The Effect of Digital Banking Adoption, Trust in Fintech, Perceived Security, and Customer Satisfaction on Financial Inclusion in Indonesian Banking

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Article Info

ABSTRACT

This study investigates the impact of Digital Banking Adoption, Trust in Fintech, Perceived Security, and Customer Satisfaction on Financial Inclusion in Indonesian banking. Employing a quantitative approach, data were collected from 110 respondents using a Likert scale (1–5) and analyzed using Structural Equation Modeling - Partial Least Squares (SEM-PLS) 3. The findings reveal that all four variables significantly and positively influence financial inclusion, with Digital Banking Adoption exerting the strongest impact. The model explains 68% of the variance in Financial Inclusion, underscoring the importance of digital transformation, trust-building, robust security, and customer satisfaction in enhancing financial accessibility. These results provide valuable insights for policymakers and financial institutions to develop targeted strategies that foster financial inclusion in Indonesia.

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1. INTRODUCTION

Financial inclusion is a key driver of economic development in Indonesia, as it improves access to financial services, reduces poverty, and promotes social equality. Although progress has been made, obstacles such as geographical barriers, poor infrastructure, and low financial literacy still limit its full potential. Financial inclusion enhances economic stability and growth through better access to financial products and services [1]. In rural areas, its integration with technology supports inclusive growth, emphasizing the need for technological advancement [2]. However, limited infrastructure and geographic constraints widen the digital divide and restrict access to financial services [1], making financial literacy essential in these regions (Putra et al., 2024). Fintech innovations like digital payments and mobile tech boost financial inclusion and economic growth, though they must complement traditional infrastructure to be effective [3]. A strong synergy between digital systems and traditional banking tools such as ATMs can enhance inclusion and performance [3]. Furthermore, increased

financial access can reduce poverty risk by up to 8.2% [4], making coordinated policies on access and literacy critical for maximizing its impact [4].

The rapid evolution of fintech and digital banking has significantly contributed to financial inclusion by making financial services more accessible and efficient, especially for underserved populations. These technologies have transformed traditional banking systems by offering tools for savings, credit, and payments; however, their effectiveness in promoting financial inclusion depends on factors such as trust in fintech, perceived platform security, and customer satisfaction. Trust in digital systems is essential, particularly in rural and developing areas where skepticism toward technology remains high [5]. Concerns over cybersecurity and data privacy present major barriers to broader adoption, as perceived security greatly influences user acceptance [6], [7]. Additionally, customer satisfaction—shaped by user-friendly interfaces and service reliability—is critical for user retention and widespread adoption [8]. Financial literacy also plays a key role in enabling users to effectively navigate digital financial services, highlighting the importance of targeted education programs [6], [9]. Moreover, the availability of robust technological infrastructure is essential, particularly in regions with limited internet connectivity [6], [9]. Lastly, effective regulatory frameworks are needed to mitigate risks such as fraud and ensure financial system stability [7].

Trust in fintech is crucial for the adoption and continued use of digital financial services, as it influences customer confidence in the reliability and security of these platforms. This trust is closely linked to perceived security, which reflects how safe users feel about their data and transactions. In low-trust societies, trust significantly affects recommendation behavior more than usage [10] and serves as a moderating factor when combined with financial literacy and tech-savviness [11]. In Palestine, trust, fintech awareness, and brand recognition strongly influence adoption, emphasizing the need for trust-building [12]. AI-driven security features like real-time fraud detection enhance perceived security and reinforce trust [13], while strong systems are essential to reduce fears of theft and poor safeguards [14]. Simplified payments, security, and usability foster customer satisfaction and ongoing engagement, with trust, usefulness, and ease of use being key drivers of adoption [14]. This study seeks to explore the interplay of these factors—digital banking adoption, trust in fintech, perceived security, and customer satisfaction—in shaping financial inclusion within the Indonesian banking sector.

2. LITERATURE REVIEW

2.1 Financial Inclusion

Financial inclusion in Indonesia is crucial for reducing poverty and fostering economic growth, yet it faces persistent challenges such as geographical barriers, limited infrastructure, and low financial literacy. Leveraging digital technologies offers a promising solution, as shown in other countries where digital financial services have improved access and supported economic development. In Turkey, mobile payment platforms have significantly increased the use of financial services [15], while in Ukraine, digital innovations have been instrumental in enhancing financial inclusiveness and reducing social inequality [16]. However, limited access to finance continues to hinder sustainable development and deepen income inequality in many developing countries, including Indonesia [17]. Financial literacy remains a key barrier, as individuals may struggle to effectively use financial services without adequate knowledge [15]. In this context, microfinance plays a vital role, particularly in supporting small businesses and alleviating poverty. In India, microfinance has successfully driven financial inclusion and economic growth in rural areas [18], [19], offering a potential model for addressing similar needs in Indonesia [19].

2.2 Digital Banking Adoption

The adoption of digital banking in Indonesia has significantly enhanced financial

inclusion, especially in rural and remote areas, by offering convenient and accessible financial services that eliminate geographical constraints. This impact, however, is shaped by factors such as ease of use, infrastructure availability, and user trust. Digital banking platforms often feature user-friendly interfaces that replicate traditional banking functions, making them accessible even to users unfamiliar with digital technology [20], while the integration of advanced technologies like blockchain further boosts security and transaction efficiency, encouraging broader adoption [21]. Despite these advancements, limited internet connectivity and access to mobile devices remain significant barriers in rural areas [22], underscoring the importance of expanding digital infrastructure to support continued growth [23]. Moreover, user trust is a critical factor in digital banking adoption, as concerns over privacy and security can deter usage [23]. Addressing these concerns through education and awareness initiatives is essential for building trust and promoting broader financial inclusion [24].

2.3 Trust in Fintech

Trust in fintech is a key factor influencing the adoption of financial technology services in Indonesia, shaping user perceptions of risk and their willingness to engage with digital platforms. It is driven by regulatory frameworks, provider credibility, and early user experiences, with higher trust levels linked to greater use of digital banking and improved financial inclusion. Blockchain technology supports trust by ensuring data security and decentralization, while hybrid consensus protocols like Proof of Elapsed Time (PoET) and Proof of Stake (PoS) enhance system efficiency and reliability [25]. Regulatory compliance remains a major concern, with 62% of stakeholders highlighting it as essential for consumer confidence and wider fintech adoption [26]. In low-trust environments, trust significantly influences consumer behavior and advocacy, making trust-building strategies crucial [10]. Privacy and security concerns also impact trust, with

data breaches undermining confidence and emphasizing the need for robust protection and policy improvements [27]. Enhancing user awareness and implementing secure digital solutions can help mitigate these concerns and strengthen trust in fintech platforms [27].

2.4 Perceived Security

Perceived security is a crucial factor influencing the adoption of digital banking and fintech services, particularly in Indonesia where financial inclusion is a key goal. Concerns over data breaches and unauthorized access can discourage usage, making strong measures like encryption, secure authentication, and transparent privacy policies essential to build trust. In Indonesia, tackling cybersecurity risks is vital for expanding digital banking access. Perceived security also mediates customer satisfaction, as shown in Generation Y's online shopping behavior, where secure transactions enhance satisfaction—a concept applicable to digital banking [28]. In Vietnam, perceived safety directly affects digital banking intentions, with trust and efficiency as mediating factors [29], while in Lahore, security, literacy, and attitude significantly shape e-banking adoption [30]. Awareness of digital threats also influences adoption, as seen in Chennai, where informed users show more trust in digital services [31]. In Indonesia, perceived security risk is the most influential factor affecting digital banking adoption, stressing the need for robust safeguards. Technologies like encryption and biometrics enhance security, but varying user confidence calls for greater transparency and reliability [32]. Lastly, user knowledge and experience positively shape perceived security, highlighting the importance of education in fostering trust.

2.5 Customer Satisfaction

Customer satisfaction in digital banking is influenced by factors such as usability, reliability, service quality, and the integration of technologies like AI and mobile banking. Satisfied users tend to remain loyal, recommend services, and adopt other financial products, supporting financial

inclusion. In Kaduna State, Nigeria, satisfaction significantly influenced AI integration (0.40) and mobile banking convenience (0.68) [33]. Key service dimensions—reliability, responsiveness, security, and customization—are essential for enhancing satisfaction [34]. A positive digital experience, as seen in the DANA digital wallet study, improves satisfaction and loyalty [35], while trust and innovation also play key roles [36]. AI features like visual appeal and problem-solving boost user experience (A & Shiny, 2024). However, internet banking has shown negative effects in places like Bamenda, Cameroon, indicating the need to address specific platform issues, and limited-scope studies, such as at Bank BCA, suggest the need for broader research [37].

2.6 The Role of Digital Banking in Financial Inclusion

Digital banking and fintech have significantly advanced financial inclusion in developing countries by lowering transaction costs and offering flexible service delivery models. These technologies have empowered small entrepreneurs and micro-enterprises through access to digital payment systems, alternative credit solutions, and financial literacy tools—essential elements for expanding market reach and enhancing financial sustainability [8]. Digital payment systems, such as mobile wallets and peer-to-peer lending, help reduce reliance on cash and improve financial transparency [8]. In Bangladesh, fintech platforms have expanded financial access for the unbanked, though challenges like limited internet and cybersecurity risks remain [6]. Trust and perceived security are critical to fintech adoption, with financial literacy and transparency playing key roles in building trust [6]. Regulatory efforts are also essential to manage risks like fraud and data misuse, ensuring long-term sustainability [7]. Collaboration between public and private sectors supports fintech's inclusive role and preserves financial system stability [7]. In the MENA region, fintech has expanded access for underserved groups, though regulatory frameworks and consumer protection are still needed to overcome barriers faced by marginalized communities [38].

2.7 Theoretical Framework

The Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology Acceptance Model (TAM) provide theoretical foundations for understanding the adoption of digital technologies in banking. These models emphasize the role of perceived usefulness, ease of use, trust, and security in shaping user behavior (Davis, 1989; Venkatesh et al., 2003). Additionally, customer satisfaction theories highlight the importance of meeting user expectations and delivering value to enhance adoption rates.

The study tests the following hypotheses:

H1: Digital banking adoption has a significant positive effect on financial inclusion.
H2: Trust in fintech has a significant positive effect on financial inclusion.
H3: Perceived security has a significant positive effect on financial inclusion.

2.8 Research Gaps

While existing studies have explored individual factors influencing financial inclusion, there is limited research examining the combined impact of digital banking adoption, trust in fintech, perceived security, and customer satisfaction. Moreover, studies specific to the Indonesian banking sector remain scarce, highlighting the need for a comprehensive analysis tailored to the country's unique socio-economic and technological landscape.

This study aims to fill these gaps by investigating the interplay of these factors and their collective influence on financial inclusion in Indonesia. By integrating insights from theoretical frameworks and empirical evidence, this research contributes to a deeper understanding of how digital banking can drive financial inclusion in a rapidly digitalizing economy.

3. METHODS

3.1 Research Design

This study employs a quantitative research design to examine the relationships between digital banking adoption, trust in fintech, perceived security, customer satisfaction, and financial inclusion in the Indonesian banking sector. Quantitative methods are suitable for testing hypotheses and analyzing the causal relationships between variables using statistical techniques.

3.2 Population and Sample

The population for this study consists of individuals who actively use digital banking services in Indonesia. A purposive sampling technique was applied to select respondents who have experience with digital banking platforms. The final sample size comprises 110 respondents, ensuring sufficient data for meaningful statistical analysis. This sample size meets the recommended minimum requirements for Structural Equation Modeling - Partial Least Squares (SEM-PLS) analysis, which requires at least 10 times the number of indicators in the most complex construct (Hair et al., 2017).

3.3 Data Collection Instrument

The data were collected using a structured questionnaire designed to measure the constructs of interest, consisting of several sections: demographics (age, gender, education level, and frequency of digital banking usage); digital banking adoption (five items assessing ease of use, accessibility, and perceived usefulness); trust in fintech (five items evaluating user confidence in reliability and transparency of fintech services); perceived security (five items related to the safety of financial transactions and data privacy); customer satisfaction (five items measuring overall satisfaction with digital banking services); and financial inclusion (five items assessing access to and usage of financial services enabled by digital banking). All items used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was pretested with a small group of respondents to ensure clarity, reliability, and validity.

3.4 Data Analysis

The collected data were analyzed using Structural Equation Modeling - Partial Least Squares (SEM-PLS), a robust statistical technique suitable for complex models with latent constructs, particularly effective for small sample sizes and non-normal data distributions. The analysis, conducted using SEM-PLS 3 software, involved several steps. First, the measurement model was assessed by evaluating convergent validity through Average Variance Extracted (AVE) with a threshold of 0.5 or higher, discriminant validity using the Fornell-Larcker criterion, and reliability via Cronbach's alpha and Composite Reliability (CR), both requiring values above 0.7. Next, the structural model was examined by analyzing path coefficients to determine the strength and direction of relationships between constructs, testing hypothesis significance using the t-statistic with a 1.96 threshold at a 95% confidence level, and evaluating the model's explanatory power using the R-squared value. Finally, hypothesis testing was performed to assess whether the relationships between variables—such as digital banking adoption and financial inclusion—were statistically significant.

4. RESULTS AND DISCUSSION

4.1 Demographic Sample

The demographic profile of the study's 110 respondents was analyzed to gain insights into their characteristics. In terms of gender, 58 respondents (52.7%) were male and 52 (47.3%) were female. The majority belonged to the 25–34 age group (45.5%), followed by 35–44 years (25.5%), 18–24 years (20.0%), and 45 years and above (9.1%). Educationally, most respondents held a bachelor's degree (60.9%), with others having a master's degree (22.7%), high school diploma (13.6%), or doctorate (2.7%). Monthly income levels varied, with 40.9% earning between IDR 5,000,000–10,000,000, 27.3% between IDR 10,000,000–20,000,000, 18.2% below IDR 5,000,000, and 13.6% above IDR 20,000,000. Regarding the frequency of digital banking use, 43.6% used it weekly, 34.5% daily, 16.4% monthly, and 5.5% rarely. Overall, the sample represented a diverse

population, predominantly young, educated, and middle-income individuals, with high engagement in digital banking—78.1% using it daily or weekly—indicating its deep integration into their financial routines.

4.2 Measurement Model Assessment

The measurement model was assessed to ensure the reliability and validity of the constructs through the evaluation of factor loadings, Average Variance Extracted (AVE), Composite Reliability (CR), and Cronbach's alpha. All indicators demonstrated factor loadings above the threshold of 0.70, ranging from 0.721 to 0.915, indicating strong convergent validity. The AVE values for all constructs exceeded the recommended minimum of 0.50, with Digital Banking Adoption at 0.636, Trust in Fintech at 0.651, Perceived Security at 0.685, Customer Satisfaction at 0.663, and Financial Inclusion at 0.70, confirming convergent validity. Cronbach's alpha values for all constructs were above 0.70, demonstrating good internal consistency: Digital Banking Adoption (0.821), Trust in Fintech (0.846), Perceived Security (0.850), Customer Satisfaction (0.831), and Financial Inclusion (0.882). Additionally, all constructs showed Composite Reliability values above 0.70, further affirming construct reliability, with Digital Banking Adoption at 0.872, Trust in Fintech at 0.886, Perceived Security at 0.892, Customer Satisfaction at 0.877, and Financial Inclusion at 0.913.

Discriminant validity was assessed using the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio to ensure that the constructs in the model were distinct from one another. Based on the Fornell-Larcker analysis, the square root of the Average Variance Extracted (AVE) for each construct was higher than its correlations with other constructs, as shown by the diagonal values exceeding the off-diagonal values in the correlation matrix, indicating good discriminant validity.

Table 1. Fornell-Lacker

Constructs	Digital Banking Adoption	Trust in Fintech	Perceived Security	Customer Satisfaction	Financial Inclusion
Digital Banking Adoption	0.791				
Trust in Fintech	0.626	0.815			
Perceived Security	0.589	0.641	0.828		
Customer Satisfaction	0.544	0.596	0.603	0.815	0.686
Financial Inclusion	0.618	0.631	0.660	0.682	0.849

The discriminant validity assessment also included the Heterotrait-Monotrait (HTMT) ratio, where all HTMT values were found to be below the recommended threshold of 0.85, confirming satisfactory discriminant validity. Note: Bold values on the diagonal of the Fornell-Larcker matrix represent the square root of AVE for each construct, which were all higher than the correlations with other constructs, further supporting the distinction among the constructs.

Table 2. Heterotrait-Monotrait

Constructs	Trust in Fintech	Perceived Security	Customer Satisfaction	Financial Inclusion
Digital Banking Adoption				
Trust in Fintech	0.787			
Perceived Security	0.765	0.684		
Customer Satisfaction	0.722	0.698	0.631	

The results of the discriminant validity tests confirm that the constructs are

empirically distinct from one another. Based on the Fornell-Larcker criterion, the square root of the AVE for each construct is greater than its correlations with other constructs, indicating that each construct shares more variance with its own indicators than with others. Additionally, the Heterotrait-Monotrait (HTMT) ratio values were all below the conservative threshold of 0.85, further supporting the presence of satisfactory discriminant validity.

4.3 Structural Model

The structural model was assessed to evaluate the relationships between constructs and the hypothesized paths, using key metrics such as path coefficients, t-values, R^2 values, f^2 effect sizes, and predictive relevance (Q^2). Path coefficients were analyzed to determine the strength and direction of the relationships, and a bootstrapping procedure with 5,000 subsamples was conducted using SEM-PLS to generate t-values and p-values for hypothesis testing.

Table 3. Hypothesis Testing

Hypotheses	Path Coefficient (β)	t-value	p-value	Result
Digital Banking Adoption → Financial Inclusion	0.353	4.122	<0.001	Supported
Trust in Fintech → Financial Inclusion	0.286	3.657	<0.001	Supported
Perceived Security → Financial Inclusion	0.258	3.026	0.003	Supported
Customer Satisfaction → Financial Inclusion	0.312	3.893	<0.001	Supported

All hypotheses in the study were supported, showing significant positive relationships between the independent variables and financial inclusion in Indonesia's banking sector. Digital Banking Adoption had the strongest influence (β = 0.353, t = 4.122, p < 0.001), highlighting its role in expanding financial access, especially for underserved groups. Trust in Fintech (β = 0.286, t = 3.657, p < 0.001) also played a key role by reducing perceived risks and encouraging adoption. Perceived Security (β = 0.258, t = 3.026, p = 0.003) confirmed the importance of safe digital environments, while Customer Satisfaction (β = 0.312, t = 3.893, p < 0.001) emphasized the value of positive user experiences in driving continued usage and financial inclusion. These findings align with existing theories, reinforcing the importance of technology, trust, and user experience.

The Coefficient of Determination (R^2) indicates that 68% of the variance in Financial Inclusion is explained by the independent variables—Digital Banking Adoption, Trust in Fintech, Perceived Security, and Customer Satisfaction—demonstrating a substantial level of predictive accuracy. This suggests that the model effectively captures the key factors influencing financial inclusion in the Indonesian banking context.

The effect size (f^2) analysis shows that Digital Banking Adoption (f^2 = 0.18) and Customer Satisfaction (f^2 = 0.14) have moderate effects on Financial Inclusion, while Trust in Fintech (f^2 = 0.12) and Perceived Security (f^2 = 0.09) have small but still meaningful impacts. Additionally, the predictive relevance of the model, measured using the Stone-Geisser Q^2 value through blindfolding, yielded a Q^2 of 0.49, which is well above zero, confirming that the model possesses strong predictive relevance.

DISCUSSION

The findings of this study underscore the critical roles of Digital Banking Adoption, Trust in Fintech, Perceived Security, and Customer Satisfaction in fostering financial inclusion in the Indonesian banking sector. Each factor was found to significantly influence financial inclusion, highlighting a multifaceted and interconnected framework that banking institutions and policymakers must address to promote accessibility to financial services.

The Role of Digital Banking Adoption

The results demonstrate that Digital Banking Adoption has the most substantial effect on Financial Inclusion, aligning with previous studies that highlight the transformative role of digital technologies in bridging financial gaps, especially in developing countries [39]–[41]. Digital banking offers cost-effective, scalable, and convenient solutions for underserved populations, particularly in remote areas with limited access to traditional banking infrastructure. This suggests that banks should prioritize the development and deployment of user-friendly digital banking platforms and mobile applications tailored to diverse demographic groups. Additionally, educational campaigns aimed at improving digital literacy are essential to ensure that users can effectively access and utilize digital financial services.

The Importance of Trust in Fintech

Trust in Fintech also has a positive and significant impact on Financial Inclusion ($\beta = 0.28$, $p < 0.001$), reinforcing the idea that trust is a critical factor in the adoption of financial technologies. Users are often cautious about online financial transactions due to concerns over fraud, data breaches, and misuse of personal information [42]–[44]. To address this, fintech providers must prioritize transparency, implement strong security measures, and adopt customer-centric approaches to build and maintain trust. Additionally, collaboration between regulators and fintech companies is essential to establish clear guidelines and safeguards that enhance user confidence in using financial technologies.

The Role of Perceived Security

Perceived Security significantly influences Financial Inclusion ($\beta = 0.25$, $p < 0.01$), highlighting the critical role of secure platforms in encouraging the adoption and continued use of digital banking and fintech services. Security concerns, such as data breaches and fraud, remain major barriers for many users. Therefore, investment in advanced security technologies—including encryption, multi-factor authentication, and real-time fraud detection—is essential.

Additionally, consistent communication with users regarding security measures and best practices can help alleviate concerns and build greater trust in digital financial platforms [42], [45], [46].

The Impact of Customer Satisfaction

Customer Satisfaction has a notable positive effect on Financial Inclusion ($\beta = 0.31$, $p < 0.001$), highlighting the critical role of service quality in retaining users and expanding access to financial services. Satisfied customers are more likely to remain loyal and recommend digital financial platforms to others, thereby accelerating financial inclusion. To support this, banks and fintech companies should prioritize personalized service delivery, efficient problem resolution, and continuous enhancement of customer experiences. Regularly measuring satisfaction and responding to user feedback can help improve service quality and ensure that offerings remain aligned with customer needs and expectations [8], [47], [48].

Theoretical Contributions

This study contributes to the existing literature by providing empirical evidence of the interrelationships between digital banking, fintech trust, security perceptions, customer satisfaction, and financial inclusion. The findings support the validity of the Technology Acceptance Model (TAM) and its relevance in financial inclusion research, emphasizing the importance of perceived usefulness and trust.

Policy Implications

Policymakers should consider the following actions to improve financial inclusion:

1) Encourage partnerships between traditional banks, fintech firms, and government entities to expand the reach of financial services.
2) Establish and enforce regulations that ensure consumer protection, transparency, and data security in digital financial ecosystems.

5. CONCLUSION

The study concludes that Digital Banking Adoption, Trust in Fintech, Perceived Security, and Customer Satisfaction are critical drivers of Financial Inclusion in Indonesia. Digital banking stands out as the most influential factor, highlighting its potential to bridge financial gaps across diverse demographic groups. Trust in Fintech and Perceived Security emphasize the importance of user confidence and platform safety in encouraging broader participation in the financial ecosystem. Meanwhile, Customer Satisfaction underlines the role of quality service in retaining and expanding the customer base.

With a substantial R^2 value of 0.68, the findings demonstrate the collective importance of these variables in fostering financial inclusion. Practical recommendations include accelerating the adoption of digital banking, enhancing fintech security measures, and fostering customer-centric approaches. Policymakers and financial institutions should collaborate to create an enabling environment for financial inclusion by addressing systemic barriers and leveraging technological advancements. Future research could extend this framework by exploring additional factors, such as financial literacy and regulatory impacts, to provide a comprehensive understanding of financial inclusion dynamics in emerging markets.

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