A MEDIATING ROLE OF CUSTOMER ENGAGEMENT, EXPERIENCE IN BANKING INNOVATIONS AND CUSTOMER SATISFACTION

Dr. B. Jail Singh[1*], Prof. Katla Rajender[2]

[1*]ICSSR Sponsored Post Doctor Fellow, Department of Commerce and Business Management, Kakatiya University, Warangal, Telangana state.

[2]Professor, Department of Commerce and Business Management, Kakatiya University, Warangal, Telangana state.

*Corresponding Author: Dr. B. Jail Singh

*ICSSR Sponsored Post Doctor Fellow, Department of Commerce and Business Management, Kakatiya University, Warangal, Telangana state.

Abstract: The Indian banking sector has transitioned from automation to digitalization over the past three decades. The effect of demonetization (2016), Digital India (2018) making it difficult for the average person to adopt advanced CRM systems. In this scenario, due to competitiveness, sustainability and profitability, majority of the banks are introducing and adopting novel technologies like AI, block chain, chat bots, big data, and robotics to improve customer engagement, experience and satisfaction,. These banking technological innovations create an ecosystem that led to better customer engagement (CE), enhance customer experience (CX) and high customer satisfaction (CS). The present study analyse the influence of banking technological innovations on customer experience, engagement and satisfaction towards banking services. The study uses a simple random sampling technique and a structured questionnaire was distributed to customers of select public (SBI, CANARA) and private (HDFC, ICICI) sector banks in Warangal city. The final sample size is 185. The researcher uses SMART PLS and path coefficient model with bootstrapping method, reliability and correlation test. The path analysis shows that a positioning and process innovation influence on customer engagement, experience and satisfaction. Furthermore, CE has a significant path relationship with CS.

KeyWords: Banking Sector, Process Innovation, Technological Innovation, Positioning Innovation, Customer Experience, Engagement, and Satisfaction.

1 Introduction

Banking is an integral part of financial activity today and digital banking in India is highly advanced. Technological innovations in the banking sector in India led to significant changes in the industry over the past three decades. The entry of foreign and private players after the Liberalization, Privatization, and Globalization in 1991 has made the banking industry highly competitive **[25].** The digitalization of banks has been a major paradigm shift, allowing for the provision of diversified and customized banking services to customers at a reduced cost **[23].** Technology-driven delivery channels such as Tele banking, ATM, Internet Banking, Mobile Banking, and E-banking have enabled banks to reach maximum customers in a more efficient manner **(29).** However, India was a late adopter of technology in the banking industry, with initial

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opposition from labor unions in public sector banks. Banks adopt the technology-based innovations that will be the key determinant in offering diversified and customized banking services to their varied customer portfolios, at a reduced cost. The adoption of technological innovation has not only resulted in improved efficiencies and operational performance but has also elevated customer satisfaction, convenience, and behavioral change, aligning the banking and financial services industry with the ongoing digital transformation observed in various other sectors [23]. Bank must have the opportunity to embrace and adapt to technology, leveraging it to enhance their customer engagement, experience, and satisfaction. This shift towards digital innovation has also raised important concerns about privacy, information security, and consumer protection.

The banking and financial services industry has experienced significant transformation due to technological innovation [16]. The introduction of ATMs in the 1960s and electronic card-based payments in the 1970s, followed by 24/7 online banking in the 2000s and mobile-based banking in the 2010s, has led to a digital economy [19]. [32] analyzes the technological innovations in the Indian banking sector, specifically focusing on the use of technology to create efficient delivery channels and address the challenges of the new economy. New competitors, changing customer expectations, and the breakdown of traditional services are pushing traditional banks to launch new technology in their operations [13]. Moreover, the emergence of high-impact technologies such as Artificial intelligence, IoT, Cloud computing, Quantum computing, and Block chain has transform the nature of financial services, offering customers unprecedented levels of convenience and personalized experiences. The use of technology has revolutionized the way financial services are delivered, enhancing customer engagement, experience, and satisfaction. Thus, Banking innovations are resulted into process, technological and positioning to shortcoming the competition and increase the profitability in an efficient manner. Overall, technological innovations played a crucial role in transforming the banking sector in India, improving customer service and efficiency.

The perception of banking customers towards these innovations may vary based on individual preferences and experiences. Some customers may perceive these innovations positively, appreciating the convenience and efficiency they bring to banking services. Others may have concerns about the security and privacy of their financial transactions when using these new technologies. Customer perception can also be influenced by factors such as ease of use, reliability, and accessibility of the innovative products and services offered by Indian banks. It is important for banks to understand and address customer concerns and preferences to ensure widespread adoption and acceptance of these innovations. Banking technological innovations resulted into novel products and services, process innovations, positioning innovations and technology innovations. Products and Services Innovations are related to tailor made banking products such as Opening a bank account, transfer funds, payments, complaint and redressal system. On the other hand, the bank introduces process innovations to reduce the stress of employees and time saving aspect to reduce the cost of operations. These changes will happen only when new technology innovations such artificial intelligence for quick interactions, block chain technology for secure

financial transactions, machine learning for identifying customer needs and behavior, robotics and chatbot for reducing operation cost and enhance operational efficiency to address the customer problems.

2 Overview of Growth of Banking Sector in India

The growth of economy depends on the growth of banking sector. At present, the contribution of banking sector to GDP is 7.7%. Banking sector intermediation as measured by total loan as a % of GDP is 30%. Indian banking sector consist of public sector (12), private sector (21), foreign banks (45) and small finance and payment banks (16). Total deposits increased by 11% and total net advances increased by 18%**.** Considering the profitability, Total Income is increased by 19%, Net interest income increased by 23%, Non-Interest Income increased by 3%, PAT increased by 42% in 2022-23**[31].**

- **Technological Innovations and Developments in Banking Sector**

Banks introduced ATMs in the 1960s and electronic, card-based payments in the '70s. The 2000s saw broad adoption of 24/7 online banking, followed by the spread of mobile-based "banking on the go" in the 2010s **[19]. Artificial Intelligence, Robotics, Machine Learning,** IoT, Cloud computing, Quantum computing, and Block chain are introduced in post 2010s **[8], [9], [17].**

3. Theoretical frame work and Hypothesis development

Innovation in various outcomes such as product, process, marketing, business model, supply chain, and organizational innovation, and requires a combination of organized procedures, creative thinking, and a supportive environment **[6].** The Indian banking sector has introduced new regulations, technological innovations, and e-banking systems. These changes aim to create new instruments, improve liquidity and safety, and enhance the monetary system. With the introduction of EFT, RTGS, NEF, mobile banking, and online banking highlights these technological changes **[22].** These changes are advanced in a forward thinking manner and continue to be at the forefront, embracing innovations that meet client expectations for financial health, wealth, trust, and security. Increased personalization of services provided to customers (and employees) can increase revenues **[15].** Higher automation, lower error rates, and better resource utilisation can reduce costs. In addition, India's banking sector has experienced significant growth in recent years with innovations like Unified Payments Interface (UPI), APIs, robotics, artificial intelligence and cloud technology.

Technological innovations in the banking sector have a significant impact on customer engagement, experience, and satisfaction. The integration of new technologies, such as information and communication technology, has transformed the way banks operate and interact with customers. Banks are adapting to technological advancements to meet customer expectations and enhance their overall experience **[6].** The use of technology has improved service quality, reliability, responsiveness, and security in the banking sector, leading to increased customer satisfaction **[2]. [22]** in his study new technological changes in Indian banking sector highpoints out the new technological changes and recent trends in Indian banking sector. The study concludes

that, there is a lot of changes occur in new technology adoption by banking sector to increase the customer reach with innovative products and services.

[6] has elaborated the digital transformation in the banking industry, ICTs for strategic management, and the opportunities that marketing presents to customer experiences, focusing on the development of proactive digital applications in explaining the concept of customer experience. Additionally, the application of machine learning techniques in customer relationship management (CRM) has further improved customer identification, attraction, retention, and development, resulting in enhanced customer satisfaction levels [8], [16]. [30] conducted the empirical analysis that demonstrates the superior performance of early adopters of technology (private sector and foreign banks) in terms of productivity and returns on equity. It means that, banks that are introducing the banking technological innovations has competitive advantage and better customer engagement, experience and satisfaction. Overall, banking innovations play a crucial role in shaping customer engagement, experience, and satisfaction in the banking sector [9].

3.1 Customer Engagement (CE): [23], analyze ten important technological innovations in the banking sector in India, focusing on their impact on customer benefits and cost reduction. [5] conducted the empirical studies to reveal the significant role of the banking sector in innovation, with relative contributions from various sectors. These studies are relevant and particularly in Asian economies with less developed financial markets, provide a more nuanced understanding of the sector's impact on innovation. [19] explores the impact of banking innovations on customer attraction, satisfaction, and retention among commercial banks in Botswana. Their research reveals that innovative banks are more likely to attract and satisfy customers. [20], explores the adaption of artificial intelligence in banking sector of Middle East and concluded that Artificial intelligence adaptation in banking sector in Middle East is far from reaching to complete maturity level within the industry but use of artificial intelligence in banking industry had become trendsetter. Thus, based on the above arguments, the first hypothesis is framed.

H_{1a}: There is a significant relationship between banking technological innovations on customer experience.

3.2 Customer Experience (CX): The integration of environmental factors and the total output of products and services demanded by the customer constitute the concept of customer experience. Due to the intensity of competition, banks' adaptation to technological innovations to meet customer expectations increases the sustainability of banks. This process must be compatible with the existing infrastructure and activities of the bank to meet customer experiences [6]. [18] Investigates the drivers and outcome of self-service technologies experience and customers' satisfaction in the retail banking sector in Nigeria.. Building robust Customer Experience (CX) and CRM programs allows organizations to focus on the needs of its customers, making them the focal point of the organization and the decision-making process. This in turn leads to improved customer satisfaction, loyalty and advocacy. [7] highlights the importance of CE in driving CX in the retail banking industry and suggests that banks should formulate appropriate strategies based

on customer experience. **[14]** found that customer touch point interactions have a significant influence on Customer Experience Management, customer satisfaction, and loyalty. Therefore, the second hypothesis is framed on the above literature stating that,

H₂ₐ: There is a positive significant relationship between banking technological innovations on customer engagement.

3.3 Customer Satisfaction (CS): Customer satisfaction is an important facet in banking industry which can be achieved with help of technology intervention **[4]** Effective engagement and good experience through innovative technology in banking services enhances better customer satisfaction. Banks are facing high competition and desire to lead the market by acquiring new customers and retain existing customers through various technological innovations in their operations. **[12]** assess the customer awareness towards use of digital Banking products in India and measure the customer satisfaction level towards the use of digital banking platform. They found that customers adopt and use the digital banking products for their convenience and time save purpose. **[6]** examines the impact of IT-enabled innovation on the banking industry, specifically focusing on customer satisfaction in public and commercial banks in Bhopal. Private Banks outscored state banks in terms of innovative successes, highlighting the importance of technology and innovation in the sector. Their study aims to understand the relationship between technological innovation and financial services, emphasizing the need for new approaches to gain a competitive advantage in the banking industry. Information and communication technology is found to be critical for the sector's performance. In the banking industry, customer experience mediates the relationship between electronic customer relationship management (E-CRM) and customer satisfaction. The authors found that customer experience mediated the relationship between E-CRM and customer satisfaction using 836 useable questionnaires from 10 banks **[10].**

H₀₃: There is no significant impact of technological innovations on customer satisfaction

We propose a conceptual framework for banking technological innovations and argue that technological innovations are driven by three major constructs: customer engagement, customer experience, and customer satisfaction. Figure 1 illustrates this conceptual model. In the present study, the researchers measure the impact of technological innovation in banking on customer satisfaction and a mediating role of customer engagement and experience. The below are the important aspects where technological innovations have high impact on Customer engagement, experience, and satisfaction.

Figure -1: Impact of Banking Technological Innovations on Customer Engagement, Experience and Satisfaction.

Banking Technological Innovations   Customer Engagement
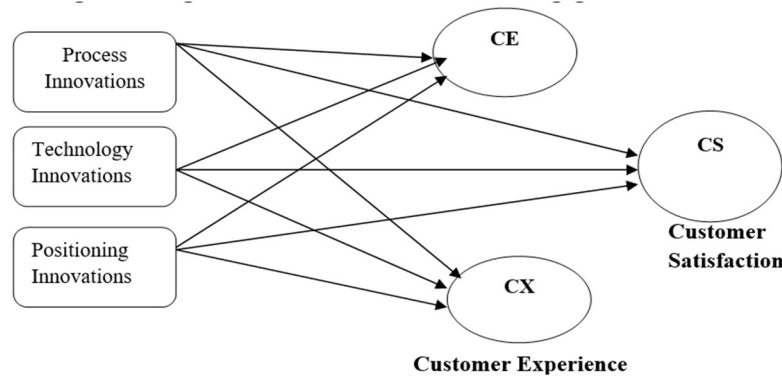
Source: Researchers contribution

H₀₄: There is no significant impact of banking innovations on CE, CX and CS
A relationship between exogenous variables and their impact on the innovation of commercial banks is depicted in the model presented above. Additionally, the model demonstrates how these variables influence customer engagement, experience, and satisfaction with regard to banking services.

3.4 Significance of the Study: The paper enhances customer understanding of innovative practices and empirically tests key variables in banking innovations, aiding commercial banks in engagement, experience and satisfaction. The present study has a structure of five sections i.e., Section - 2 discuss the theoretical framework and hypothesis development, than Section - 3 explains methodology followed by Section - 4 analyse the data and results and Section -5 depicts the discussions and Managerial implications.

4. Methodology of the study
The present study applies mixed research design encompasses of both explorative and descriptive research. The study conducted in Warangal city which is second largest city consisting of 716,457 population in Telangana state **(Telangana socio economic outlook - 2022).**

Measurement Instrument
The researchers develop a structure questionnaire for data collection and are derived from literature review. This questionnaire used Likert's five point scale starting from 1 – strongly disagree to 5-strongly agree. The questionnaire items were developed as follows: Banking Innovations (Process Innovation (8) Technological Innovations (5) and Positioning Innovations (4) statements **[4], [13], [19], [22].** Customer Engagement (15), Customer Experience (14) and Customer Satisfaction (10) items included in the questionnaire **[12], [6], [2], [8], [16], [18].**

Procedure
The study involved banking institutions conducting a survey to understand their customers' preferences for services. Participants were randomly selected from each commercial bank and asked to complete a self-administered questionnaire. The questionnaire, which was two pages long

and took 10-15 minutes to complete, asked participants to indicate what they considered important in choosing services from different banks. This study aimed to understand their perceptions and preferences in banking services.

Sample Respondents

The study involved participants from diverse age, gender, and education levels, who were selected using random sampling technique for a representative sample. Questionnaire was distributed to 75 sample respondents (customers) from SBI, CANARA, ICICI and HDFC branches through e-mail and WhatsApp in Warangal city. A total of 300 questionnaires were sent and final sample size confined to 185 only. The data analyzed using SMART PLS – 4.0 Version and Path Analysis (T-test) Bootstrapping method is applied to test the hypothesis.

Table – 1 Sample distribution

S.No	Bank Name	Questionnaire sent	Received
1	SBI	75	42
2	CANARA	75	46
3	HDFC	75	52
4	ICICI	75	45
Total		**300**	**185**

4. Analysis and Results: The data collected from the respondents are processed and analyzed using SPSS – 26 Version, SMART PLS – 4.0 with appropriate statistical tools mentioned in the methodology.

Objective -1: To measure the significant relationship between technological innovations on customer experience, engagement, and satisfaction towards public and private sector banking products and services.

H01: There is no significant no significant relationship between technological innovations on customer experience, engagement, and satisfaction towards banking services.

Table 2: Correlations and Reliability Analysis of Banking technological innovations and customer experience, engagement, and satisfaction.

Variables	CE	CX	CS	TI	α Value
CE	1				**0.872***
CX	0.470**	1			**0.824***
CS	0.317**	0.782**	1		**0.863***
BTI	0.587**	0.591**	0.493**	1	**0.822***

Source: Primary Data

Where CE: Customer Engagement; CX: Customer Experience; CS: Customer Satisfaction; and BTI: Banking Technological Innovations.

Customer Engagement is consisting 15 statements and the reliability value of Customer Engagement is 0.872. Customer Experience consisting of 14 statements and the Cronbach's Alpha value is 0.824. Customer satisfaction consisting of 10 statements and the reliability value of α is 0.863. The reliability values of CE, CX, CS and TI are ranges from 0.822 to 0.872 shows excellent internal consistency and correlation among the variables. The minimum cut – off value of Cronbach's alpha is 0.5.

Table-1 illustrates the correlation analysis among customer engagement, customer experience, customer satisfaction and technological innovations. Customer Engagement has a positive low significant relationship between customer experience (r=0.470) and customer satisfaction (r=0.317) at 1% level of significance. Customer Engagement has a moderate positive significant relationship with technological innovations (r=0.587, p < 0.01). Customer experience has a high positive significant relationship with customer satisfaction (r=0.782) and moderate positive significant relationship with technological innovations (r=0.591) at 1% significant level. Customer Satisfaction has a low positive significant relationship with technological innovations (r=0.493, p< 0.01)

Objective-2: to analyse the impact of technological innovations on customer experience, engagement, satisfaction and loyalty towards banking services

H_{02}: There is no significant impact of technological innovations on customer experience, engagement, satisfaction and loyalty towards banking services.

Table – 3 Summary of Direct effect of Banking Technological Innovations on Customer Engagement, Experience and Satisfaction

Direct Effect	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
CE -> CS	-0.078	-0.077	0.046	1.702	0.089
CX-> CS	0.659	0.656	0.043	15.252	0.000
Pos Inn -> CS	**0.091**	**0.090**	**0.038**	**2.378**	**0.017**
Pos Inn -> CE	**0.364**	**0.363**	**0.048**	**7.549**	**0.000**
Pos Inn -> CX	**0.181**	**0.179**	**0.051**	**3.588**	**0.000**
Proc Inn -> CS	**0.254**	**0.252**	**0.044**	**5.835**	**0.000**
Proc Inn -> CE	**0.252**	**0.252**	**0.068**	**3.705**	**0.000**
Proc Inn -> CX	**0.415**	**0.414**	**0.058**	**7.212**	**0.000**
Tech Inn -> CS	0.041	0.041	0.043	0.955	0.340
Tech Inn -> CE	0.048	0.046	0.071	0.682	0.495
Tech Inn -> CX	0.068	0.068	0.067	1.014	0.311

Source: Primary Data

Where, Pos Inn – Positioning Innovations; Proc Inn – Process Innovations and Tech Inn – Technology Innovations.

Affect of banking technological innovations on customer engagement, experience and satisfaction using path analysis (bootstrapping method) depicted in table -2. The results shows that customer experience has a significant relationship with customer satisfaction (T=15.252, p < 0.01). Positioning Innovation has a significant relationship with customer satisfaction (T=2.378), customer engagement (T=7.549), and customer experience (T=3.588) at 5% level of significance. Process Innovation has a significant relationship with customer satisfaction (T=5.835, p<0.05), customer engagement (T=3.705, p < 0.05) and customer experience (T=7.212, p < 0.05). Technology Innovation does not have any significant relationship with customer satisfaction, engagement and experience.

Table – 4 Summary of Indirect Effect of Banking Technological Innovations on Customer Engagement, Experience and Satisfaction

Indirect Effect	Original sample (O)	Sample mean (M)	(STDEV)	T statistics (|O/STDEV|)	P values
Pos Inn -> CX -> CS	-0.028	-0.028	0.017	1.667	0.095
Proc Inn -> CX -> CS	0.274	0.272	0.043	6.315	0.000
Tech Inn -> CX -> CS	0.045	0.045	0.044	1.011	0.312
Proc Inn -> CE -> CS	-0.020	-0.020	0.014	1.446	0.148
Tech Inn -> CE -> CS	-0.004	-0.004	0.007	0.558	0.577

Source: Primary Data

The results of indirect effect of banking technological innovations on customer engagement (CE), customer experience (CX). The path analysis (indirect effect) results shows that Process Innovation has a signification relationship with customer experience that leads to customer satisfaction (T=6.315, p<0.05). The other indirect effects are not significant towards customer satisfaction with process innovation and customer experience (T=1.667, p>0.05). Technological innovations and customer experience are not significant related towards customer satisfaction (T=1.011, p>0.05). It is also observe that, Process innovation -> Customer engagement ->Customer satisfaction do not have significant relationship (T=1.446, p>0.05) and Technology innovation -> Customer engagement ->Customer satisfaction does not have significant relationship (T=0.558, p>0.05).

Figure -2 Impact of Banking Technological Innovations on Customer Engagement, Experience and Satisfaction.
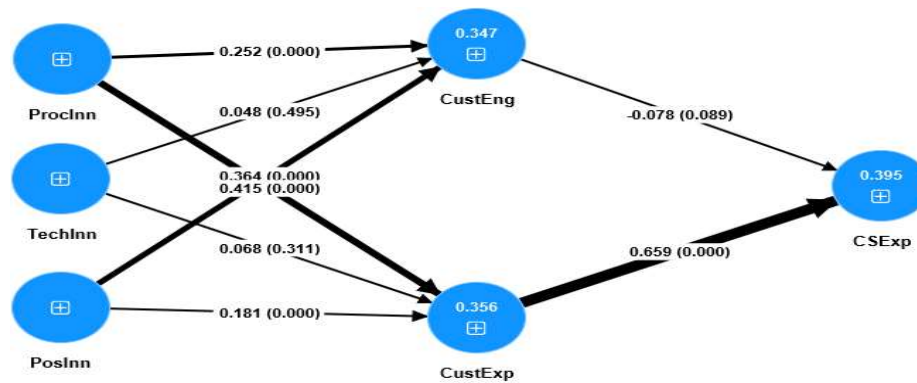
5. Discussion

The study examines the influence of banking technological innovations on customer engagement (CE), customer experience (CX) and customer satisfaction (CS). The present study results illustrates that Process Innovation influences the customer experience and customer satisfaction. This is consistent with previous research studies [7], [1]. This indicates that banks must offer the novel technological innovations in all the level to adopt, access for better customer experience and engagement. There is a strong association between customer experience and customer satisfaction suggests that, banks offers technology innovations provides easy to access, time saving and simple to deliver the services. Cutting edge innovations in the banking industry have revolutionized banking services, enhancing customer experiences and enabling seamless transactions. Technological Innovation has a moderate relationship between customer engagement and customer experience. This result is supported by the earlier works of [3], [7]. Positioning Innovation and Process Innovation has a significant relationship with Customer Experience, Customer Engagement and Customer Satisfaction. This results is consistent with the prior work of [18], [14], [19]. Additionally, the study also found that there is no significant relationship between customer engagement and satisfaction. Technology Innovations towards customer engagement, customer experience and customer satisfaction. At the first level, customers are resistant to use the technology innovations. This may be a cause for insignificant relationship. This result is contradicted with [6]. The study has ignored few factors that might affect on the customer engagement, experience and satisfaction. These factors namely customer behavioral intention, technological readiness, access to various technological innovations may affect the present study. The study is limited to assess the influence of banking technological innovations on customer engagement, experience and satisfaction.

6. Conclusion and Research Implications

The study provides insights of banking technological innovations affect on customer engagement, customer experience and customer satisfaction in Warangal city of Telangana state. Banking technological innovations are introduced to reduce the cost of operations, enhance the operational efficiency and avoid the competition. These technological innovations help the banks for better customer satisfaction and attract the new customers in the competitive market.

Research Implications

The banking management could benefit a lot from this study, as the results report positive relationships between banking technological innovations, customer experience and customer satisfaction. However, bank management establishes back end support 24/7 to operate these banking technological innovations in a cost effective manner. This helps the customers for better customer engagement (accessible and affordable), customer experience (real time assistance, escalation of problem, grievance and redressal mechanism, quick response from bank) and enhance customer satisfaction.

Limitations and scope for future research

The study is a cross sectional survey and conducted in Warangal city of Telangana state. The sample responses are low and limited to 185 only. These results are not generalized due to its sample size. These empirical results may be conducted in other cities of Telangana state also and may add include these variables customer loyalty and readiness, adoption and access to technological innovations.

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