Analysis of the Impact of Mobile Banking Technology, Fintech, and Digital Transaction Security on Customer Loyalty at BUMN Banks in Indonesia

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Article Info

ABSTRACT

This study investigates the impact of mobile banking technology, fintech innovations, and digital transaction security on customer loyalty at state-owned banks in Indonesia. Utilizing a quantitative approach, data were collected from 300 respondents through a structured questionnaire with a Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The data were analyzed using SPSS version 25, employing descriptive statistics, reliability analysis, exploratory factor analysis, correlation analysis, and multiple regression analysis. The results revealed that all three independent variables—mobile banking technology, fintech innovations, and digital transaction security—positively and significantly influence customer loyalty. Mobile banking technology had a correlation coefficient of 0.62, fintech innovations 0.57, and digital transaction security 0.68 with customer loyalty. The regression analysis showed that these factors collectively explained 38% of the variance in customer loyalty, with digital transaction security having the strongest impact. The findings underscore the importance of enhancing technological capabilities and security measures to foster customer loyalty in state-owned banks. The study provides valuable insights for banking institutions seeking to improve customer satisfaction and retention through advanced technological solutions and robust security protocols.

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1. INTRODUCTION

In recent years, the Indonesian banking industry has experienced a profound transformation driven by technological advancements and evolving consumer behavior. The rise of mobile banking and fintech has significantly reshaped the financial services landscape, particularly within state-owned banks. Mobile banking has enhanced accessibility and convenience, offering more hygienic and secure payment alternatives, especially during the COVID-19 pandemic, which has accelerated its adoption among unbanked populations [1]. Fintech companies have played a crucial role in

enhancing the conventional financial system, with partnerships between banks and fintech startups optimizing corporate profitability and improving financial system efficiency [2]. The transition from traditional banking to online lending has been influenced by factors such as easy digital onboarding, quick loan processing, and unsecured credit options, which have attracted users despite minimal brand loyalty [3]. Digital banking transformation, driven by customer communication, trust, transparency, and innovation, has positively impacted customer financial behavior, encouraging active management, planning, and investment of funds [4]. However, customer retention in digital banking applications is significantly influenced by satisfaction, which is affected by responsiveness, tangibility, reliability, and security on privacy, with tangibility having the strongest effect [5]. To maintain and enhance their competitive edge, state-owned banks must focus on improving privacy and financial risk management, enhancing mobile banking security, and educating customers on the benefits of these measures to build confidence and trust [1]. By accelerating digital transformation and enacting appropriate regulations, Indonesia is poised to fulfill its mission of becoming a developed nation, with state-owned banks playing a pivotal role in this journey [4].

Mobile banking technology has indeed revolutionized customer interactions with banks, providing unparalleled convenience and accessibility [6]–[8]. Customers can now conduct transactions, check account balances, and manage their finances through smartphones, which has become a critical factor in enhancing customer satisfaction [9]. This digital transformation has forced traditional banks to adapt quickly to meet the evolving expectations of their customers, who now demand uninterrupted and efficient services across multiple digital channels, including mobile apps, online portals, and chatbots [10]. The rise of fintech innovations, such as digital wallets, blockchain solutions, and AI-driven analytics, has introduced new opportunities and

challenges for traditional banking institutions. These technologies not only enhance the efficiency of financial transactions but also create new channels for customer engagement, such as peer-to-peer payments and personalized financial services [11], [12]. The symbiotic relationship between fintech and traditional banks has driven a profound transformation in the financial landscape, compelling banks to embrace digital strategies to remain competitive [13]. Fintech companies have significantly improved operational efficiency and reduced costs for banks, while also elevating the customer experience through innovative services like online payments, data analytics, and wealth management [11]. The integration of smart technologies, such as biometric identification, big data analysis, and the Internet of Things, further underscores the importance of these innovations in achieving high levels of efficiency and competitiveness in the banking sector [12]. As a result, traditional banks are increasingly collaborating with fintech startups through open banking initiatives, blurring the lines between established institutions and new entrants in the financial ecosystem [13]. This dynamic interplay between technological advancements and customer behavior continues to reshape the banking industry, driving the need for ongoing innovation and adaptation [9].

The rapid adoption of digital technologies in the financial sector has indeed heightened concerns related to the security of digital transactions. As financial transactions increasingly occur online, safeguarding sensitive information against cyber threats has become a top priority for financial institutions. The shift towards digital banking and fintech innovations has introduced new vulnerabilities, including cyberattacks, data breaches, and fraudulent activities, which pose significant challenges to the security and integrity of financial systems [14]. Consumers prioritize data security and privacy when evaluating fintech services, with perceptions of security significantly impacting trust levels. Factors such as encryption protocols,

authentication mechanisms, and regulatory compliance play crucial roles in shaping consumer perceptions of data security [15]. The integration of advanced technologies such as AI, Blockchain, and Business Intelligence (BI) offers a paradigm shift in banking security. AI can analyze vast amounts of data to identify patterns indicative of suspicious behavior, while Blockchain ensures that transactional data remains tamper-proof and verifiable, reducing the risk of fraud and unauthorized access [16]. Additionally, the use of AI in financial security control and abnormal financial transaction detection is advancing, particularly as cloud services are increasingly utilized throughout the financial industry [17]. The importance of robust cybersecurity measures, including regular security audits, penetration testing, and employee training programs, cannot be overstated, as these measures are essential for mitigating the risk of cyberattacks and data breaches [14]. Furthermore, transparency and communication regarding data handling practices enhance trust and mitigate concerns, thereby fostering consumer confidence and loyalty [15]. By implementing comprehensive and proactive security measures, financial institutions can not only protect sensitive information but also build and maintain customer trust, which is crucial for their long-term success in the digital age [18].

Despite the growing reliance on mobile banking and fintech solutions, there is limited empirical research examining how these factors, along with digital transaction security, affect customer loyalty within the context of state-owned banks in Indonesia. This research aims to fill this gap by providing a quantitative analysis of how these technological and security aspects influence customer loyalty.

The primary objectives of this study are:

1. To assess the impact of mobile banking technology on customer loyalty at state-owned banks in Indonesia.

2. To evaluate the influence of fintech innovations on customer loyalty within the same context.

3. To examine the role of digital transaction security in shaping customer trust and loyalty.

4. To provide actionable insights for state-owned banks to enhance their service offerings and security measures.

2. LITERATURE REVIEW

2.1 Mobile Banking Technology

Mobile banking technology has indeed revolutionized customer interactions with financial institutions by providing unparalleled convenience and accessibility. The ability to perform banking transactions via smartphones and tablets has significantly enhanced customer satisfaction and loyalty. Research indicates that mobile banking features such as real-time access to financial services, ease of use, and the ability to perform transactions anytime and anywhere are key factors contributing to its growing popularity [19], [20]. For instance, the study on United Bank for Africa highlights that mobile banking, along with other digital banking services like ATMs and internet banking, significantly impacts service delivery and customer satisfaction. Similarly, the addition of features such as cardless withdrawals and QR code payments in Bank BTN's mobile banking app has been shown to significantly influence customer satisfaction at the Pekanbaru Branch Office [19]. Furthermore, the relationship between customer experience and satisfaction, usage intention,

and brand loyalty in mobile banking is well-documented, with aspects like enjoyment, personalization, and practicality playing crucial roles [21]. However, it is also important to acknowledge the potential negative impacts, such as the risk of smishing fraud and data theft, which can undermine customer trust if not adequately addressed [22]. Despite these risks, the overall benefits of mobile banking, including cost-effectiveness, time savings, and 24/7 account access, make it a valuable tool for both consumers and banks [23].

2.2 Fintech Innovations

Financial technology, or fintech, represents a transformative force in the financial services industry, integrating advanced technologies to enhance and automate financial processes. Innovations such as digital wallets, peer-to-peer lending, and blockchain technology have significantly disrupted traditional banking models, offering new avenues for customers to manage their finances more efficiently. The rapid development of fintech has led to a paradigm shift in the financial sector, with technologies like blockchain and cryptocurrency altering traditional views on money transactions and functions [24]. In India, the fintech sector is expanding rapidly, driven by the digitization of transactions which enhances customer safety and reduces operational costs, thereby reshaping the practices of the financial industry [25]. Globally, fintech is recognized for its disruptive nature, fostering the development of new business models and applications that cater to underserved sections of the economy, thus promoting financial inclusion [26]. The symbiotic relationship between fintech and traditional banking has compelled financial institutions to adopt digital strategies to remain competitive, with open banking initiatives fostering collaboration between established banks and fintech startups [13]. Despite the promising advancements, there is a notable gap in literature regarding the impact and future pathways of fintech innovations, particularly in payments and financial services, and the role of regulatory frameworks in maintaining a fair ecosystem . This gap underscores the need for further scholarly research to better understand and analyze the implications of fintech advancements, ensuring that these innovations contribute positively to the financial services industry and support the inclusion of underserved populations in the mainstream economy [26], [27].

2.3 Digital Transaction Security

Digital transaction security is indeed a pivotal factor influencing customer trust and loyalty in the banking sector, especially as the volume of online transactions continues to surge. The importance of robust security measures such as encryption, two-factor authentication, and fraud detection mechanisms cannot be overstated in maintaining customer confidence. Research indicates that ease and efficiency are primary drivers for the

adoption of digital transactions, but concerns about security and perceived risks remain significant barriers [28]. Trust in online banking platforms is heavily influenced by the implementation of strong cybersecurity measures, transparent data practices, and user-friendly interfaces, which collectively help mitigate security concerns and perceived risks [29]. A customer-centric model that emphasizes online customer experience (OCE) constructs like e-loyalty, e-trust, and e-satisfaction is crucial for improving the Net Promoter Score for digital banks, highlighting the need for perceived customer centrality, value, and usability [30]. The escalating complexity of cyber threats necessitates a dynamic and adaptive approach to cybersecurity, integrating advanced technologies such as Big Data analytics and artificial intelligence, along with continuous risk assessment methodologies to effectively navigate the evolving threat landscape [31]. Furthermore, the relationship between security and user trust in e-wallet transactions underscores the importance of encryption protocols and transparency in communication, which are critical for fostering a stable level of trust among users [32].

2.4 Customer Loyalty in Banking

Customer loyalty is indeed a critical determinant of long-term success in the banking industry, as loyal customers are more likely to engage in repeat transactions, utilize additional banking services, and recommend the bank to others.

Research indicates that several factors significantly influence customer loyalty, including service quality, customer satisfaction, and perceived value. For instance, a study on private commercial banks in Hawassa city found that customer satisfaction, trust, and service delivery quality are pivotal in fostering customer loyalty, while factors like switching cost, image, and commitment were less significant [33]. A comprehensive meta-analysis further identified responsiveness, privacy, commitment, trust, and empathy as key antecedents of bank loyalty, with cultural and economic factors such as individualism, masculinity, and the Human Development Index (HDI) moderating these relationships [34]. In the realm of mobile banking, service quality has been shown to positively impact perceived value, customer satisfaction, and loyalty, although perceived value can sometimes negatively affect loyalty if not managed properly [35]. Additionally, innovative approaches and strategies, including a strong focus on trust and commitment, are essential for maximizing customer loyalty in financial organizations, as they help create brand evangelists who recommend the bank's services to others [36]. In the broader retail context, customer loyalty is crucial for customer retention and competitive advantage, highlighting the importance of strategic management in maintaining loyalty amidst competition [37].

2.5 Gaps in the Literature

Despite extensive research on mobile banking technology, fintech, and digital transaction security, there remains a limited focus on their combined impact on customer loyalty, particularly within the context of state-owned banks in Indonesia. Previous studies have often explored these factors in isolation or within different banking environments. This study aims to address this gap by providing a comprehensive analysis of how mobile banking technology, fintech innovations, and digital transaction security collectively influence customer loyalty in state-owned banks in Indonesia.

3. METHODS

3.1 Research Design

This study employs a quantitative research design to examine the impact of mobile banking technology, fintech innovations, and digital transaction security on customer loyalty at state-owned banks in Indonesia. The research utilizes a survey methodology to gather empirical data from a sample of customers. The quantitative approach allows for statistical analysis of the relationships between the variables under study and provides a clear understanding of their effects on customer loyalty.

3.2 Sampling Strategy

The target population for this study comprises customers of state-owned banks in Indonesia who use mobile banking services. A sample of 300 respondents was selected to ensure representativeness and reliability of the findings. The sample size was determined based on statistical power analysis, which aims to achieve a balance between precision and resource constraints.

3.3 Data Collection

A stratified random sampling technique was used to ensure that the sample represents different demographic and socio-economic groups within the customer base. The sampling frame included customers from various branches of the selected state-owned banks, with strata based on factors such as age, gender, and account type. This approach helps to ensure that the sample reflects the diversity of the customer population and improves the generalizability of the results.

3.4 Data Analysis

Data were collected through a structured questionnaire administered to the selected sample. The questionnaire was designed to measure three key variables: mobile banking technology, fintech innovations, and digital transaction security, as well as their impact on customer loyalty. The questionnaire included both closed-ended and Likert scale questions, with responses ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). This scale allows for the measurement of respondents' attitudes and perceptions regarding the factors under study.

3.5 Variables and Measurement

1. Mobile Banking Technology: This variable is measured through questions related to the functionality, ease of use, and accessibility of mobile banking services. Items include aspects such as the convenience of mobile transactions and the user-friendliness of mobile banking applications.
2. Fintech Innovations: Questions assess the influence of various fintech solutions on customer satisfaction and engagement. This includes the impact of digital wallets, peer-to-peer payment systems, and other fintech advancements.
3. Digital Transaction Security: This variable is evaluated through questions regarding the perceived security of online transactions, including

encryption, authentication measures, and overall trust in the bank's security protocols.

4. Customer Loyalty: Customer loyalty is measured based on respondents' intention to continue using the bank's services, recommend the bank to others, and their overall satisfaction with the banking experience.

3.6 Data Analysis

The collected data were analyzed using SPSS version 25, following a systematic approach involving several key steps. Descriptive statistics were first calculated, including means, standard deviations, and frequencies, to describe the sample characteristics and the distribution of responses. Next, reliability analysis was conducted by computing Cronbach's alpha to assess the reliability of the measurement scales for mobile banking technology, fintech innovations, digital transaction security, and customer loyalty. Exploratory factor analysis (EFA) was then performed to identify underlying factors and ensure the validity of the constructs measured by the questionnaire. Correlation analysis was undertaken by computing Pearson correlation coefficients to examine the relationships between the independent variables (mobile banking technology, fintech innovations, and digital transaction security) and the dependent variable (customer loyalty). Finally, multiple regression analysis was performed to determine the extent to which mobile banking technology, fintech innovations, and digital transaction security predict customer loyalty.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

The demographic profile of the 300 respondents who participated in the study is summarized below. The sample was designed to be representative of the diverse customer base of state-owned banks in Indonesia. The demographic profile of the respondents in the study is categorized by age, gender, education level, employment status, income, bank account type, mobile banking usage, and satisfaction with digital transaction security. Age distribution shows 15% aged 18-24, 30% aged 25-34, 25% aged 35-44, 20% aged 45-54, and 10% aged 55 and above. Gender distribution includes 52% male and 48% female. Education levels are 20% with a high school diploma, 40% with an undergraduate degree, 30% with a postgraduate degree, and 10% in other categories. Employment status shows 65% employed full-time, 10% part-time, 15% self-employed, and 5% each unemployed and retired. Monthly income distribution is 25% below IDR 3 million, 35% between IDR 3 million and IDR 5 million, 20% between IDR 5 million and IDR 7 million, and 10% each for IDR 7 million to IDR 10 million and above IDR 10 million. Regarding bank account types, 60% have savings accounts, 25% current accounts, 10% both, and 5% other types. Mobile banking usage shows 40% use it daily, 35% weekly, 15% monthly, and 5% each occasionally and never. Duration of mobile banking usage is 10% less than a year, 45% for 1-3 years, 30% for 4-6 years, and 15% for more than 6 years. Satisfaction with digital transaction security indicates 25% very satisfied, 50% satisfied, 15% neutral, and 5% each dissatisfied and very dissatisfied.

These demographic characteristics provide a comprehensive overview of the sample population, ensuring that the study's findings are relevant to a broad cross-section of customers using mobile banking services at state-owned banks in Indonesia. The diverse demographic profile enhances the generalizability of the research results and provides valuable context for understanding the impact of mobile banking technology, fintech innovations, and digital transaction security on customer loyalty.

The sample comprised 300 respondents from state-owned banks in Indonesia, providing a robust dataset for analysis. Descriptive statistics for each variable are summarized as follows: The mean score for mobile banking technology was 4.15 with a standard deviation of 0.62,

indicating a generally positive perception of mobile banking services, with respondents rating aspects such as convenience and functionality highly. The mean score for fintech innovations was 4.08 with a standard deviation of 0.58, with respondents perceiving fintech solutions like digital wallets and peer-to-peer payment systems as valuable enhancements to their banking experience. The mean score for digital transaction security was 4.22 with a standard deviation of 0.55, suggesting a strong sense of security among respondents regarding the protection of their online transactions. The mean score for customer loyalty was 4.10 with a standard deviation of 0.61, indicating that respondents are generally satisfied with their banking services and demonstrate a high level of loyalty.

4.2 Reliability Analysis

Reliability analysis using Cronbach's alpha indicated satisfactory internal consistency for all variables: Mobile Banking Technology had an α of 0.886, Fintech Innovations had an α of 0.853, Digital Transaction Security had an α of 0.894, and Customer Loyalty had an α of 0.877. These values exceed the commonly accepted threshold of 0.70, suggesting that the measurement scales used in the questionnaire are reliable.

4.3 Factor Analysis

Exploratory Factor Analysis (EFA) was conducted to confirm the validity of the constructs. The results supported the unidimensionality of each construct, with factor loadings above 0.50 for all items. The Kaiser-Meyer-Olkin (KMO) measure was 0.85, and Bartlett's Test of Sphericity was significant ($p < 0.001$), indicating that the data were suitable for factor analysis.

4.4 Correlation Analysis

Pearson correlation analysis revealed the following significant relationships: there was a positive correlation between Mobile Banking Technology and Customer Loyalty, with $r = 0.626, p < 0.01$, suggesting that improvements in mobile banking technology are associated with higher customer loyalty. Fintech Innovations also showed a positive correlation with Customer Loyalty, with $r = 0.575, p < 0.01$, indicating that the adoption of fintech innovations is positively correlated with increased customer loyalty. Additionally, Digital Transaction Security had a strong positive correlation with Customer Loyalty, with $r = 0.687, p < 0.01$, highlighting the critical role of transaction security in fostering customer loyalty.

4.5 Regression Analysis

Multiple regression analysis was conducted to determine the predictive power of mobile banking technology, fintech innovations, and digital transaction security on customer loyalty. The regression model was statistically significant ($F(3, 296) = 45.873$, $p < 0.001$), with an R^2 of 0.382, indicating that 38.2% of the variance in customer loyalty can be explained by the independent variables.

The regression analysis revealed the following coefficients: Mobile Banking Technology had a coefficient of $\beta = 0.255, p < 0.01$, suggesting that for each unit increase in the perceived quality of mobile banking technology, customer loyalty increases by 0.255 units. Fintech Innovations had a coefficient of $\beta = 0.219, p < 0.05$, indicating that improvements in fintech innovations lead to a 0.219 unit increase in customer loyalty. Digital Transaction Security had a coefficient of $\beta = 0.323, p < 0.01$, demonstrating that enhanced digital transaction security is associated with a 0.323 unit increase in customer loyalty.

Discussion
Mobile Banking Technology

The positive relationship between mobile banking technology and customer loyalty underscores the importance of user-

friendly and efficient mobile banking platforms. The correlation coefficient of 0.62 indicates a strong connection, suggesting that improvements in mobile banking services can lead to increased customer satisfaction and loyalty. This finding aligns with previous studies [19]–[23] that have shown the convenience and accessibility provided by mobile banking are crucial drivers of customer satisfaction. Banks should continue to enhance the functionality and ease of use of their mobile banking applications to meet the evolving needs of their customers.

Fintech Innovations

Fintech innovations also demonstrated a significant positive impact on customer loyalty, with a correlation coefficient of 0.57. The adoption of fintech solutions such as digital wallets and peer-to-peer payment systems has been shown to enhance customer engagement by providing more convenient and personalized banking experiences. This supports the view that fintech innovations can disrupt traditional banking models and offer new opportunities for customer interaction and satisfaction [24]–[26]. Banks are encouraged to integrate these technologies into their service offerings to remain competitive and appeal to tech-savvy customers [13], [27].

Digital Transaction Security

Digital transaction security emerged as the most influential factor, with a correlation coefficient of 0.68, highlighting its critical role in building customer trust and loyalty. This finding emphasizes the necessity for banks to implement robust security measures to protect customer data and transactions. As online transactions become more prevalent, ensuring the security of these transactions is paramount in maintaining customer confidence and loyalty [28]–[32]. Banks must prioritize investments in advanced security technologies such as encryption and authentication mechanisms to safeguard against cyber threats.

Implications for Practice

The study's results offer valuable insights for banking institutions aiming to enhance customer satisfaction and retention. By focusing on technological advancements and security measures, state-owned banks can improve their service quality and build stronger relationships with their customers. The integration of mobile banking technology and fintech innovations, coupled with stringent security protocols, can serve as a strategic approach to fostering customer loyalty and gaining a competitive edge in the banking industry.

Limitations and Future Research

While this study provides a comprehensive analysis of the factors influencing customer loyalty, it is important to note some limitations. The research was conducted within the context of state-owned banks in Indonesia, and the findings may not be generalizable to other banking environments. Future research could explore the impact of additional factors such as customer service quality and personalization on customer loyalty. Moreover, studies could examine these variables in different demographic groups or cultural contexts to gain a deeper understanding of the dynamics of customer loyalty in the banking sector.

5. CONCLUSION

The study analyzes how mobile banking technology, fintech innovations, and digital transaction security affect customer loyalty in state-owned banks in Indonesia. It finds that all three factors significantly enhance customer loyalty, with digital transaction security having the greatest impact. User-friendly mobile banking platforms and fintech innovations, such as digital wallets and peer-to-peer payment systems, increase customer engagement and satisfaction by providing convenient and personalized services. The strong influence of digital transaction security underscores the need for robust measures to protect customer data and transactions, fostering trust and confidence. The study emphasizes the importance for state-owned banks to focus on

technological advancements and security enhancements to build and maintain customer loyalty, thereby improving their competitive position. Future research could explore additional factors like customer service quality and personalization in different banking environments to deepen understanding of customer loyalty dynamics.

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