

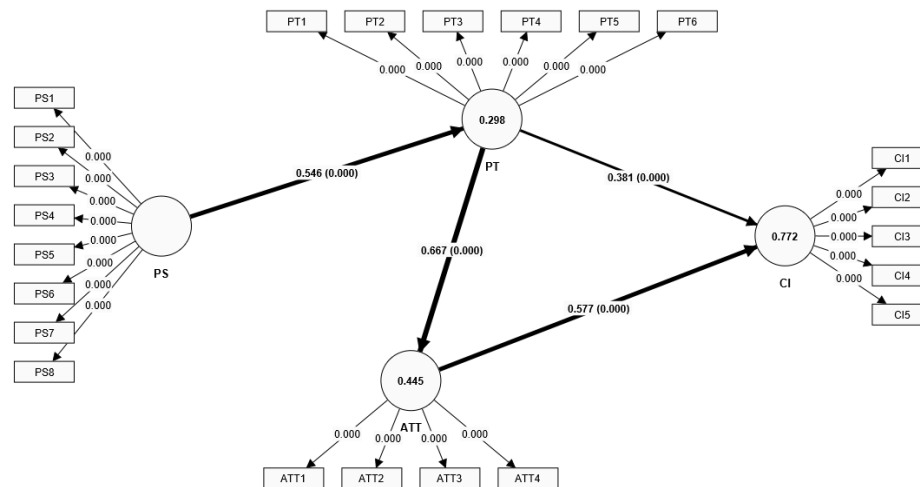


Figure 3. Structural Model

Source: Smart PLS output

Table 4. Path Coefficients

Hypothesis	Path	Path Coefficient (β)	T Statistics	P Values	Supported
H1	PS → PT	0.456	10.065	< 0.001	Yes
H2	PT → ATT	0.667	12.554	< 0.001	Yes
H3	PT → CI	0.381	6.138	< 0.001	Yes
H4	ATT → CI	0.577	8.007	< 0.001	Yes
H5	PS → PT → CI	0.208	4.140	< 0.001	Yes
H6	PT → ATT → CI	0.385	7.403	< 0.001	Yes
H7	PS → PT → ATT → CI	0.210	5.965	< 0.001	Yes

Source: Smart PLS output

The above table shows that H1 ($B = 0.456$, $p < 0.000$), H2 ($B = 0.667$, $p < 0.000$), H3 ($B = 0.381$, $p < 0.000$), H4 ($B = 0.577$, $p < 0.000$), H5 ($B = 0.208$, $p < 0.000$), H6 ($B = 0.385$, $p < 0.000$), H7 ($B = 0.210$, $p < 0.000$), are accepted as the P value is less than the threshold value of 0.05. It clearly depicts that PS has a strong influence on CI through ATT and PT. It also shows that PT has a strong influence on CI both directly and by mediating ATT, and ATT has a strong influence on CI. PT also has a strong influence on ATT.

The ability of the independent variables to explain the dependent variable is gauged by R^2 values. When evaluating R^2 values, 0.75 is considered “substantial”, 0.50 is viewed as “moderate”, and 0.25 is deemed “weak”. (Henseler et al., 2009). Hence, the effect of independent variable PT on ATT is said to be moderate (0.445), the effect of independent variables PT and ATT on CI is substantial (0.772) and effect of PS on PT is weak (0.298). The effect size of the independent variables is measured using f square values, where the strength of each predictor variable is explained. Shmueli et al. (2019) states the effect size in three categories 0.02(small), 0.15(medium) and 0.35(large). By considering Chin, (1998) effect size ATT, CI, PT has large effect size. Shmueli et al.(2019) suggested blindfolded Stone-Geisser test (Q^2 square) to analyze sample predictive power output for the model proposed with a threshold value above 0. The table 5 values of Q^2 satisfies the thumb rule, which portrays the robust predictive power of the framework.

Table 5. R^2 , Q^2 and f^2 Values

Construct	R^2	Q^2	Relationship	f^2
ATT	0.445	0.616	ATT → CI	0.810
CI	0.772	0.631	PS → PT	0.425
PT	0.298	0.643	PT → ATT	0.803
PS	—	0.441	PT → CI	0.353

Source: Smart PLS-SEM output

In PLS SEM, The “Standardized Root Mean Square Residual” (SRMR <0.08) and “Normalized Fit Index” (NFI = 0.9) are two widely used parameters to test the model fit (Henseler et al., 2016), with values of good fit as given (Sarstedt et al., 2021). The model proposed in current research is said to be well fitted as its SRMR value and NFI values fall within prescribed values.

5. Discussion

Customer perception of continuation use of mobile banking application is explored in this study through security, trust and ATT. The findings indicate that PS plays a crucial role in building trust by creating a sense of reliability. This finding aligns with past research findings (Lai, 2017). The research also explored that PS has an indirect impact on CI by influencing trust and ATT. Creating a secure environment can establish trust in the system or entity. Trust is crucial for users' ATTs towards a system or entity. When users feel secure, it has a positive impact on their perception (Garrouch, 2021). Trust in the system positively influences the ATT towards the continued usage of mobile banking apps. Trust not only influences the ATT, but it also influences the intention to persistently use mobile banking app. Interestingly, trust not only directly impacts the intention to use mobile banking apps but also affects continuation usage through the mediation of ATT. Past studies have shown that PT substantially impacts consumers' willingness to continue using a service (Manuel et al., 2011). By building trust, organizations can enhance users' ATTs towards the system, ultimately leading to a higher likelihood of continued usage. Enhancing trustworthiness can result in users perceiving things more positively. Trust and positive ATTs play a crucial role in decision of users to keep using the system or service, indicating that the service providers must concentrate on building and maintaining trust among the users to provide a positive ATT towards mobile banking applications. It can be achieved by bringing proper security measures, transparency and enhanced customer service which results in customer retention. But it is difficult for the service provider to delve deep into the cognitive and emotional factors of the customers. Therefore, to make it easier and simple user-

centric environment can be implemented to increase loyal customers that provides positive experience that leads to retention.

It's important to address security concerns to build trust and influence user intentions. Investing in security measures and building trust among users is crucial. Organizations can create an environment that promotes user engagement and long-term success by prioritizing security, trust, and fostering positive ATT.

5.1 Theoretical and Practical implications

The current research through its findings and model contributed extensively to the theoretical knowledge in the field of CI in mobile banking. This study integrates the ATT and PT to reveal the relationship between PS and CI. The analysis highlighted strong positive connection between PS and CI, mediated by trust and ATT both directly and indirectly. The researchers attempted to find the drivers of CI of the mobile banking application users. The serial mediation analysis enlightens the depth of insights impact of cognitive and emotional factors of the mobile banking application users. By adopting theory of stimuli, organism and response (S-O-R), this study provides more evidence on the proposed variables. This study is successful in identifying the hierarchy of the variables which needs to be addressed step by step for achieving the adoption and continuation of the usage of new technology in context of fintech. By testing the S-O-R model for mobile banking applications, this finding provides an important addition to the existing literature.

It is essential to implement the findings and theories discussed above in practical contexts to enhance user experience and retain customers in mobile banking applications. As the study revealed that trust and ATT play a significant role in user CI, the service providers of banking applications can prioritize establishing and maintaining trust amongst the consumers to inculcate positive ATT towards their mobile banking applications. Implementing enhanced automatic security, transparency and loyal customer service can develop trust that leads to favorable ATT that results in retention of users. As the study emphasis on serial mediation, the significance of interconnection between trust and ATT in influencing user continuation is highlighted. By taking this in mind service providers can design personalized user experiences by focusing on both trust and ATT. The impact of cognitive and emotional factors of the users is paramount in determining the intention of the users. The service providers can tailor the strategies in such a way to keep engaged in the competitive mobile banking landscape. Therefore, all these factors can be put together to create a user-centric environment which leads to positivity in trust, ATT and CI that ultimately drives the mobile banking industry to achieve heights.

6. Conclusion

This study used the Stimulus-Organism-Response paradigm to examine how security, trust, and ATT affect mobile banking app users' CIs. A survey of 204 Gen Y millennials in Gujarat, India was conducted to collect data, and the collected data was analysed using SEM technique in Smart PLS. The results revealed that perceptions of security positively influence trust, which in turn impacts users' ATT towards mobile banking applications. Trust and ATT play important roles in the connection between security and ongoing commitment. Trust and ATT play crucial roles in connecting security and continued intention to use the app. These findings highlight the importance of enhancing users' perception of security to build trust, foster positive ATT, and increase the likelihood of continued usage. This study emphasises the significance of security, trust, and user experience in retaining mobile banking customers. The knowledge gained can help mobile banking service providers implement robust security measures, ensure transparent communication

about data protection, and prioritise user experience to foster user engagement and loyalty in the highly competitive mobile banking industry.

6.1 Limitations and future scope

Apart from the insights provided in this study, it's important to acknowledge certain limitations of the study. Firstly, this study is confined to only a particular geographical area with a limited data set. There might be bias in the responses of the respondents in the primary data collection, which might provide unreliable results. Lastly, only mobile banking applications are considered for the study, where the results and the conclusions cannot be implemented for digital applications. Further studies can explore the impact of emerging technologies like artificial intelligence and blockchain on consumer trust, ATT, security and CI. The role of education and awareness programs in developing trust and ATT in mobile banking applications can be explored from the customers side which further provides more practical strategies for the service providers. Additionally trust and ATT towards the mobile banking app is influenced by other variables like, past experience, perceived corporate image, ease of use etc., in future research these variables can be explored.

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