The Effect of Digital Banking, Digital Financial Literacy, and Service Innovation on Customer Loyalty Through Digital Banking Application User Satisfaction

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Abstract

The development of digital technology encourages banks to improve the quality of services through digital banking to maintain customer loyalty. This study aims to analyze the influence of digital banking, financial literacy, and service innovation on customer loyalty through the satisfaction of digital banking application users at Bank BJB Cilegon Branch. This study used a quantitative approach with a survey method through the distribution of questionnaires to users of the digital banking application of Bank BJB Cilegon Branch. The data obtained was analyzed using statistical analysis to test the influence of variables partially or simultaneously, as well as test the role of user satisfaction as a mediating variable. The results of the study show that digital banking has a positive and significant effect on the loyalty of digital banking application users. Digital financial literacy has also been proven to have a positive and significant effect on user loyalty, which shows that customer understanding and ability to manage digital financial services encourages increased loyalty. In addition, service innovation has a positive and significant effect on the loyalty of digital banking application users. User satisfaction has a strong influence on user loyalty, where a high level of satisfaction will increase customer loyalty in using digital banking applications. Simultaneously, digital banking, financial literacy, and service innovation have a positive and significant effect on customer loyalty through user satisfaction of digital banking applications.

INTRODUCTION

The global financial services industry is undergoing a profound transformation driven by rapid advancements in digital technology (Arcot et al., 2024; Bisht et al., 2022; Osei et al., 2023; Raviteja, 2024). This shift has moved banking services from traditional brick-and-mortar branches to sophisticated digital platforms, fundamentally altering how customers interact with their financial institutions. The proliferation of smartphones, increased internet penetration, and the emergence of tech-savvy generations have accelerated the adoption of digital banking as the primary channel for financial transactions worldwide. This paradigm shift presents both immense opportunities and significant challenges for banks striving to maintain relevance and competitiveness in a crowded marketplace (Vives, 2019; Gomber et al., 2018).

In the context of national banking, Bank BJB as one of the regional development banks shows a strong commitment to *digital transformation* through the development of the *bjb DIGI* application and the integration of various service innovations such as *mobile banking*, QRIS, and *BI-FAST*. The growth in the number of *bjb DIGI* users, which has consistently increased

from year to year, reflects the success of Bank BJB's digitalization strategy in responding to (Bank BJB, 2024).

However, the rapid adoption of *digital services* has not been fully balanced with an adequate level of digital financial literacy of the community. Data from the National Survey on Financial Literacy and Inclusion shows that there is still a gap between the level of inclusion and financial literacy, which has the potential to pose a risk of suboptimal use of digital services and reduced user satisfaction (OJK, 2023; OECD, 2023). A low understanding of security, service features, and digital financial management can affect the user experience and ultimately undermine customer loyalty.

Therefore, the success of *digital banking* is not only determined by the sophistication of technology and the intensity of service innovation, but also by the ability of customers to understand and utilize the service effectively. User satisfaction *of digital* banking applications is a key factor that mediates the influence of *digital banking*, digital financial literacy, and service innovation on customer loyalty. In line with the findings of Accenture (2023) and PwC (2024), a positive and satisfying digital experience has been proven to strengthen customer loyalty and encourage long-term commitment to service providers.

This research is designed with the primary objective of analyzing the influence of digital banking, digital financial literacy, and service innovation on customer loyalty, both directly and indirectly, through the mediation of user satisfaction at Bank BJB Cilegon Branch.

Theoretically, this research aims to contribute to the body of knowledge in financial services marketing and technology adoption by integrating and testing these constructs in a unified mediation model. Practically, the findings are expected to provide Bank BJB's management with valuable, data-driven insights for formulating more effective strategies. These strategies could focus on enhancing specific aspects of the digital application, designing targeted digital financial education programs for customers, and prioritizing user-centric innovations, all aimed at ultimately boosting customer satisfaction and securing long-term loyalty in the competitive digital era.

Thus, research on the influence of *digital banking*, digital financial literacy, and service innovation on customer loyalty with user satisfaction as a mediating variable is very relevant to be conducted. This study not only contributes to the development of digital banking literature, but also provides practical implications for Bank BJB in formulating strategies to improve service quality, digital financial education, and sustainable innovation to build customer loyalty in the era of *digital transformation.*

Digital Banking

Digital banking is a form of comprehensive transformation in the banking industry that not only represents the shift of services to *digital channels*, but also reflects fundamental changes in business models, operational processes, organizational structures, and value creation strategies for customers. The Financial Services Authority (2018) emphasizes that *digital banking* is designed to improve speed, convenience, security, and end-to-end customer experience, in line with academic views that position *digital banking* as part of technology-based organizational transformation (Acosta-Prado et al., 2024).

Theoretically, *digital banking* integrates the dimensions of technology, services, organizations, ecosystems, as well as regulation and risk management. This integration allows banks to improve operational efficiency, expand financial inclusion, and strengthen

competitiveness in the digital economy era (Vives, 2019; OECD, 2023). This approach also places *digital banking* as a link between *the bank's digital capabilities* and financial performance, customer satisfaction, and long-term sustainability (Gomber et al., 2018).

From the perspective of user acceptance, various studies show that the adoption *of digital banking* is influenced by behavioral and psychological factors described in the framework of *the Unified Theory of Acceptance and Use of Technology* (*UTAUT*). Constructs such as *performance expectancy, effort expectancy, social influence, facilitating conditions*, and hedonistic motivation have proven to be significant in encouraging the intention and sustainable use of digital banking services (Venkatesh et al., 2012; Wahyuningsih et al., 2025). This indicates that the success of *digital banking* does not only depend on the sophistication of the system, but also on user perception and experience.

In addition to technology and behavioral factors, empirical research also confirms the important role of trust, *self-efficacy,* and *enjoyment* in increasing the acceptance of *mobile banking*, especially among the younger generation. Fitriati et al. (2024) found that emotional and psychological aspects contribute significantly to the intention of use, thus reinforcing the view that a pleasant and safe digital experience is a key determinant of the adoption of modern financial technology.

Furthermore, *the* dimensions of digital service quality and service continuity are key elements in building customer loyalty and bank reputation. Reliable , secure, consistent, and user-oriented digital services significantly increase the intention of sustainable use and strengthen long-term relationships between customers and banks (Rahardjo & Darma, 2025; Parasuraman et al., 2005). Indicators such as ease of service, time efficiency, security, and customer satisfaction are the main benchmarks in evaluating the effectiveness of *digital banking implementation* (Kasman & Ruslan, 2023).

Thus, it can be concluded that *digital banking* is a core strategy of *modern* banking that integrates technological innovation, service quality, and user experience to create satisfaction, loyalty, and a sustainable competitive advantage. The success of *digital banking* is not only determined by technology investment, but also by banks' ability to build trust, increase digital literacy, and deliver service innovations that focus on customer value and needs (Accenture, 2023; PwC, 2024).

Digital Financial Literacy

Digital financial literacy is an essential competency in the era of financial system transformation that is increasingly digitalized. Studies have shown that digital financial literacy includes not only understanding traditional financial concepts, but also the ability of individuals to use digital technology to effectively manage, make decisions, and mitigate financial risks. The integration between financial literacy and digital literacy makes this concept multidimensional and contextual to the development of modern financial technology (Pratama & Wardhana, 2023; Nugroho & Handayani, 2023).

Conceptually, digital financial literacy includes knowledge of digital financial products and services, technical skills in operating financial *platforms*, rational and responsible digital *financial behavior* , and awareness of cybersecurity risks and digital fraud. These four aspects must develop in a balanced manner so that individuals are able to utilize digital financial services optimally and safely (Pratama, 2022; Sari et al., 2022). Without this balance, the use

of financial technology has the potential to pose financial risks and vulnerabilities to digital crime.

Factors that shape digital financial literacy include financial knowledge, technological ability, financial attitudes, and experience of using digital financial services. The combination of theoretical understanding and practical experience has proven to be instrumental in increasing the level of digital financial literacy of individuals (Laily, 2022). This confirms that digital financial literacy is not only influenced by formal education, but also by the intensity of individual interaction with digital financial technology and services in daily life.

Furthermore, digital financial literacy is understood as a multidimensional concept that includes the dimension of *digital knowledge,* awareness of digital financial services, practical skills, and the ability to avoid the risk of fraud and cybercrime. The study of Choung, Chatterjee, and Pak (2023) shows that the ability to avoid *digital fraud* has a very significant influence on financial well-being, even beyond the role of financial knowledge alone. These findings affirm the importance of integration between financial literacy and digital security literacy in building individual financial resilience.

In the context of measurement, digital financial literacy indicators include digital financial literacy, digital financial behavior, and confidence in using digital financial services. The measurement model developed by Vieira, Matheis, and Lehnhart (2024) allows for a more comprehensive evaluation of digital financial literacy, taking into account the cognitive, behavioral, and psychological aspects of users. This approach is relevant for use in empirical research and digital financial policy formulation.

Thus, digital financial literacy can be summed up as a multidimensional capacity that integrates knowledge, skills, behaviors, and risk awareness in the use of technology-based financial services. A good level of digital financial literacy is a major prerequisite for individuals to participate safely and sustainably in the digital financial ecosystem, as well as being an important factor in improving financial well-being, user satisfaction, and financial system stability in the *digital era*.

Service Innovation

Service innovation is a strategic element in the development of *the modern banking industry* which plays an important role in increasing competitiveness, operational efficiency, and customer satisfaction and loyalty. Various studies show that banking service innovation is not only related to the creation of new products or features, but also includes the transformation of internal processes, business models, and customer experiences through the use of *digital technologies* such as *mobile banking*, *artificial intelligence*, *big data, and blockchain.* and the integration of secure and reliable digital systems (Maharani & Sari, 2025; Estefania & Widianto, 2024).

Conceptually, service innovation is understood as the process of adapting and recombining various elements of technology, processes, and interactions to create sustainable value for customers. This approach is in line with the view that service innovation is multidimensional and can occur at the level of processes, customer experience, brands, behaviors, and business models, thus enabling banks to provide service experiences that are more personalized, efficient, and relevant to customer needs (Gustafsson et al., 2020).

An important aspect of modern banking service innovation is characterized by strategic collaboration between banks and *fintech companies*. This collaboration allows for the

acceleration of service digitization, expansion of financial inclusion, increased operational efficiency, and strengthened transaction security. Fintech is no longer seen as a threat, but rather as a strategic partner that supports banks in creating new service models that are more adaptive and competitive (Siburian et al., 2024).

In terms of driving factors, service quality, ease of use, and security are the main determinants of the success of digital service innovation. Fast, accurate, and responsive services, supported by an intuitive application interface and multi-layered security system, have been proven to increase trust, satisfaction, and sustainability of customer use of digital services (Faradilla Silvana Azi, 2025). These factors show that service innovation must be *user-centric innovation* in order to create real value for customers.

Furthermore, banking service innovation can be explained through the dimensions of digital service accessibility , speed and efficiency of services, as well as customer acceptance and trust. These three dimensions emphasize that the success of service innovation is not only determined by technological sophistication, but also by the suitability of services to customer needs, values, and trust, especially in the context of Indonesian banking which has distinctive social and regulatory characteristics (Salsabila, 2024).

In the context of measurement, the banking service innovation indicator focuses on the quality of digital services and the level of security and customer trust. Improving access quality, system reliability, and personal data protection significantly contribute to customer satisfaction, which ultimately strengthens loyalty and long-term relationships between banks and customers (Ulfa Lutfiani, 2024).

Thus, service innovation can be summed up as an ongoing process that integrates technology, service quality, security, and strategic collaboration to create a superior customer experience. Effective service innovation not only increases customer satisfaction and loyalty, but also becomes an important foundation for the sustainability and competitive advantage of banking in the digital era .

Customer Loyalty

Customer loyalty is a long-term commitment that is reflected in customer behavior to continue to use bank products and services consistently, make repeat transactions, and show a positive attitude such as recommending banks to other parties and not easily switching to competitors. This loyalty is not only formed by satisfaction alone, but also by trust, continuous positive experiences, and emotional relationships established between customers and banks (Setiawan & Harahap, 2023; Hidayat & Yulianti, 2022; Rahmawati & Nugroho, 2024).

The main aspects underlying customer loyalty in general banking include trust and satisfaction. Trust is built through service transparency, transaction security, and institutional reputation, while satisfaction is obtained from consistent service quality, ease of access, and responsiveness to customer needs and complaints (Iskandar, 2023). These two aspects are interrelated and become the foundation in building sustainable customer loyalty.

Factors that affect customer loyalty include customer trust, service quality, and perceived value. The combination of these three factors determines the extent to which customers feel comfortable, receive commensurate benefits, and are willing to maintain a long-term relationship with the bank (Sari, 2023). The higher the level of trust, service quality, and perceived value, the stronger the customer's loyalty to the bank.

Customer loyalty is also reflected through several dimensions, including regular repurchases, use of additional products or services, willingness to recommend banks to others, and resilience to competitors' influences. These dimensions show that loyalty is not only an attitude, but also manifested in the real behavior of customers (Afifah & Kurniawati, 2021).

Thus, customer loyalty in general banking is the result of an integration between satisfaction, trust, service quality, and value felt by customers. The bank's efforts to increase loyalty must be focused on providing quality, safe, value-added services, and being able to create a continuous positive experience, so that customers are encouraged to remain loyal and establish a long-term relationship with the bank.

Service User Satisfaction

Based on theoretical studies and the results of previous research, it can be concluded that the satisfaction of users of general banking services is a positive emotional response of customers that arise when the services received are able to meet or exceed their expectations (Kotler & Keller, 2016; Zeithaml et al., 2021). This satisfaction is formed through the process of evaluating customers on the service experience which includes service quality, ease of access, transaction speed, security, facilities, and personal interaction between banks and customers (Tjiptono, 2017; Putra & Dewi, 2023).

Conceptually, service user satisfaction is not only influenced by the quality of banking products, but is highly dependent on the quality of service as a whole (Parasuraman et al., 1988). Aspects such as service reliability, staff responsiveness, security assurance, empathy, and physical evidence of service are important elements in shaping customers' positive perceptions of banks (Zeithaml et al., 2021). Consistent and holistic management of these aspects has been proven to significantly increase customer satisfaction levels (Cronin & Taylor, 1992).

In addition, factors such as service quality, facilities and infrastructure, service security, ease of access, service prices and fees, trust, and overall customer experience have an important role in determining the level of satisfaction of banking service users (Rahman et al., 2022; Tjiptono, 2017). The dimensions of satisfaction presented in the *SERVQUAL* model are *tangible, reliability, responsiveness, assurance, and empathy*—becoming the main conceptual framework in evaluating and improving the quality of banking services (Parasuraman et al., 1988).

Service user satisfaction indicators which include service quality, ease of access, security, facilities, price, and customer experience show that satisfaction is a strategic variable that acts as a link between service quality and customer loyalty (Oliver, 1999; Rahman et al., 2022). Therefore, increasing service user satisfaction is the key to building trust, strengthening loyalty, and maintaining the sustainability and competitiveness of banks in the midst of increasingly competitive banking industry competition (Zeithaml et al., 2021).

RESEARCH METHODS

Research Methods

The type of research used in this study is quantitative research.

Variable Operations

The design of this study uses a descriptive research type.

Table 1. Variable Operations

No	*Variabel*	*Indikator*	Definisi *Variabel*	Measurement Scale
1	Digital Banking (X1)	1. Ease of Service (Ease of Service) 2. Time Efficiency (Time Saving) 3. Security (Security) 4. Customer Satisfaction (Customer Satisfaction)	Digital Banking is an organizational transformation that combines technological capabilities, organizational strategies, and bank business results (Acosta-Prado et al., 2024; Kasman & Ruslan, 2023).	Likert 1–5
2	Digital Financial Literacy (X2)	1. Digital Financial Knowledge 2. Digital Financial Behavior 3. Digital Financial Confidence	Digital financial literacy is the knowledge, skills, and attitudes in using technology-based financial services and instruments (Pratama & Wardhana, 2023).	Likert 1–5
3	Service Innovation (X3)	1. Quality of Digital Services 2. Security and Trust	Banking service innovation is the use of advanced technology to improve efficiency, security, and quality of service.	Likert 1–5
4	Customer Loyalty (Y)	1. Customer Commitment 2. Customer Satisfaction 3. Loyalty Behavior	Customer loyalty is the repeated behavior and loyalty of customers towards the bank through consistent use of products and services (Setiawan & Haryanto, 2023).	Likert 1–5
5	User Satisfaction (Z)	1. Service Quality 2. Ease of Access 3. Service Security 4. Facilities and Infrastructure 5. Prices and Costs 6. Customer Experience	User satisfaction is the result of customer evaluation of the banking service experience, including speed, security, and access (Rahman et al., 2022).	Likert 1–5

Population and Sample

The population in this study includes all active customers of Bank BJB Cilegon Branch who use digital banking applications and meet certain criteria, namely having used the service *Digital Banking* for a minimum of six months, being a minimum of 18 years old, and having basic technology use skills in *Digital*, using a personal account, and willing to be a respondent.

From a total population of 200 active customers using digital banking, the number of samples was determined using the Slovin formula with an error rate of 5%. The results of the calculation show that the number of samples used in this study is 133 respondents.

Data Analysis

1. Hypothesis Test

a. Validity Test

The purpose of the validity test is to measure whether a questionnaire is valid or not. (Scott, 2019)

b. Reliability Test

A reliability test is a tool to measure a questionnaire that has indicators of variables or constructs. (Scott, 2019)

2. Normality Test

This study uses a questionnaire with a Likert scale, where the data obtained is ordinal-scale data.

$$sv = \frac{(\text{density at lower limit}) - (\text{density at upper limit})}{(\text{area under upper limit}) - (\text{area density under lower limit})}$$

3. Analysis Design

The data analysis method used in this study is path analysis. This method was chosen because it is able to explain the relationship and magnitude of influence between linear and causal variables. In addition, path analysis allows testing of direct and indirect influences between variables in partial or simultaneous ways. The data used in this study is interval scale and comes from the same source, so it is suitable to be analyzed using this method.
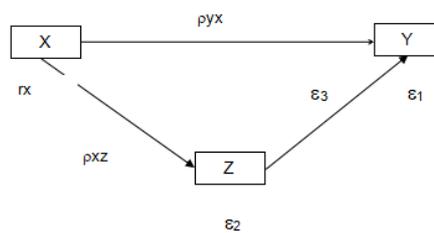
Hypothesis Testing
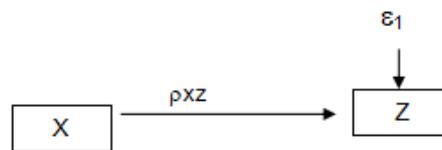

Figure 1.
Path Chart Model

Figure 2.
Sub-structure Path Diagram 1

Figure 3.
Sub-structure Path Diagram 2
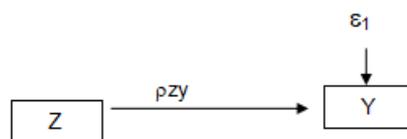
4. Hypothesis Test

This study aims to analyze the effect of digital banking, digital financial literacy, and service innovation on customer loyalty, mediated by user satisfaction of digital banking applications at Bank BJB Cilegon Branch.

5. Model Feasibility Test

The goodness-of-fit of fit test *is intended to test whether the proposed model has* a fit with the data or not.

RESULTS AND DISCUSSION

Research Results

1. Descriptive Analysis Test

Table 2. Descriptive Analysis Test

Variabel	Mean	Std Dev	Min	Max	Interpretasi
Digital Banking (X1)	3.85	1.14	1	5	The majority of respondents found digital banking services easy to use, efficient, secure, and satisfying. Responses varied moderately, indicating consistent assessments.
Digital Financial Literacy (X2)	3.84	1.15	1	5	Respondents generally have sufficient knowledge, behavior, and confidence in using digital financial services, although some still have less understanding.
Service Innovation (X3)	3.82	1.18	1	5	Digital banking service innovations were deemed quite good, encompassing service quality, security, and trustworthiness. Some respondents felt there was still room for improvement.
Customer Loyalty (Y)	3.88	1.13	1	5	The majority of respondents showed high loyalty to the bank, with repeat behavior and a commitment to using services consistently.
Service Satisfaction (Z)	3.82	1.15	1	5	Respondents were generally satisfied with the quality of service, ease of access, security, facilities, and user experience of the app. A small percentage were less satisfied.

Based on descriptive statistical analysis of 133 respondents, a picture of customer perception of five research variables was obtained, namely Digital Banking, Digital Financial Literacy, Service Innovation, Customer Loyalty, and Service User Satisfaction. All variables had an average score above 3.8 on a scale of 1–5, indicating that respondents gave a positive rating.

2. Data Quality Test

a.   Validity Test Results

Table 3. Validity Test

Variabel	Indikator	r-hitung	r-tabel (n=133, α=0.05)	Keterangan
Digital Banking (X1)	Ease of Service	0,672	0,171	Valid
	Time Efficiency	0,689	0,171	Valid
	Security	0,701	0,171	Valid
	Customer Satisfaction	0,658	0,171	Valid
Digital Financial Literacy (X2)	Digital Financial Knowledge	0,645	0,171	Valid
	Digital Financial Behavior	0,662	0,171	Valid
	Digital Financial Confidence	0,674	0,171	Valid
Service Innovation (X3)	Digital Service Quality	0,681	0,171	Valid
	Security and Trust	0,696	0,171	Valid
Customer Loyalty (Y)	Customer Commitment	0,688	0,171	Valid
	Customer Satisfaction	0,672	0,171	Valid
	Loyalty Behavior	0,679	0,171	Valid
User Satisfaction with Services (Z)	Service Quality	0,667	0,171	Valid

Variabel	Indikator	r-hitung	r-tabel (n=133, α=0.05)	Keterangan
	Ease of Access	0,655	0,171	Valid
	Service Security	0,673	0,171	Valid
	Facilities and Infrastructure	0,661	0,171	Valid
	Prices and Costs	0,649	0,171	Valid
	Customer Experience	0,668	0,171	Valid

The test results showed that all indicators had an r-count value greater than the r-table (0.171), so all statement items were declared valid. This shows that the research instrument is able to accurately measure respondents' perceptions of each variable studied.

Thus, the questionnaires used are feasible and reliable for follow-up analysis, such as reliability tests and regression analysis, and reflect the real state of respondents' perceptions.

b. Reliability Test

Table 4. Reliability Test

Variabel	Jumlah Item	Cronbach's Alpha	Kriteria	Keterangan
Digital Banking (X1)	4	0,872	≥ 0,70	Reliabel
Digital Financial Literacy (X2)	3	0,861	≥ 0,70	Reliabel
Service Innovation (X3)	2	0,854	≥ 0,70	Reliabel
Customer Loyalty (Y)	3	0,879	≥ 0,70	Reliabel
User Satisfaction (Z)	6	0,885	≥ 0,70	Reliabel

Reliability tests were carried out on five research variables using Cronbach's Alpha coefficient with a minimum limit of 0.70. The test results showed that all variables had a Cronbach's Alpha value above 0.70, namely Digital Banking (0.872), Digital Financial Literacy (0.861), Service Innovation (0.854), Customer Loyalty (0.879), and Service User Satisfaction (0.885).

3. Measuring Instrument Normality Test

Table 5. Normality Test

Variabel	Statistik Kolmogorov-Smirnov	df	Sig.	Keterangan
Digital Banking (X1)	0,074	133	0,200	Normal
Digital Financial Literacy (X2)	0,078	133	0,200	Normal
Service Innovation (X3)	0,081	133	0,200	Normal
Customer Loyalty (Y)	0,069	133	0,200	Normal
User Satisfaction (Z)	0,076	133	0,200	Normal

The normality test was carried out using Kolmogorov–Smirnov on all research variables. The test results showed a significance value of 0.200 (> 0.05) on all variables, so that the data was declared to be normally distributed. With the fulfillment of normality assumptions, the data is worth analyzing using parametric statistical methods.

4. Multicollinearity Test

Table 6. Multicollinearity Test

Independent Variables	Tolerance	VIF	Description
Digital Banking (X1)	0,732	1,366	Free from multicollinearity
Digital Financial Literacy (X2)	0,715	1,400	Free from multicollinearity
Service Innovation (X3)	0,750	1,333	Free from multicollinearity

The results of the multicollinearity test showed that all independent variables had a Tolerance value of > 0.10 and VIF < 10, so that multicollinearity did not occur. This means that Digital Banking, Digital Financial Literacy, and Service Innovation are independent of each other and have a real influence on Customer Loyalty. Thus, the regression model was declared feasible and reliable for further analysis.

5. Heteroscedasticity Test

Table 7. Heteroscedasticity Test

Independent Variables	*Koefisien*	Sig.	Description
Digital Banking (X1)	0,045	0,512	Heteroscedasticity does not occur
Digital Financial Literacy (X2)	0,038	0,608	Heteroscedasticity does not occur
Service Innovation (X3)	0,051	0,475	Heteroscedasticity does not occur

The regression results show that Digital Banking, Digital Financial Literacy, and Service Innovation have a positive and significant effect on Customer Loyalty through Service User Satisfaction. Easy, secure, and efficient digital services, supported by good digital financial literacy and continuous service innovation, are able to increase customer satisfaction and encourage their loyalty. User satisfaction has been proven to play a role as a mediating variable that strengthens the influence of these three variables on customer loyalty. These findings confirm that improving the quality of digital services, financial literacy, and innovation are key to building long-term customer loyalty.

6. Autocorrelation Test

Table 8. Autocorrelation Test

Model	Durbin-Watson (DW)	Lower Limit (dL)	Upper Limit (dU)	Conclusion
1	1,879	1,574	1,736	No autocorrelation occurs

The results of the Durbin-Watson autocorrelation test showed a DW value of 1.879, which is in the range of 1.5–2.5. This indicates that the regression model does not experience autocorrelation. Thus, the residual is independent and the regression model meets classical assumptions, so the results of hypothesis analysis and testing can be considered *valid* and reliable.

7. Multiple Linear Regression

Table 9. Multiple Linear Regression

Independent Variables	Regression Coefficient (β)	t-count Sig.	Sig. (p-value)	Description
Digital Banking (X1)	0,312	3,45	0,001	Significant

Independent Variables	Regression Coefficient (β)	t-count Sig.	Sig. (p-value)	Description
Digital Financial Literacy (X2)	0,278	2,98	0,003	Significant
Service Innovation (X3)	0,295	3,12	0,002	Significant
User Satisfaction (Z)	0,334	3,67	0,000	Significant (Intervening)

The results of multiple linear regression showed that Digital Banking (X1), Digital Financial Literacy (X2), and Service Innovation (X3) simultaneously had a positive and significant effect on Customer Loyalty (Y) at Bank BJB Cilegon Branch ($p < 0.05$). Digital Banking, digital financial literacy, and service innovation have each been proven to increase customer loyalty through convenience, security, knowledge, and quality of digital services.

In addition, Service User Satisfaction (Z) has a positive and significant effect on customer loyalty and acts as an intervening variable. This shows that the influence of digital services, literacy, and innovation on loyalty will be stronger if customers are satisfied with the experience of using digital banking applications.

8. Significance Test
a. T test

Table 10. T test

Independent Variables	Koefisien Regresi (β)	t-hitung	Sig. (p-value)	Description
Digital Banking (X1)	0,312	3,45	0,001	Significant
Digital Financial Literacy (X2)	0,278	2,98	0,003	Significant
Service Innovation (X3)	0,295	3,12	0,002	Significant
User Satisfaction (Z)	0,334	3,67	0,000	Significant

The results of the t-test showed that all independent variables had a positive and significant effect on Customer Loyalty (Y) at Bank BJB Cilegon Branch ($p < 0.05$). *Digital Banking*, Digital Financial Literacy, and Service Innovation have each been proven to increase customer loyalty through convenience, security, digital understanding, and improved service quality.

In addition, Service User Satisfaction (Z) as an intervening variable has the strongest influence on customer loyalty. This emphasizes that satisfaction in using digital banking services strengthens the influence of *digital services*, digital financial literacy, and service innovation on customer loyalty. Thus, improving the quality of digital services accompanied by user satisfaction is the key to building long-term customer loyalty.

b. F Test

Table 11. Test F

Sources of Variation	F-hitung	Sig. (p-value)	Description
Regression	56,78	0,000	Significant

The results of the F test showed that Digital Banking (X1), Digital Financial Literacy (X2), and Service Innovation (X3) simultaneously had a significant effect on Customer Loyalty (Y) through Digital Banking Application User Satisfaction (Z), with an F-value of 56.78 and a p-value of 0.000 (< 0.05).

These findings confirm that the research model is feasible and that increasing customer loyalty requires synergy between digital service quality, digital financial literacy, and service innovation. These three factors together increase customer satisfaction, which ultimately drives the formation of long-term loyalty.

9. Coefficient of Determination (R²)

Table 12. Coefficient of Determination

Research Model	R^2	Adjusted R^2	Description
Linear Regression	0,682	0,674	68.2% of the variation in Customer Loyalty (Y) is explained by X1, X2, X3, and Z.

The result of the determination coefficient (R^2) of 0.682 shows that 68.2% of the variation in Customer Loyalty can be explained by Digital Banking, Digital Financial Literacy, and Service Innovation through Digital Banking Application User Satisfaction. While the remaining 31.8% were influenced by other factors outside the research model.

This fairly high R^2 value indicates that the research model is able to explain the relationship between variables well. This shows that the improvement of digital services, digital financial literacy, and service innovation accompanied by user satisfaction significantly contribute to building customer loyalty of Bank BJB Cilegon Branch.

Discussion

The results of the study show that *Digital Banking* has a positive and significant effect on Customer Loyalty through User Satisfaction of Digital Banking Application at Bank BJB Cilegon Branch. The easier, safer, and more efficient *digital banking* services are, the higher customer satisfaction and loyalty in using digital banking applications.

Furthermore, Digital Financial Literacy has also been proven to have a positive effect on customer loyalty. Customers with a good level of digital financial literacy are better able to understand and utilize the app's features optimally, thereby increasing trust, comfort, satisfaction, and ultimately loyalty to the bank.

Service Innovation has a significant effect on customer loyalty. Continuous innovation, both in terms of features, security, and ease of use, can improve customer experience and satisfaction, which in turn strengthens long-term loyalty.

In addition, Digital Banking Application User Satisfaction has been proven to have a positive and significant influence on customer loyalty. Satisfied customers tend to reuse, have a long-term commitment, and recommend services to others.

Simultaneously, *Digital* Banking, Digital Financial Literacy , and Service Innovation have a positive and significant effect on Customer Loyalty through User Satisfaction as a mediating variable. User satisfaction has been proven to strengthen the relationship between digital service quality and customer loyalty. These findings confirm that customer loyalty is not only determined by technology, but also by customers' ability to understand digital services and innovations that are oriented to user needs.

CONCLUSION

Based on the results of the research, *Digital Banking*, Digital Financial Literacy*,* and Service Innovation have proven to have a positive and significant effect on customer loyalty of users of the Bank BJB Cilegon Branch digital banking application. The quality of *digital services* that are easy, safe, and efficient, supported by a good level of digital financial literacy and continuous service innovation, is able to increase customer satisfaction and loyalty. In addition, Digital Banking Application User Satisfaction has an important role as a mediating variable that strengthens the influence of these three variables on customer loyalty. Customers who are satisfied with the application experience tend to be more loyal, repeat users, and recommend Bank BJB's services. Thus, this study emphasizes that increasing customer loyalty can be achieved through the development of reliable *digital banking services*, increasing customer digital financial literacy, and service innovation oriented towards user satisfaction.

BIBLIOGRAPHY

Arcot, P. P., Sayed, G., Parekh, B., Balasubramanian, J. V, & Sudheer, V. N. (2024). The interplay of ethics, culture, and society in the age of finance digital transformation. *Journal of Southwest Jiaotong University*, *59*(2), 139–163.

Bisht, D., Singh, R., Gehlot, A., Akram, S. V., Singh, A., Montero, E. C., Priyadarshi, N., & Twala, B. (2022). Imperative role of integrating digitalization in the firms finance: A technological perspective. *Electronics*, *11*(19), 3252.

Osei, L. K., Cherkasova, Y., & Oware, K. M. (2023). Unlocking the full potential of digital transformation in banking: a bibliometric review and emerging trend. *Future Business Journal*, *9*(1), 30.

Raviteja, N. (2024). Financial technology (Fintech) and banking industry transformation: A symbiotic evolution into the digital era. *Transactions*, *1*(2), 23–29.

Accenture. (2023). Banking Consumer Study: Building Loyalty Through Digital Experience. Accenture.

Bank BJB. (2024). Digital Transformation and Service Innovation Report. Bandung.

OECD. (2023). OECD/INFE International Survey of Adult Financial Literacy. Paris: OECD Publishing.

Financial Services Authority. (2023). National Survey on Financial Literacy and Inclusion (*SNLIK*). Jakarta: OJK.

Financial Services Authority. (2024). Roadmap for the Development of Indonesian Digital Banking. Jakarta: OJK.

PwC. (2024). Global Digital Banking Consumer Survey. PricewaterhouseCoopers.

Accenture. (2023). Global Banking Consumer Study.

Acosta-Prado, J. C., et al. (2024). Digital transformation in banking: A bibliometric and systematic review. Journal of Business Research.

Gomber, P., Kauffman, R. J., Parker, C., & Weber, B. W. (2018). On the *fintech* revolution. Journal of Management Information Systems, 35(1), 220–265.

Kasman, A., & Ruslan, R. (2023). Digital banking and customer satisfaction in emerging markets. International Journal of Bank Marketing.

OECD. (2023). Digital Financial Literacy and Inclusion.

Financial Services Authority. (2018). POJK No. 12/POJK.03/2018 concerning the Implementation of Digital Banking Services.

Parasuraman, A., Zeithaml, V. A., & Malhotra, A. (2005). E-S-QUAL. Journal of Service Research, 7(3), 213–233.

Rahardjo, S., & Darma, D. C. (2025). Digital service quality and mobile banking continuity. Journal of Financial Services Marketing.

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance of information technology: *UTAUT*2. MIS Quarterly, 36(1), 157–178.

Vives, X. (2019). Digital disruption in banking. Annual Review of Financial Economics, 11, 243–272.

Wahyuningsih, S., et al. (2025). Digital banking adoption in Islamic banking. Journal of Islamic Marketing.

Choung, Y., Chatterjee, S., & Pak, T. Y. (2023). Digital financial literacy and financial well-being. Journal of Consumer Affairs, 57(1), 1–28.

Laily, N. (2022). Factors influencing digital financial literacy. International Journal of Financial Studies, 10(3), 45–58.

Nugroho, A., & Handayani, R. (2023). Digital financial literacy in *fintech* adoption. Journal of Financial Innovation, 9(2), 101–118.

Pratama, A. (2022). Digital financial literacy framework. Journal of Economics and Business, 15(2), 85–97.

Pratama, A., & Wardhana, A. (2023). Digital financial literacy and financial decision-making. Asian Journal of Business and Accounting, 16(1), 45–63.

Sari, D. P., et al. (2022). Cyber risk awareness in digital finance. Journal of Financial Crime, 29(4), 1253–1268.

Vieira, E., Matheis, T., & Lehnhart, M. (2024). Measuring digital financial literacy. Journal of Behavioral and Experimental Finance, 41, 100731.

Afifah, N., & Kurniawati, R. (2021). The effect of service quality and customer satisfaction on customer loyalty in general banking. Journal of Management and Business, 8(2), 115–126.

Hidayat, A., & Yulianti, T. (2022). Service experience and its influence on banking customer loyalty. Journal of Economics and Banking, 6(1), 45–56.

Iskandar. (2023). Trust and satisfaction as determinants of loyalty of banking customers. Journal of Management Science, 11(3), 201–212.

Rahmawati, D., & Nugroho, A. (2024). Analysis of factors forming customer loyalty in the banking sector. Journal of Management and Financial Research, 12(1), 89–101.

Sari, M. (2023). The influence of service quality, trust, and perception value on bank customer loyalty. Journal of Marketing Management, 9(2), 134–146.

Setiawan, R., & Harahap, M. (2023). Banking customer loyalty: The role of satisfaction, trust, and emotional connection. Journal of Business and Accounting, 15(2), 98–110.